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Geologic Map 85

Landslide Inventory and Slope Map of Jefferson County, Southwest Montana

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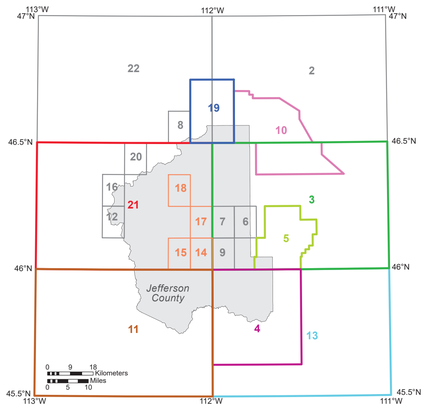

1. Stickney and others, 2000
2. Reynolds and Brandt, 2005
3. Reynolds and Brandt, 2006
4. Vuke, 2006
5. Vuke, 2007
6. Mahoney and others, 2008a
7. Mahoney and others, 2008b
8. Berg, 2009
9. MacLaurin and others, 2010
10. Vuke, 2011
11. McDonald and others, 2012
12. Hargrave and Berg, 2013
13. Vuke and others, 2014
14. Scarberry, 2016a
15. Olson and others, 2016
16. Scarberry, 2016b
17. Scarberry and others, 2017
18. Olson and others, 2017
19. Stickney and Vuke, 2017
20. Scarberry and others, 2018
21. Scarberry and others, 2019
22. McDonald and others, 2020

Figure 1. Previous mapping in the study area.

Legend

- Interstate
- Major road
- Railroad
- Town
- Stream
- County boundary
- Open pit mine

- Active Historic landslide
- Dormant Young landslide
- Dormant Mature landslide
- Dormant Old landslide

Slope index gradient

Moderate — Steep

Slope index values

25–30° | 30–35° | 35–45° | >45°

Scale 1:100,000

0 4 8 12 Kilometers
0 2.5 5 7.5 10 Miles

Basemap: Lidar hillshade DEM overlain by slopeshade (relief) and colored slope index values >25°. Lidar data for Jefferson County made available by the Montana State Library.

This landslide inventory and slope map identifies landslides that demonstrate evidence of gravity-driven movement based on lidar data, geomorphic and topographic analyses, satellite imagery, field checks, and, when available, published geological maps (fig. 1). Landslides are classified based on the relative recency of surface movement. The slope map provides a preliminary tool to identify areas that may be susceptible to failure. Several factors in addition to slope steepness affect the formation of landslides, including the geologic setting, stream erosion, weathering, vegetation, change in precipitation or ground water levels, and human activities.

Landslides shown on this map are gravity-driven mass movements or mass wasting deposits where soil, sediments, rock, and/or rock debris have failed down-slope. Landslides and mass movements include earth flows, debris flows, debris slides, rock slides, and rock falls. Mapped landslides are identified from the geomorphic expression of both the source area (i.e., head scarp or scar) and transported material. Landslide identification and location certainty are limited to mappable features in the lidar data at scales less than or equal to 1:5,000. Smaller or poorly preserved landslides may not have been identified.

The lidar slope map displays a colored slope index gradient. Classes of 25–30°, 30–45°, 35–45°, and >45°, delineate areas with increasing potential for mass movements. The slope map, combined with occurrence of landslides in a given area and recency of surface movement, provides a set of proxies and tools to identify areas susceptible to mass movements. This map is designed for use as a general planning tool and is appropriate for use at a scale of 1:100,000. Site-specific investigations and more detailed geotechnical information are required for landslide hazard assessments.

Active/Historic landslides represent movements that occurred in the historic record or are associated with anthropogenic activity. Landslides in this category have well-constrained locations with clear scarps or scars, cracks, well-defined boundaries, disrupted vegetation, blockage to drainages, or damaged man-made features, and show little to no erosion.

Dormant-Young landslides represent movements that occurred during the Latest Quaternary (within the past 15,000 years) that appear relatively fresh and have no existing historical record. Landslides in this category have well- to moderately constrained locations with clear scarps or scars, cracks, well defined boundaries, disrupted vegetation, or blockage to stream drainage, and show minor erosion.

Dormant-Mature landslides represent movements that occurred during the Late Quaternary (within the past 130,000 years) that appear smoothed and/or partly modified by erosion. Landslides in this category have well to moderately constrained locations with some degree of head scarp rounding, diffused scars, eroded toe area, partly smoothed boundaries and deposits, relatively uniform vegetation, and some gullies or drainages incised within the landslide features.

Dormant-Old landslides represent movements that likely occurred during the Quaternary (within the past 2.6 million years) that have been greatly smoothed and modified by erosion. Landslides in this category have moderately constrained to inferred locations with a strong degree of head scarp rounding or fully eroded head scarp, no clear scars, eroded toe area or not preserved, smoothed boundaries and deposits, fully revegetated, and well-defined gullies or drainages incised within the landslide features.

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Maps may be obtained from:
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