

## **2.3 Mass Wasting-Slope Instability Hazards**

### **2.3.1 Introduction**

Mass wasting is the down-slope movement of rock and regolith (rock products such as soil, sediment, weathered rock and wind-blown deposits) near the Earth's surface, mainly due to the pull of gravity. Mass wasting includes landslides, mudflows, rock falls and creep. It is an important part of the erosional process, as it moves material from higher elevations to lower elevations, where transporting agents like streams pick up the material and move it to even lower elevations. Mass wasting occurs continuously on all slopes; some mass wasting processes act very slowly, others occur very suddenly, often with disastrous results.

As human populations expand over more of the land surface, mass wasting processes become an increasing concern. In a typical year in the United States, mass wasting causes 25 to 50 deaths and over \$1.5 billion in damages.

There are predictable relationships between local geology and mass wasting processes. Knowledge of these relationships can improve planning and reduce vulnerability. Slope stability is dependent on many factors and their interrelationships. Rock type and pore water pressure are possibly the most important factors, followed by slope steepness due to natural or man-made undercutting. The igneous and metamorphic basement rock forming much of the County's hillside terrain (Figure 2-3) is generally grossly stable in its natural condition. However, the steepness of the slopes result in locally precarious rocks that could fall as a result of earthquake ground shaking or intense rainfall. In addition, many existing landslides and soil slumps have been mapped within the County, and where slopes have failed before, they will fail again.

Every slope has an angle of repose (Figure 2-4). Slopes less than this angle can resist the pull of gravity and will be at rest. Slopes steeper than this angle will eventually fail. On average, the angle of repose is 35 degrees from horizontal, but varies widely. The looseness or consolidation of the material, planes of weakness and vegetation all affect angles of repose. Thickly forested slopes can maintain a 45 degree angle; however, slopes as shallow as 26 degrees have failed catastrophically in the San Francisco region. The most effective way for the County of Riverside to protect lives and property from mass wasting is to prohibit development on or near slopes that exceed about 30 degrees in steepness. Figure 2-3 illustrates slopes that should be preserved in their natural condition, due to mass wasting potential.