

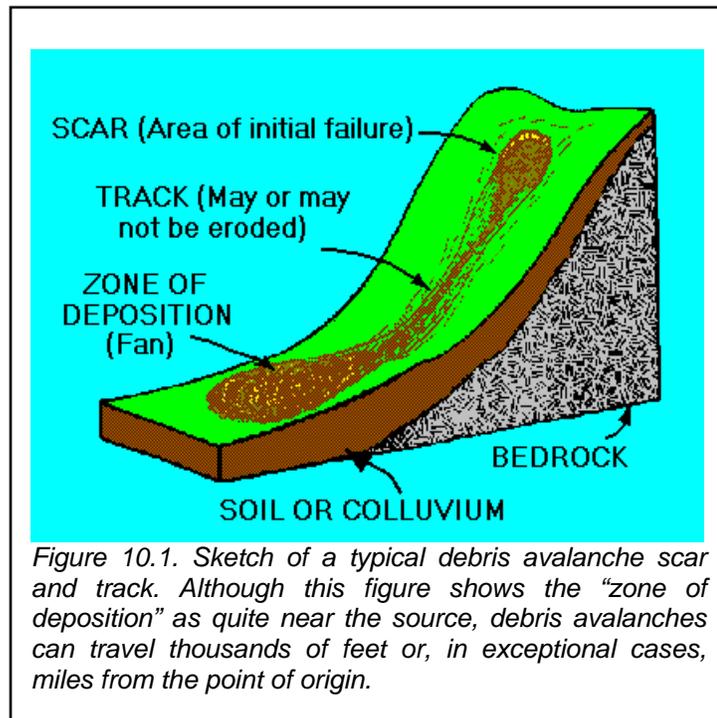
CHAPTER 10. LANDSLIDE RISK ASSESSMENT

10.1 IDENTIFYING HAZARDS—DESCRIPTION OF THE LANDSLIDE HAZARD

Under 44 CFR Section 201.6(c)(2)(i) of DMA2K, local mitigation plans are required to include a risk assessment with a description of the types of natural hazards that can affect the jurisdiction. This section identifies the risks faced by the City of Roseville from the landslide hazard.

10.1.1 Background

Landslides can be described as the sliding movement of masses of loosened rock and soil down a hillside or slope. Fundamentally, slope failures occur when the strength of the soils forming the slope exceeds the pressure, such as weight or saturation, acting on them. Mudslides or mudflows (or debris flows) are rivers of rock, earth, organic matter and other soil materials saturated with water. They develop in the soil overlying bedrock on sloping surfaces when water rapidly accumulates in the ground, such as during heavy rainfall or rapid snowmelt. Water pressure in the pore spaces of the material increases to the point that the internal strength of the soil is drastically weakened. The soil's reduced resistance can then easily be overcome by gravity, changing the earth into a flowing river of mud or "slurry."



Landslides can be initiated by storms, earthquakes, fires, volcanic eruptions, and by human modification of the land. A debris avalanche (Figure 10.1) is a fast-moving debris flow that travels faster than about 10 miles per hour (mph) or approximately 25 yards in about 5 seconds. Speeds in excess of 20 mph are not uncommon, and speeds in excess of 100 mph, although rare, can occur.

A debris flow or mudflow can move rapidly down slopes or through channels, and can strike with little or no warning at avalanche speeds. The slurry can travel miles from its source, growing as it descends, picking up trees, boulders, cars, and anything else in its path. Although these slides behave as fluids, they pack many times the hydraulic force of water due to the mass of material included in them. Locally, they can be some of the most destructive events in nature.

A sinkhole is a collapse depression in the ground with no visible outlet. Its drainage is subterranean; its size is typically measured in meters or tens of meters, and it is commonly vertical-sided or funnel-shaped.

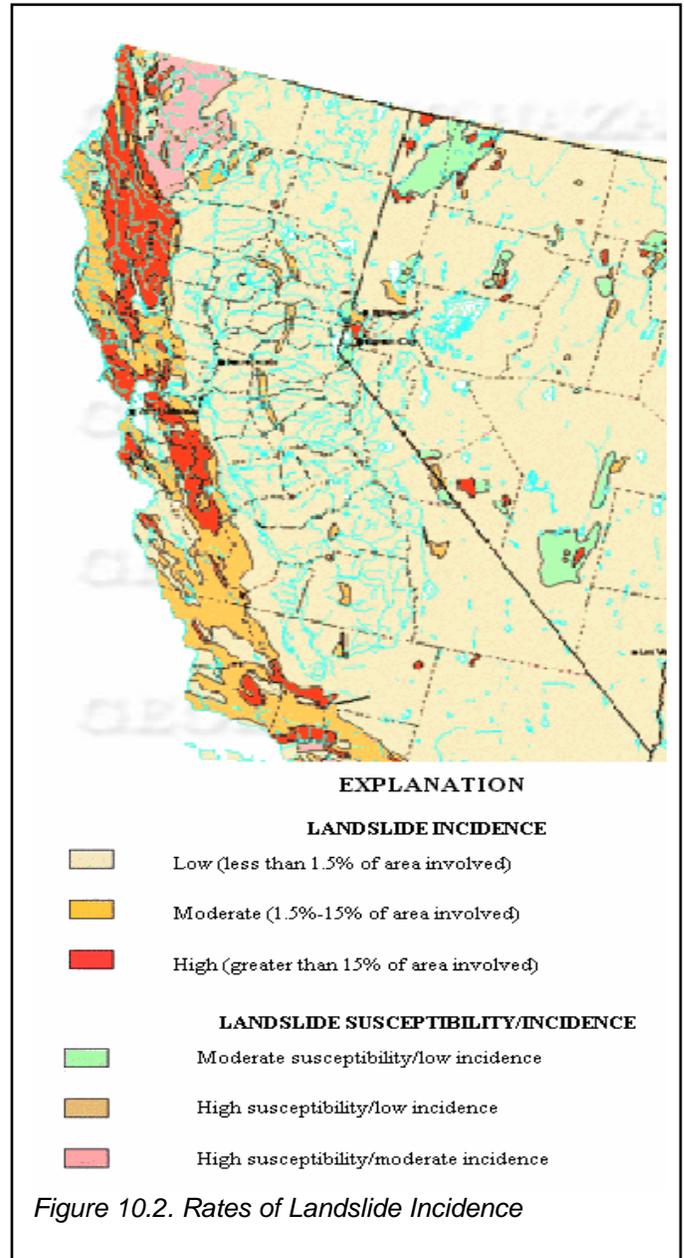
In general, landslide hazard areas occur where the land has certain characteristics, which contribute to the risk of the downhill movement of material. These characteristics include the following:

- A slope greater than 15 percent
- Landslide activity or movement occurred during the last 10,000 years
- Stream or wave activity, which has caused erosion, undercut a bank or cut into a bank to cause the surrounding land to be unstable
- The presence or potential for snow avalanches
- The presence of an alluvial fan, which indicates vulnerability to the flow of debris or sediments
- The presence of impermeable soils, such as silt or clay, which are mixed with granular soils such as sand and gravel

10.1.2 Landslide Hazard Assessment

Using the criteria listed above, portions of Roseville reflect the characteristics for potential landslide hazard areas. These are areas with steep slopes in excess of 15 percent in the Stoneridge Specific Plan area. Land sliding has likely occurred numerous times in the past as evidenced by past deposits exposed in erosion gullies. The time frame for these past occurrences is most likely in geologic terms, probably over the last several hundred, if not thousands of years. There is little or no record of landslides occurring within Roseville that caused damage to property. However, with the presence of steep slopes in excess of 15 percent, and the frequent occurrence of multiple intense storms that can saturate the soil, there is an exposure to landslides within Roseville. The USGS has identified geologic hazard areas and their associated susceptibility and rate of incidence. Placer County and the Roseville vicinity has been classified as a low rate of incidence with less than 1.5 percent of the area susceptible to landslides (see Figure 10.2).

Roseville’s most likely risk exposure to landslides is as a secondary risk exposure to an earthquake or wild land fire. The ground shaking that could occur during a regional earthquake could trigger landslides in the steep slope areas. This scenario could be further enhanced should an earthquake occur during a time where the soils are saturated due to repeated storm events typical for this region. After a wild land fire, the landscape becomes denatured and unable to absorb the impacts of repeated intense rainfall. This can cause the soil to become saturated and vulnerable to sliding.



10.2 LANDSLIDE HAZARD PROFILE

Under 44 CFR Section 201.6(c)(2)(i) of DMA2K, risk assessments are required to include a description of the location and extent of the hazards that can affect the jurisdiction. This sub-section includes information on previous landslide occurrences in the City of Roseville (location, extent, and historic damages) and on the probability of future occurrences.

10.2.1 Landslide Location and Extent

Little or no existing scientific analysis is available with regards to this hazard for the Roseville area. Any and all assessment of the risk from this hazard is based on, past occurrences, observed conditions, and guidance from state and federal agencies. Any future assessment of the risk from this hazard could be enhanced with better data specific to this hazard.

The city's geographic location, soil conditions, and surface terrain combine to minimize risk of major damage from landslides, subsidence (gradual shrinking of the earth's surface due to underground resource extraction), or other geologic hazards resulting from seismic activity and related natural forces. While Roseville is located on relatively level terrain, the land gradually increases in slope to the east and north. The most significant slope areas are located along creeks and ravine areas. The soil type in these ravine areas is a mehrten soil typical associated with post volcanic activity. This soil is very dense and not considered to be erosion prone. Therefore, the extent of the risk exposure to landslides would be considered negligible based on observed conditions.

Landslide Hazard Identification Program

This Landslide Hazard Identification Act directs the State Geologist to identify and map hazardous landslide areas for use by municipalities in planning and decision-making on grading and building permits. Three factors that characterize landslide hazard areas include significant slope, weak rocks, and heavy rains. This program focuses on urban areas and growth areas that exhibit these characteristics. Roseville and the surrounding Sacramento region are not identified as areas prone to landslide hazards. Therefore, the region has not been included as a part of this study program.

10.2.2 Previous Occurrences

Little recorded information for Roseville is available regarding previous landslide occurrences. Three landslide events have been recorded within Placer County according to the Placer County hazard Mitigation Plan. These events occurred in the eastern portion of the county, which is significantly different in geologic terms. Therefore, no parallel's can be interpolated from these events for the City of Roseville.

10.2.3 Probability of Future Landslides

Chapter 15 of this plan ranks the risks as they pertain to the City of Roseville. One of the parameters in establishing this ranking is probability of occurrence. The following thresholds have been established by the Hazard Mitigation Plan Steering Committee to rank the probability of occurrence.

- High: Event likely to occur within 25 years
- Medium: Event likely to occur within 100 years
- Low: Event not likely to occur within 100 years

Based on historical records of occurrence and the above definitions, the probability of occurrence for landslides in Roseville is considered low.

10.3 VULNERABILITY ASSESSMENT

Under 44 CFR Section 201.6(c)(2)(ii) of DMA2K, risk assessments are required to include a description of the jurisdiction's vulnerability to specified hazards and their potential impact on the community. This description should also describe Roseville's vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the hazard area and estimate potential dollar losses to vulnerable structures as well as analyze development trends. This sub-section presents the results of the landslide vulnerability assessment for Roseville.

10.3.1 Impact of Landslides on Life, Safety, and Health

Based on the best available data, observed conditions and past occurrences, it would appear that the probable impact of landslides on the life, safety, and health of the citizens of Roseville would be little or no impact. This is based on the lack of exposure of any structure or facility critical to the safety and health of the citizens of the city.

10.3.2 Impact of Landslides on Critical Facilities

Critical facilities are structures where vital community operations are performed. If these facilities are damaged, there could be severe consequences to public health and safety. Therefore, it is imperative that critical facilities be adequately protected from the impacts of hazard events. Critical facilities are not strictly defined by FEMA. Rather, local governments are encouraged to evaluate their own community and determine which facilities would be necessary during an emergency event. As such, the Steering Committee has defined a critical facility as:

“A facility that is vital for the City's ability to provide essential services and protect life and property and/or the loss of which would have a severe economic or catastrophic impact.”

Based on this definition, there are no Critical facilities subject to a landslide risk exposure. This is based on the information available at the time of this planning process. As stated earlier the data necessary to truly identify the potential vulnerability to landslides, if it exists, is not currently available. A critical facilities analysis should be performed as new risk based information (mapping) becomes available.

10.3.3 Impact of Landslides on Existing Structures At Risk

Based on observed characteristics such as location and estimation of slope percentage, there would appear to be no structures that are vulnerable impacts from a landslide. There have been no reported damages from this type of event and no record of past occurrences. Once better data in the form of landslide hazard and landslide susceptibility mapping become available, a more thorough vulnerability analysis can be performed.

10.3.4 Economic Impact from Landslides

There would appear to be little or no economic impact of a landslide should one occur within the city of Roseville. Based on observed conditions, those areas with potential susceptibility to a landslide due to slope, have no economic significance to the City of Roseville. The majority of these areas are in an open space use due to current City policies required by the General Plan, Safety Element. Roads and

infrastructure that service these areas could possibly be impacted, should a landslide occur. However, without better detailed data to analyze this susceptibility, this potential exposure and vulnerability simply can not be determined.

10.3.5 Impact of Landslides on Development and Redevelopment Trends

The area considered to be the most vulnerable to this risk exposure is a small geographical area in terms of entire city limits of Roseville. As stated earlier, these are ravine areas in the south eastern portion of Roseville, and are considered to be non-developable areas. This along with the fact that the probability of occurrence of this type of hazard is so low primarily due to the soil type in this region, would lead to the assumption that this hazard would have little or no impact on future development and redevelopment trends. The City's current land use policies would also ensure that no future development or re-development would be impacted by this hazard (see Section 4.2).

10.4 REVIEW OF EXISTING ORDINANCES, PROGRAMS, AND PLANS

The City of Roseville General Plan, Safety Element includes components that address geologic hazards such as landslides. Since 1975, state law has required that a safety element be included as part of all general plans. In 1984, the legislature consolidated the safety and seismic elements into one element that includes seismic safety, geologic hazards, fire safety, and flooding. The seismic and geologic hazards component includes goals and policies to protect the city's residents from danger associated with active faults, liquefaction, ground failure (landslides), and steep slopes. While the potential for seismic and geologic hazard occurrences in Roseville is not high, the soil and geologic characteristics of the city continue to play an important role in determining safety procedures.

While the potential for geologic hazards such as landslides in Roseville is not high, the soil and geologic characteristics of the city continue to play an important role in determining safety procedures. Current policies and ordinances reflect the City's ongoing obligations to protect lives and property and include ongoing monitoring of seismic activity and periodic updating of plans for emergency events. Continued implementation of these policies and enforcement of City ordinances and General Plan policies will ensure that efforts are maximized in protecting the safety of Roseville's citizens from potential geologic safety hazards. Policies and implementation measures were identified in the Seismic and Geologic component of the Safety Element that will mitigate the potential exposure to geologic hazards within Roseville. These policies are as follows:

- Continue to mitigate the potential impacts of geologic hazards through building plan review.
- Minimize soil erosion and sedimentation by maintaining compatible land uses, suitable to the existing environment.
- Develop appropriate building designs and implement appropriate construction techniques to decrease the impact of a landslide.
- Create and adopt slope development standards prior to or as part of the planning process for any area identified as having significant slope.
- Require contour grading, where feasible, and re-vegetation to mitigate the appearance of engineered slopes and to control erosion.

These policies are implemented through existing, ongoing programs that include the following:

- **California Building Code**—Through the Building Division of the Public Works Department, continue to enforce and keep abreast of the most recent updates to the CBC that include construction standards for seismic and geologic safety.
- **Development Review Process**—Refer any development proposal that may be impacted by grading, soil, or geologic issues to the Public Works Department. Consider the comments of the Public Works Department in the development review process. The environmental review for projects shall include a full inventory of potential grading impacts and any potential soil or geologic concerns, assessment of potential project impacts, and identification of mitigation and monitoring measures. Issues relating to slopes, liquefaction, ground failure and erosion shall be addressed. Project design, grading, and building construction techniques shall be used, as applicable, to minimize impacts. Sites that are determined to have significant slope shall be identified and appropriate design restrictions shall be implemented to avoid the risk of erosion or landslide. Graded slopes shall generally be limited to 2:1 where feasible. Slopes that are less than 2:1 should be encouraged. The use of retaining walls or stepped building designs should be pursued as an alternative to high or steep slopes where feasible and desirable.
- **Grading Ordinance**—Enforce and regularly evaluate the Grading Ordinance. The Grading Ordinance includes specific standards for project construction and erosion control. This ordinance requires prompt re-vegetation of disturbed areas, avoidance of grading activities during wet weather, avoidance of disturbance within drainage ways, and other erosion control measures.
- **Specific Plans**—Ensure that specific plans are consistent with the goals and policies of the General Plan. Specific plans shall identify potential geologic, soil, and seismic hazards within the planning area and shall also include measures to reduce the risk of such hazards. Proposed specific plans shall identify criteria for development on steep slope areas, as applicable, in order to ensure public safety and minimize environmental and aesthetic impacts.
- **Land Use Designation**—In areas where potentially significant soil and erosion impacts are identified, the City should consider open space or other appropriate land use designations, as specific in the Land Use Element, to minimize potential impacts.

10.5 REVIEW OF MITIGATION ALTERNATIVES

After assessing the vulnerabilities to this hazard through the risk assessment process, the Planning Team and Steering Committee has determined the probable impacts to the City of Roseville from this type of hazard event to be very low. Therefore the time and effort allocated to the review of possible mitigation alternatives for this hazard was kept to a minimum.. The list of possible mitigation measures for this hazard can be found in the catalog of mitigation measures for the landslide hazard in Chapter 17 of part 4 of this plan.