

BACKGROUND

The Severy Creek Watershed is located on the northern flank of Pikes Peak, in Teller and El Paso Counties, Colorado. Severy Creek originates at an elevation of approximately 11,500 feet and flows 4 miles to its confluence with Cascade Creek at 8,500 feet. The watershed serves as a catchment for water that is used by the City of Colorado Springs and surrounding communities as well as an important habitat for the threatened Colorado greenback cutthroat trout (*Oncorhynchus clarki stomias*). Within the watershed lies the Severy Creek wetland which encompasses 14.5 acres.

PURPOSE

The geologic mapping for this project was completed in the fall of 2009. The purpose of the study was to: map the bedrock and surficial geology, and determine the relative age of the units. The final map and GIS data will aid in the overall understanding of the past geologic history of the basin and how the structural geology of the basin is influencing current geomorphic processes.

FINDINGS

Extremely steep slopes, up to 45° are found above the Severy Creek wetland. Recent anthropogenic activities (mainly runoff from the Pikes Peak Highway) have exacerbated natural erosion processes on the upper slopes resulting in the formation of several deeply incised gullies approximately 30 feet deep and 40 feet wide. Alluvium transported through the gullies has inundated approximately 10 acres within the basin, covering 5.6 acres of wetland. Field evidence did not reveal any significant faulting; however, north- to northeast-trending joints within the granitic bedrock control the location of many of the gullies that feed into the basin. The joints also create significant weakness in the bedrock that provide pathways for water and ice to seep into and wedge the rock into large blocks, some reaching 15 feet across. The results of this mapping, in conjunction with previous research by the Rocky Mountain Field Institute, suggests that the area has been subjected to multiple mass-wasting events that have inundated the basin with large amounts of sediment throughout the late Pleistocene and Holocene.

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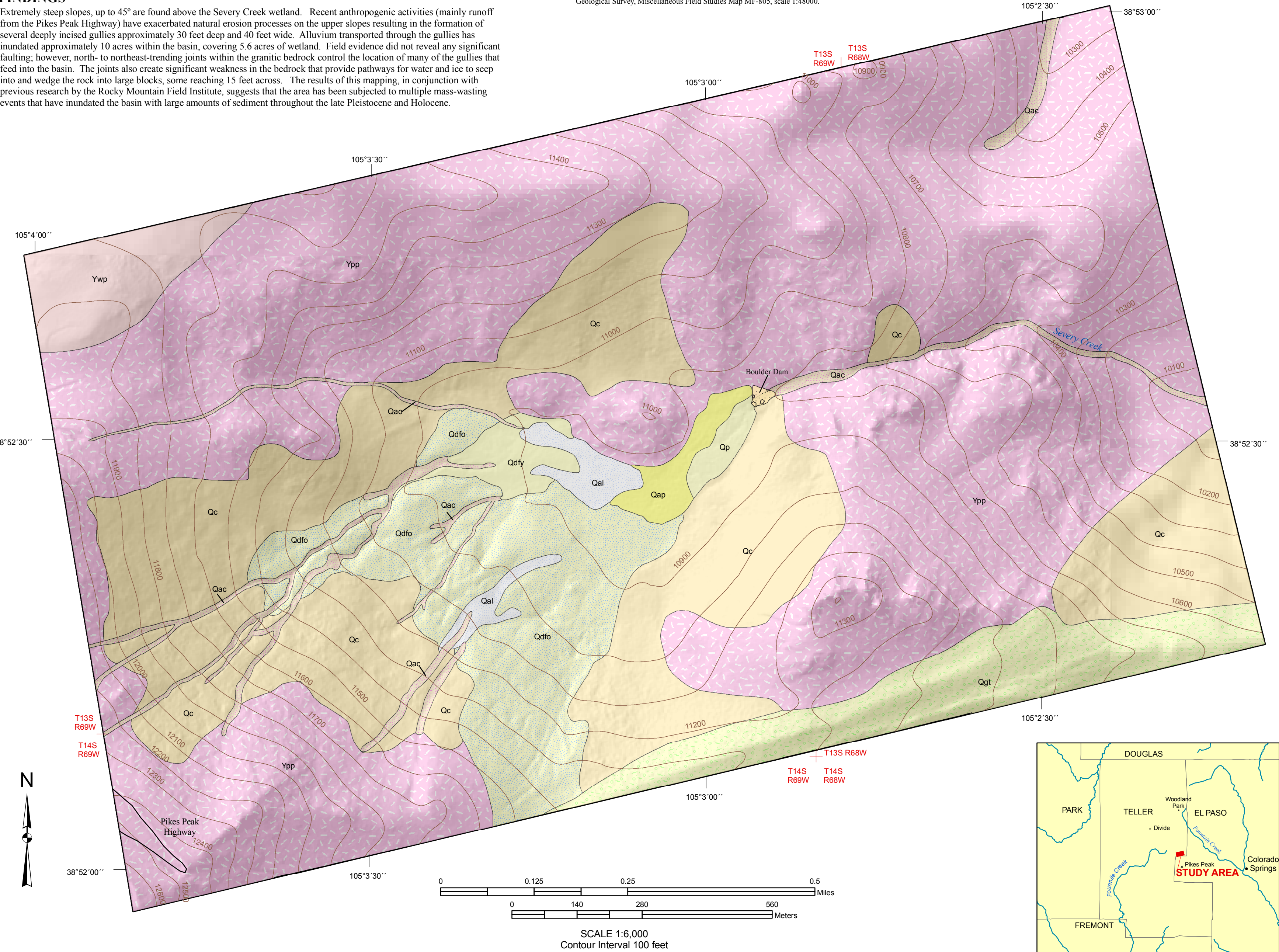
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Study area location shown in Colorado's counties

DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS

ALLUVIAL DEPOSITS

Qal Stream-channel and flood-plain alluvium (Holocene)—Clast-supported, pebble, cobble, and boulder gravel in a sandy matrix. Clasts are subangular to well rounded and consist predominantly of Pikes Peak Granite (Ypp) with lesser amounts of Windy Point Granite (Ywp). Unit may include locally organic-rich sediments. Deposits may be interbedded with debris-flow deposits (Qdly, Qdfo), colluvium (Qc), alluvium-colluvium (Qac), and paludal deposits (Qp, Qap). Ash (fire) layers are also present within in this unit. Maximum thickness of this unit may exceed 15 ft. Areas mapped as Qal may be prone to flooding, erosion, and sediment deposition.

ALLUVIAL AND COLLUVIAL DEPOSITS

Qac Alluvium and colluvium, undivided (Holocene and late Pleistocene)—Stream channel, terrace, and flood-plain deposits along valley floors of ephemeral, intermittent, and small perennial streams and colluvium deposits along valley sides. Interfingers with stream alluvium (Qal), debris-flow deposits (Qdly, Qdfo), and colluvium (Qc) along valley margins. Alluvium is typically composed of poorly to well-sorted, stratified, interbedded, pebbly sand, sandy silt, and sandy gravel. Colluvium may range from unsorted, clast-supported, pebble to boulder gravel in a sandy silt matrix to matrix-supported, gravelly, clayey, sandy silt. Clast types consist predominantly of Pikes Peak Granite (Ypp) with lesser amounts of Windy Point Granite (Ywp). Maximum thickness of the unit is approximately 12 ft.

Qc Colluvium deposits (Holocene to late Pleistocene)—Weathered bedrock fragments that have been transported downslope primarily by gravity. The deposit ranges from unsorted, clast-supported, pebble to boulder gravel in a sandy silt matrix to matrix-supported gravelly, clayey, sandy silt. It is generally unsorted to poorly sorted, contains angular to subangular clasts, and is weakly stratified. Maximum clast size is approximately 20 feet. Colluvial deposits derived from alluvial deposits contain rounded to subrounded clasts. Colluvium of large cobble- and boulder-sized rock fragments includes rockfall debris. The units may contain small landslides of limited extent. Clast lithologies consist predominantly of Pikes Peak Granite (Ypp) with lesser amounts of Windy Point Granite (Ywp). Colluvium deposits grade into and interfinger with debris flow deposits (Qdly, Qdfo) and stream alluvium (Qal). A boulder dam composed of granite boulders up to 20 ft in length may have dammed Severy Creek and created the wetland. The downstream face of the dam drops 57 ft from the wetland to the floor of the valley over a distance of 175 feet. Maximum thickness of this unit is approximately 40 ft. Areas mapped as colluvium are susceptible to future colluvial deposition and locally are subject to debris flows and rockfall.

Qdly Younger debris flow deposits (Holocene)—Poorly sorted to moderately sorted, matrix-supported, gravelly, sandy silt to clast-supported, pebble, cobble, and boulder gravel in a sandy silt or silty sand matrix. Clasts are mostly angular to subrounded fragments of Pikes Peak Granite and Windy Point Granite; some reach a maximum diameter of 5 ft. Sediments are deposited primarily by debris flows and hyperconcentrated flows with lesser input from streams and sheetwash. The deposits exceed 15 ft in thickness. Fan-shaped debris-flow deposits form where tributary drainages with steep gradients join lower gradient streams. Soil development is absent indicating recent deposition. Younger debris-fan deposits are subject to flooding and future debris-flow, hyperconcentrated flow, and sheetwash deposits.

Qdfo Older debris flow deposits (late Pleistocene)—Poorly sorted to moderately sorted, matrix-supported, gravelly, sandy silt to clast-supported, pebble, cobble, and boulder gravel in a sandy silt or silty sand matrix. Clasts are mostly angular to subrounded fragments of Pikes Peak Granite and Windy Point Granite; some reach a maximum diameter of 15 ft. Sediments were deposited primarily by debris flows, hyperconcentrated flows, rockfall, and landslide events with lesser input from streams and sheetwash. The deposits exceed 25 ft in thickness. The fan-shaped morphology of these deposits is subdued and the fans are dissected by a younger Qdly deposit. The deposits are probably late Pleistocene (correlative with the latest stade of the Pinedale glaciation) in age on the basis of height above adjacent drainages (15 ft to 25 ft), moderate weathering of granitic clasts, and a well developed A-horizon in several locations.

PALUSTRINE DEPOSITS

Qp Paludal deposits (Holocene)—Organic-rich, fine-grained sediments formed in swampy, closed depressions where the local water table is near or slightly above the ground surface. The reducing conditions in these stagnant environments slow the rate of decay of the organic matter, which favors accumulation of organic material. Paludal sediments are susceptible to compaction. Basins in which these sediments are deposited have elevated water tables and may be prone to flooding. Maximum thickness of this unit may exceed 5 feet.

Qap Paludal and alluvial deposits, undivided (Holocene)—Paludal deposits are organic-rich, fine-grained sediments formed in swampy, closed depressions where the local water table is near or slightly above the ground surface (see Qp description for more details). Alluvial deposits are clast-supported, pebble, cobble, and boulder gravel in a sandy matrix. This undivided deposit contains alluvium that interfingers with paludal deposits in the upper 3 feet of the unit. The basin in which these sediments are deposited has an elevated water table and may be prone to flooding. Maximum thickness of this unit may exceed 10 feet.

GLACIAL DEPOSITS

Qgt Glacial till, undivided (late to late middle Pleistocene)—Boulders, cobbles, and gravel set in a silty sand matrix that was deposited by and adjacent to glacial ice. Clasts are predominantly Pikes Peak Granite and Windy Point Granite. Within the mapped area, this unit forms a narrow, topographically distinct lateral moraine. Maximum thickness of unit is approximately 50 ft. It is unclear if this unit correlates with the Pinedale or Bull Lake glaciations although it is mapped as Bull Lake till by Wobus and others (1976).

BEDROCK

Ypp Pikes Peak Granite (Middle Proterozoic)—Pink, light reddish-brown, light-gray, coarse-grained, equigranular to locally porphyritic granite. Resistant outcrops are typically rounded and bouldry. Weathering often produces deposits of grus (loose, disaggregated mass of constituent minerals). More resistant rock between joints may remain intact as rounded “corestones”. Gross and Heinrich (1965) described the petrology of the Pikes Peak Granite in detail. The constituent minerals of Pikes Peak Granite, in order of decreasing abundance, are perthitic microcline, quartz, plagioclase (oligoclase), and biotite. Accessory minerals include hornblende, zircon, apatite, magnetite, and fluorite, plus rare allanite and bastnaesite. Aplitic dikes, typically 0.25 to 2.0 ft in width, are widely scattered in the Pikes Peak Granite but have not been mapped separately (Keller and others, 2005). Irregularly-shaped pegmatite dikes and quartz veins are typically small and also were not mapped separately. Pegmatites and miarolitic cavities in the granite are notable for spectacular mineral specimens in places. This granite is the main constituent of the potassic series of intrusives that constitute more than 90 percent of the Pikes Peak batholith as a whole (Wobus and others, 1976; Smith and others, 1999).

Ywp Windy Point Granite (Middle Proterozoic)—Gray to pinkish-gray, fine- to medium-grained, porphyritic granite and quartz monzonite. Weathers to reddish-tan or buff. The unit weathers to a blocky appearance compared to the rounded weathering of the coarse-grained Pikes Peak Granite. Microcline phenocrysts commonly stand out in relief giving some weathered surfaces a “knobby” appearance. Quartz phenocrysts may be present as well but are not as large as microcline phenocrysts. Typically, Windy Point Granite is more resistant to weathering than the enclosing coarse-grained granites and forms the rocky caps of linear ridges. The unit forms lens-shaped and arcuate dikes and sheet-like masses that intruded the Pikes Peak Granite (Keller and others, 2005). Windy Point Granite is geochemically similar to Pikes Peak Granite and is thought to be a late-stage, rapidly-cooled variant of Pikes Peak Granite (Wobus and others, 1976). Windy Point Granite is of the potassic series of late-stage granites of the Pikes Peak batholith (Wobus and others, 1976; Smith and others, 1999). The principle minerals composing the Windy Point Granite, in order of decreasing abundance, are microcline, quartz, biotite, and plagioclase (oligoclase) (Keller and others, 2005). The microcline is partly perthitic. Biotite commonly occurs in rounded clusters. Quartz is usually present as individual grains rather than as clusters of grains. The contacts between the Windy Point Granite and Pikes Peak Granite are often diffuse or gradational, and the exact mapped contact between them is somewhat arbitrary based on the overall grain-size. The interior areas of masses of Windy Point Granite are fine grained and commonly contain fewer phenocrysts than areas near contacts.

GEOLOGIC MAP OF THE SEVERY CREEK WATERSHED, TELLER AND EL PASO COUNTIES, COLORADO

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