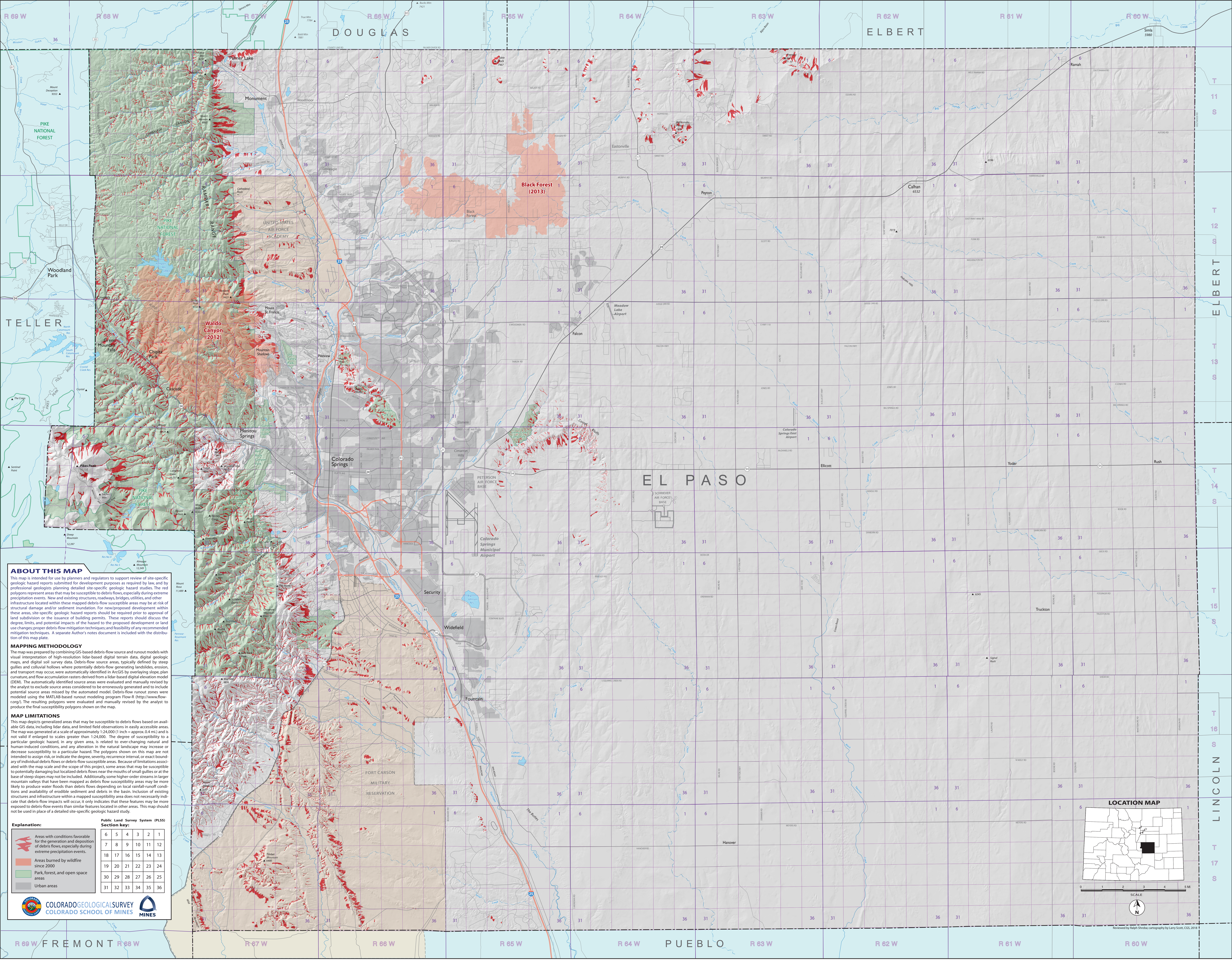


DEBRIS FLOW SUSCEPTIBILITY MAP OF EL PASO COUNTY, COLORADO

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COLORADO GEOLOGICAL SURVEY, 2018

OPEN-FILE REPORT 18-11



ABOUT THIS MAP
This map is intended for use by planners and regulators to support review of site-specific geologic hazard reports submitted for development purposes as required by law, and by professional geologists planning detailed site-specific geologic hazard studies. The red polygons represent areas that may be susceptible to debris flow, especially during extreme precipitation events. New and existing structures, roads, bridges, utilities, and other infrastructure located within these mapped debris-flow susceptible areas may be at risk of structural damage and/or sediment inundation. For new/proposed development within these areas, site-specific geologic hazard reports should be required prior to approval of land subdivision or the issuance of building permits. These reports should discuss the degree, limits, and potential impacts of the hazard to the proposed development or land use changes, proper debris-flow mitigation techniques, and feasibility of any recommended mitigation techniques. A separate Author's notes document is included with the distribution of this map plate.

MAPPING METHODOLOGY
The map was prepared by combining GIS-based debris flow source and runoff models with visual interpretation of high-resolution lidar-based digital terrain data, digital geologic maps, and digital soil survey data. Debris-flow source areas, typically defined by steep gullies and colluvial hollows where potentially debris-flow generating landslides, erosion, and transport may occur, were automatically identified in ArcGIS by overlying slope, plan curvature, and flow accumulation rasters derived from a lidar-based digital elevation model (DEM). The automatically identified source areas were evaluated and manually revised by the analyst to exclude source areas considered to be erroneously generated and to include potential source areas missed by the automated model. Debris-flow runoff zones were modeled using the MATLAB-based runoff modeling program Flow-R (<http://www.flow-r.org/>). The resulting polygons were evaluated and manually revised by the analyst to produce the final susceptibility polygons shown on the map.

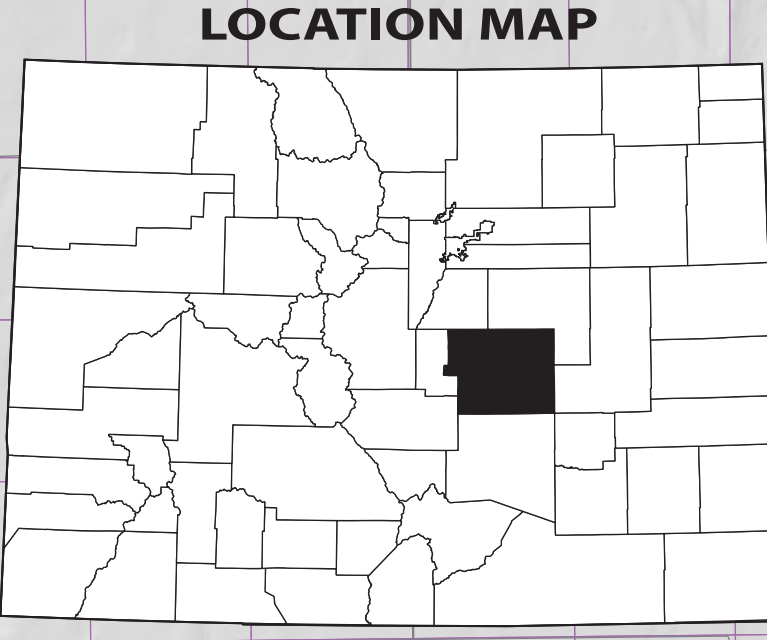
MAP LIMITATIONS
This map depicts generalized areas that may be susceptible to debris flows based on available GIS data, including lidar data, and limited field observations in easily accessible areas. The map was generated at a scale of approximately 1:24,000 (1 inch = approx. 0.4 mi) and is not valid if enlarged to scales greater than 1:24,000. The degree of susceptibility to a particular geologic hazard, in any given area, is related to ever-changing natural and human-induced conditions, and any alteration in the natural landscape may increase or decrease susceptibility to a particular hazard. The polygons shown on this map are not intended to assign risk, or indicate the degree, severity, recurrence interval, or exact boundary of individual debris flows or debris-flow susceptible areas. Because of limitations associated with the map scale and the scope of this project, some areas that may be susceptible to potentially damaging but localized debris flows near the mouths of small gullies or at the base of steep slopes may not be included. Additionally, some higher-order streams in larger mountain valleys that have been mapped as debris flow susceptibility areas may be more likely to produce water floods than debris flows depending on local rainfall-runoff conditions and availability of erodible sediment and debris in the basin. Inclusion of existing structures and infrastructure within a mapped susceptibility area does not necessarily indicate that debris flow impacts will occur; it only indicates that these features may be more exposed to debris-flow events than similar features located in other areas. This map should not be used in place of a detailed site-specific geologic hazard study.

Explanation:

- Areas with conditions favorable for the generation and deposition of debris flows, especially during extreme precipitation events.
- Areas burned by wildfire since 2000
- Park, forest, and open space areas
- Urban areas

Public Land Survey System (PLSS) Section Key:

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36



Reviewed by Ralph Shroba, cartography by Larry Scott, CGS, 2018