Lidar-based landslide inventory of Garfield County, Colorado

Metadata

Tags

Colorado Geological Survey, Landslides, Landslide inventory

Summary

Garfield County is located on the west side of the state and contains a portion of the I-70 corridor through the Rocky Mountains. Several larger communities support year-round recreation and agriculture in the county. Urban growth and development is encroaching on steep, landslide prone slopes in the county. This dataset is part of a statewide effort to develop landslide inventories of landslide-prone areas in Colorado and was funded by the U.S. Geological Survey Cooperative Landslide Hazard Mapping and Assessment Program from 2024 to 2026. This dataset includes a landslide inventory of Garfield County, identified and mapped using 1-m resolution lidar. Debris-flow and rockfall deposits are not mapped. Rock glacier deposits are included as a part of this dataset. Some areas with heavy soil creep and solifluction may have shallow landslides that are unmapped.

CGS has developed a 3-level schema for lidar-based landslide inventories. Level 2 inventories are comprised of detailed landslide deposit mapping, including nested deposits, and detailed headscarp and scarp mapping. Potential landslide deposits are also included as point features, labeled “Potential_Landslide_Points”. This mapping level also uses a simplified attribute table like that used for schema Level 1 mapping. CGS used a scarp identification method developed by Bunn and others (2019; Special Paper-52) to assist with the mapping of internal scarps. County boundaries were acquired in 2025 from the Colorado Department of Public Health and Environment (CDPHE).

Description

This dataset includes mapped landslide deposits, nested landslide deposits, headscarps, internal scarps, and potential landslide points. Landslides are mapped using 1-m resolution, lidar-derived slope maps. Lidar was examined and landslide deposits were mapped at varying scales, generally 1:5,000 or smaller, but may be as great as 1:2,000. Five- to ten-foot contours derived from lidar DEM’s were used to

assist in mapping deposit boundaries. This inventory does not include rockfall or debris-flow deposit mapping. Rock glacier deposits are included where their morphology is identifiable in lidar, but the dataset does not determine whether individual features are active or ice-rich.

A simple attribute table accompanies this inventory dataset and includes:

Confidence: A mapping confidence assigned by the mapper(s). Considerations are listed for each confidence interval. Confidence can be re-assessed after field review.

Low: Landslide features are difficult to distinguish, boundaries are not clear, and/or the lidar is distorted (tinning) and difficult to interpret. Headscarps and flanks are difficult to distinguish, and general landslide morphology (hummocky topography, internal scarps) is muted, weathered, or eroded.

Moderate: Most landslide features are distinguishable in lidar, but some deposit features may not be well-defined. Headscarps may be present and easy to identify, or they may be more eroded but are generally still defined. Deposit boundaries may be difficult to distinguish in places, but the general shape and distribution of the landslide deposit is still distinguishable in the lidar. Hummocky topography is present but may not be as well-defined as a high confidence landslide.

High: Most or all landslide boundaries are easy to identify and map. The landslide deposit shows clear hummocky topography and, though none are mapped, if internal scarps are present, they are clearly defined in lidar. Headscarps and flanks are clear and easy to identify.

FieldCheck: An attribute to identify landslides confirmed during fieldwork, with a "Yes". This field is left blank for landslides that are not field confirmed. Any mapped landslides that the mapper confirmed were not present in the field were removed from the dataset.

Notes: Mapper notes for landslide deposits. Some earlier datasets may not include mapper notes until the dataset is reevaluated and published.

County: The county where the landslide deposit exists within

Unique_ID: A unique identifier assigned using a combination of the county name and OBJECTID.

CGS used lidar data collected by Merrick and Co. that was published in 2016. Lidar can be accessed here.

Map Use Limitations

This is not a complete dataset of existing landslides. Where these processes have occurred before, it is possible for them to occur in the future if appropriate assessment and mitigation are not developed. This inventory mapping does not show any assessment of susceptibility or risk. This map is intended for use at a 1:24,000 scale and should not be used for site-specific analysis; rather, this mapping should be used to advise on how much and what type of site-specific analysis may be necessary. To assess landslide initiation susceptibility, a qualified geotechnical engineer or engineering geologist should be enlisted to evaluate each site or drainage individually. The lidar used to map deposits in this inventory was collected in 2016; therefore, the dataset may not include any landslides initiated or reactivated after that date. This database will continue to be updated iteratively when new data becomes available.

Credits

Colorado Geological Survey. Amy Crandall and Jonathan Lovekin performed technical review of map and text products. The project was funded by a the U.S. Geological Survey Cooperative Landslide Hazard Mapping and Assessment Program.