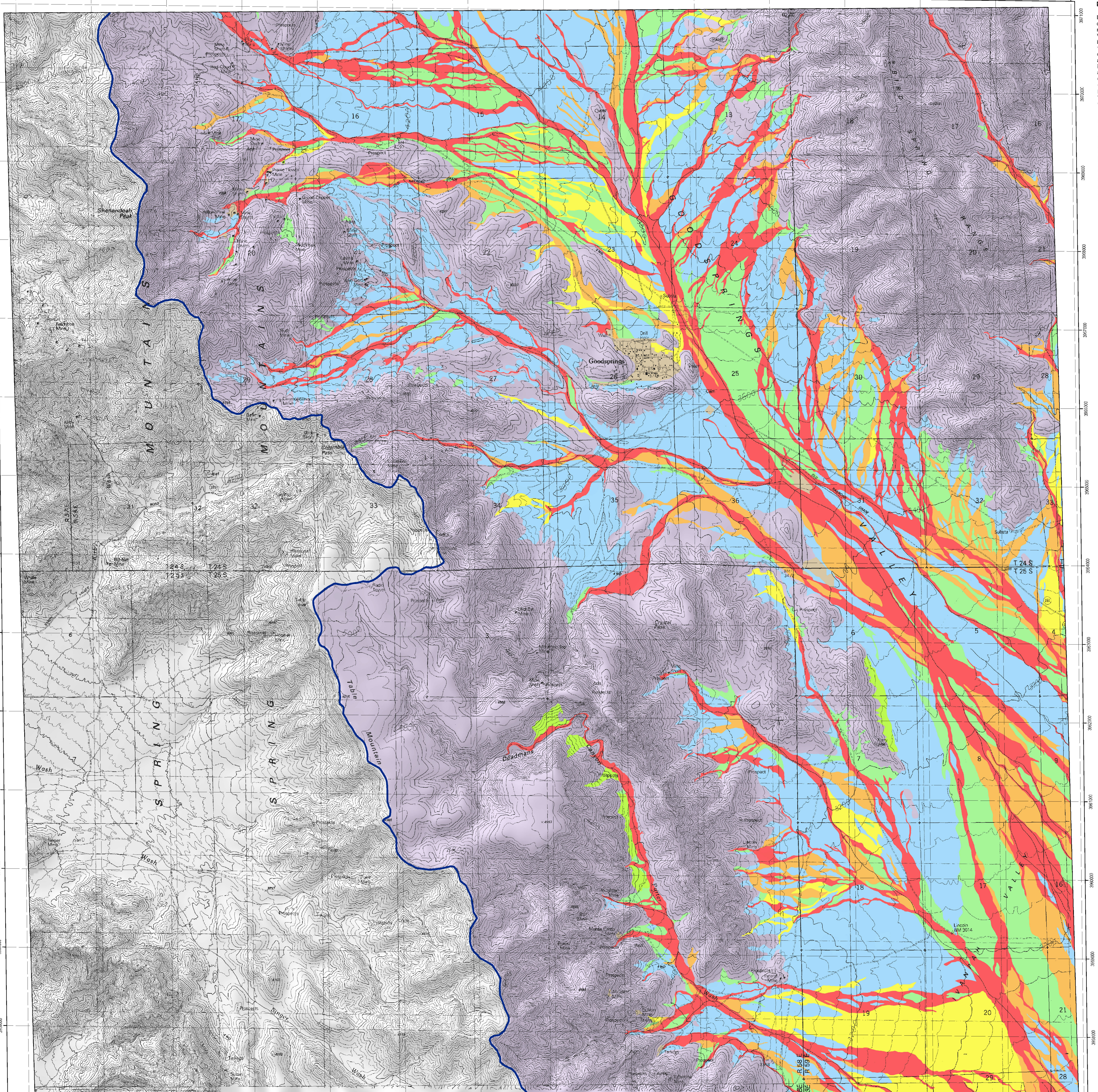


MAP EXPLANATION

Data shown in this map are directly extracted from digital geologic data depicted in House (2006). The House (2006) map, in turn, depicts a direct reclassification of a part of a 1:50,000 surficial geologic map of the Ivanpah Valley area created by House and others (2006) into a series of relative flood hazard classes. The geologic data were compiled at scales greater than 1:24,000, so the depiction here is a valid representation. The flood hazard classes are qualitative and not intended to explicitly represent or supplant administrative or regulatory flood zone boundaries. They do not have specific implications of flow depths and velocities. The hazard zones depict the loci and spatial variability of flood hazard zones as inferred from geologic evidence of relative flow frequency, vigor, surface stability, and landform type (see House, 2005). Each classification represents a composite of physical properties related to surface age, stability, and geomorphic position that form the basis of the geologic map. The classification scheme represents a cautiously conservative interpretation of the geologic data.

Relative flood hazard classes

VERY HIGH Areas of the most frequent and concentrated runoff including well-defined active channels; broad, gravelly, and sparsely vegetated zones of intricate distributary flow networks on active alluvial fans; alluvial fan feeder channels; local trunk drainages; and terminal playas. Processes include high-velocity, channelized flow and high-velocity sheetflow on piedmont drainages and playa perimeters. Channel boundaries and positions are generally unstable and may shift considerably during and between large flows. Central playa areas subject to extensive, shallow inundation on a regular basis. Playa perimeters are subject to flooding from the toes of adjacent, active alluvial fans and channels. Processes of sediment erosion, transport, and deposition in these areas are vigorous and involve particle sizes ranging from coarse gravel (boulders and cobbles) to sand and silt. Corresponding surface morphology includes prominent alluvial channels, fresh gravel bars, and relatively flat gravel sheets in broad distributary flow areas and playa-fan interface areas. Gravel pavements, rock varnish, and soil development absent or weak on surfaces in this class. Soil development is ranges from none to weak. Geologic deposits and surfaces in this class are latest Holocene to late Holocene in age (0 to approximately 4000 years).

Washes and fans draining high-relief areas (e.g., the Lucy Gray Range, the McCullough Range and the Table Mountain and Potosi Mountain areas of the southern Spring Mountains; see House et al., 2006; House, 2006) are characterized by boulder-rich flood and debris flow deposits. Elsewhere in the study area, debris flows and boulder-rich flood deposits are typically restricted to tributary washes and fans draining high-relief mountain interior or mountain areas.

Geologic evidence indicates this class conveys dangerous floods and poses a very significant floodplain management concern.

HIGH Areas of frequent, concentrated to widespread, relatively unconfined runoff. Commonly adjacent to and linked with areas mapped in the preceding class. Includes large areas of diffuse 'very high' hazard-type zones too intricate to divide. This class includes active and intermittently active alluvial fan areas, low channel-bounding terraces, and parts of playa perimeters. Class includes areas that are vulnerable to overflow and re-occupation by active channel networks. Sediment characteristics similar to areas mapped in 'very high' hazard class. These areas have a high potential to convey flow during large floods because of their proximity to highly active alluvial surfaces and because their relatively young age and low relief precludes a lower hazard determination. Channel and flow-swath boundaries and positions are generally unstable. Morphology characterized by relatively fresh bar and channel to slightly weathered bar and swale complexes; relatively flat-lying terrace surfaces adjacent to active channels, and relatively flat gravel sheets in playa fringe areas. Gravel pavements are rare but may be present on inclusions of small, older surface remnants and locally in low-lying swales. Light rock varnish may be present on siliceous surface clasts. Soil development ranges from none to weak. Yellowish-brown cambic horizon (Bw) and stage 1 calcic horizon (Bk) may be present in some areas. Geologic deposits in this class range from latest Holocene to at least late Holocene (0 to approximately 4000 years).

Geologic evidence indicates this class has high potential to convey dangerous flows during large flood events. It poses a significant floodplain management concern.

MODERATE Areas of intricately mixed, highly active alluvial surfaces; intermittently active or recently abandoned alluvial surfaces; and dispersed remnants of stable alluvial surfaces too small to map. Includes active and recently abandoned (last 100 to few 1000s of years) alluvial surfaces, distal areas of overflow from active surfaces, and some active alluvial surfaces fed by small drainage areas. Includes stable distributary flow networks and areas of shallow sheetflow. Classification does not preclude hazardous condition but only indicates that flow is generally less frequent, less intense, less recently occurring, or that the distribution of different geologic units is too fine to map at this scale. Channel boundaries and positions range from moderately stable to unstable. Morphological characteristics include weathered bar and swale complexes with muted topography and light to moderate varnish and weathering of surface clasts; class also includes shallowly dissected remnants of older, stable surfaces interspersed among stable distributary flow networks. Classification represents a composite characteristic within the mapped areas, but may not adequately represent conditions in specific sub-areas. A more cautious interpretation of this class would upgrade it to 'high'. Depending on local conditions, these areas may not convey flow, even during particularly large floods. In high relief areas, they may be subject to debris flow. Geologic deposits and surfaces in this class span an age range from latest Holocene to latest Pleistocene (0 to approximately 14,000 years).

Geologic evidence indicates that class has moderate but variable potential to convey dangerous flow during large floods. It poses a definite floodplain management concern.

LOW Areas of stable alluvial surfaces that have been largely excluded from active alluvial fan processes for more than 5000 years. Members of this class, however, are linked too closely in space and time with areas in the high and moderate classes to assert that they are not flood hazardous. Members of this class exhibit strongly planar surfaces with moderate to strong gravel pavement development and moderately to darkly varnished surface clasts. Surface clasts of carbonate rocks are weakly to moderately etched, otherwise clast weathering is minor. Soil development associated with these surfaces is characterized by strong Av and Bw horizons and stage 1 to 2 Bk horizon development.

This class also includes broad areas of planar alluvial fan surfaces mantled with at least 0.75 m of windblown sand which is commonly overlain by a thin and loose gravel lag. The preponderance of eolian materials on these surfaces indicates the general absence of active alluvial fan processes. This type of feature is particularly widespread in Hidden Valley and along the north and east sides of Jean, Roach, and Ivanpah lakes. Soil development on the sand-mantled surfaces is minimal and characterized by weak cambic (Bw) and calcic (Bk stage 1) horizons.

Surface morphology, soil development, and relations to regional studies strongly suggest that surfaces in this class have not been subject to alluvial fan processes for at least the last 7000 to 8000 years, and flood hazards are not significant except locally where members of the class are adjacent to major active channels and where they are crossed by incised, active channels. In these areas (particularly along unit lateral and upslope margins in middle and lower reaches of major fan complexes) shallow to moderate overflow or lateral erosion may be relevant concerns. Geologic deposits and surfaces in this class range in age from early Holocene to latest Pleistocene (ca. 8000 to at least 14,000 years).

This class represents a lower floodplain management concern than preceding ones. They are locally vulnerable to overflow and lateral erosion.

NONE This class includes geologic deposits and surfaces that do not experience alluvial fan flooding. It includes thick, actively accumulating mantles of eolian sand and ancient, moderately to very strongly carbonate cemented relict alluvial surfaces that have been free from active alluvial fan processes for 10,000s to 1,000,000s of years. In some cases, surfaces included in this class are so high-standing as to obviously preclude alluvial fan flood hazards, but even the lowest-lying members exhibit surface morphology and soil development characteristics that are consistent with extremely long periods of stability, including: planar surface remnants with tight, darkly varnished gravel pavements that may include abundant clasts of calcrete litter; moderately to deeply weathered surface clasts (etching, pitting, and splitting); deeply furrowed planar to weakly convex surface remnants with exposed calcic soil horizons, high-standing, deeply incised fan remnants with retrograde gravel pavements on surface and sideslopes; and high-standing planar ridges underlain by massive petrocalcic soils up to 3 m thick. Eolian features included in this class include locally thick accumulations of sand on ancient fan and bedrock surfaces, thick sand ramps that overlie steep mountain-front slopes, and some small areas of dunes.

This class does not represent a significant floodplain management concern.

VARIABLE Small areas that may have special hazardous conditions that are not linked to alluvial fan / piedmont flood hazards. This includes mixed colluvial gravel and debris flow deposits on steeply sloping hillslopes and variably active talus piles and colluvial debris cones below steep bedrock cliffs. The former situation is common on steep slopes in volcanic rocks of the McCullough Range in the Hidden Valley area, and below Table Mountain in the Southern Spring Mountains; whereas the latter situation is mainly present in parts of the Bird Spring and Spring Mountain Ranges where steep bedrock cliffs are common (see House and others, 2006; House, 2006). These types of units (mainly the latter type) were mapped sparingly throughout the area where they were easily distinguished on aerial photographs and other imagery.

Members of this class represent special situations and should be evaluated on an individual basis. They comprise a very small part of the map area and are often in rugged and remote settings.

INDETERMINATE Areas that have been extensively modified by excavation, artificial fill, or commercial development. Flood hazards in these areas cannot be assessed from the basis of geologic evidence. This includes the course of Interstate 15, the Union Pacific railroad, borrow pits and mining operations, and developed areas in Goodsprings, Jean (including the Jean Airport and the correctional facility), and Primm (see House, 2006).

This class represents a special situation. It may locally represent a significant floodplain management concern, but large tracts of it are obviously not flood prone.

UNMAPPED Areas mapped as bedrock by House and others (2006). Locally includes small areas of active and inactive alluvial surfaces, colluvium, and minor amounts of eolian sediment. Significant flood and debris flow hazards exist in narrow bedrock canyons and steep slopes in these areas but are too small to map. Extremely rugged topography in most bedrock areas limits potential for commercial and suburban development.

This class may locally represent a floodplain management concern, but very large tracts of it are neither flood prone nor readily accessible.

GEOLOGIC ASSESSMENT OF PIEDMONT FLOOD HAZARDS IN THE IVANPAH VALLEY PART OF THE GOODSPRINGS AND SHENANDOAH PEAK 7.5' QUADRANGLES, CLARK COUNTY, NEVADA

P. Kyle House

Mapping extracted without modification from Open-File Report 06-9 (House, 2006) and placed on the USGS 1:24,000 scale topographic bases.
Base map: U.S. Geological Survey, Shenandoah Peak, NV-CA, 7.5' Quadrangle, 1985
CONTOUR INTERVAL 10 METERS
Supplementary contour interval 2.5 meters
and U.S. Geological Survey, Goodsprings, NV 7.5' Quadrangle, 1984
CONTOUR INTERVAL 40 FEET
Projection: Universal Transverse Mercator, zone 11
1927 North American Datum
UTM Grid (shown with thin black lines) is based on the 1983 North American Datum

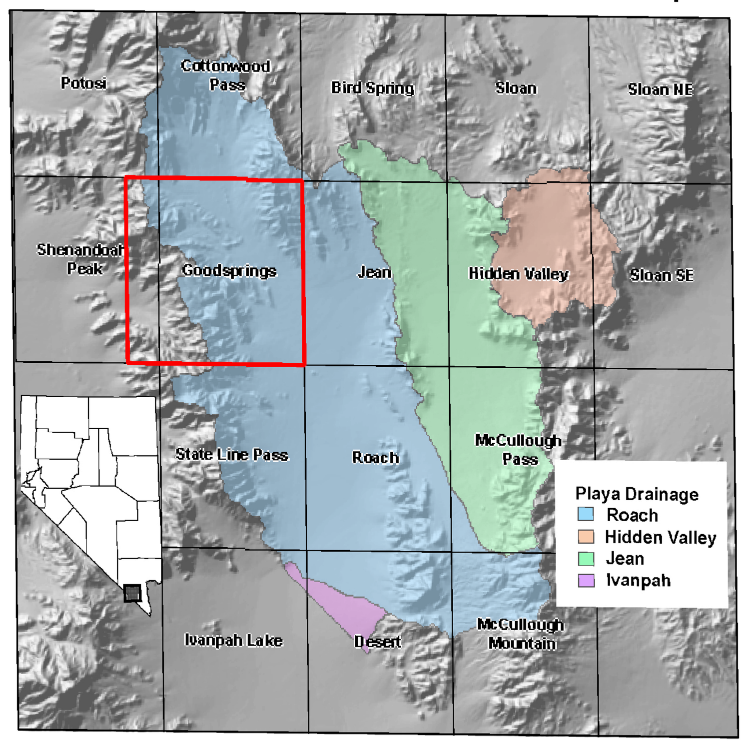
SCALE 1:24,000

0 0.5 1 Kilometers

0 0.5 1 Miles

0 1,000 2,000 3,000 4,000 5,000 Feet

7.5' Quadrangle Index and Basin Location Map



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MACKAY SCHOOL OF EARTH SCIENCES AND ENGINEERING
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UNIVERSITY OF NEVADA, RENO
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DRAFT
Preliminary map.
Has not undergone office or field review.
Will be revised before publication.

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