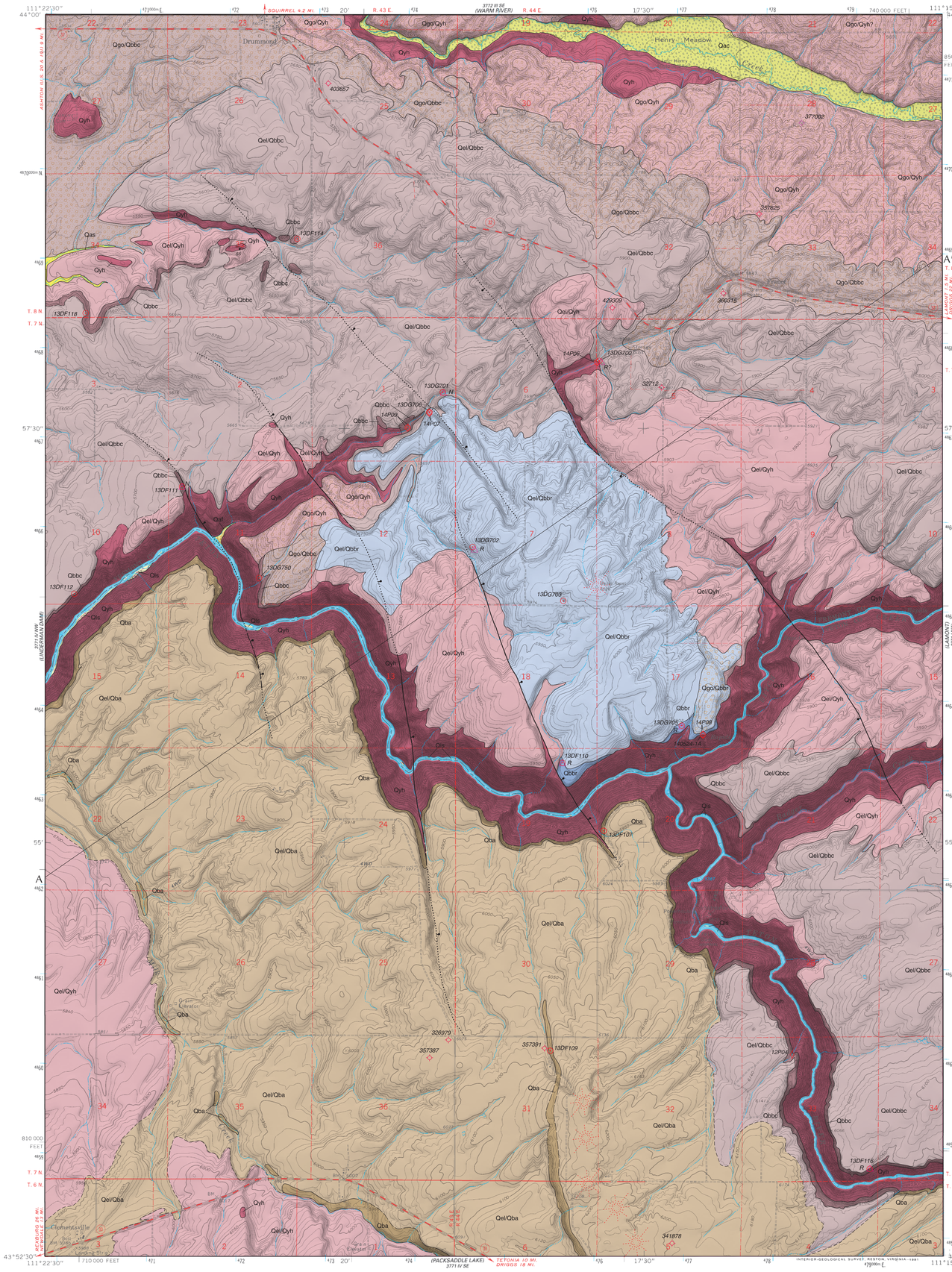
Geologic Map of the Drummond Quadrangle, Fremont and Teton Counties, Idaho

Dennis M. Feeney, Dean L. Garwood, and William M. Phillips

2014



Base Map Credit

Base digitally scanned from 24,000-scale USGS film separates, 1965.

Shaded elevation from 10 m DEM.

Topography by photogrammetric methods from aerial photographs taken 1963. Field checked 1965.

Projection: Idaho coordinate system, east zone (Transverse Mercator). 1927 North American Datum.

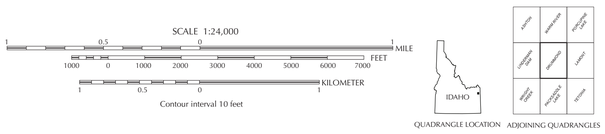
10,000-foot grid ticks based on Idaho coordinate system, east zone.

1000-meter Universal Transverse Mercator grid ticks, zone 12.

Declination from NOAA National Geophysical Data Center.

SCALE 1:24,000

Contour interval 10 feet



Field work conducted 2012 and 2013.

This geologic map was funded in part by the U.S. Geological Survey National Cooperative Geologic Mapping Program, USGS award no. G13AC00122.

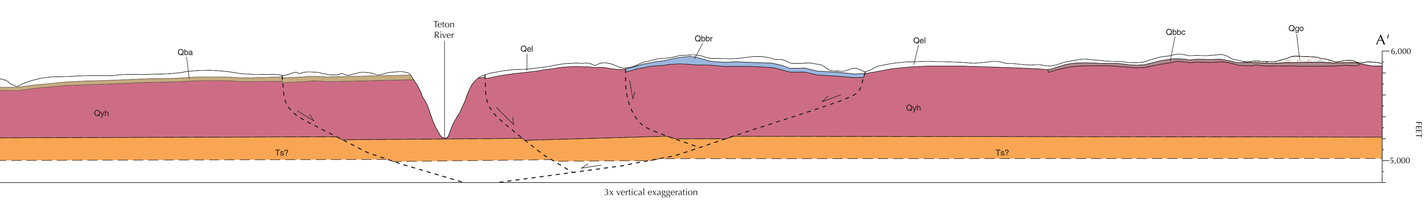
Digital cartography by Jane S. Freed at the Idaho Geological Survey's Digital Mapping Lab.

Technical review status: Authors only.

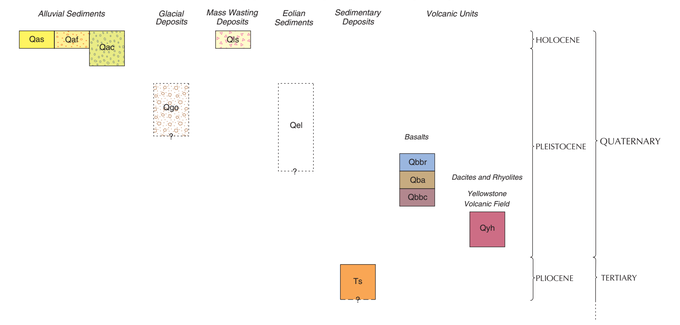
Editorial review by Alyson R. Kral.

Map version 1-20-2015.

PDF (Acrobat Reader) map may be viewed online at www.idahogeology.org.



CORRELATION OF MAP UNITS



INTRODUCTION

This map depicts the bedrock and surficial geology of the Drummond 7.5' quadrangle. The boundaries of the Drummond quadrangle lie within a low basin between the Big Bend Ridge caldera of the Yellowstone volcanic field and the Big Hole Mountains and Teton Mountains of the Rocky Mountain thrust belt. An array of northwest-trending normal faults representing the northern reach of the West Teton Valley Fault System creates a series of grabens and half grabens across the center of the map. Near-surface bedrock geology features of the Drummond quadrangle include the Huckleberry Ridge Tuff at 2.135 ± 0.006 to 2.113 ± 0.004 Ma (Ellis and others, 2012) and three younger basalt units. Bedrock outcrops are rare outside of the Teton River, Badger Creek and Bitch Creek drainages due to widespread loess deposits. Vents for the basalts were identified via geomorphic evidence.

SYMBOLS

Contact: dashed where approximately located.

Normal fault: ball and bar on downthrown side; dashed where approximately located; dotted where concealed.

Volcanic vent (concealed).

55 Strike and dip of eutaxitic foliation in welded tuff.

13DF109 Geochemical sample.

12P04 Paleomagnetic sample.

R Fluxgate measurement site showing magnetic polarity.

357391 Water well showing Idaho Department of Water Resources Well ID number. Water well logs can be found at: http://www.idwr.idaho.gov/apps/appswell/RelatedDocs.asp?WellID=xxxxxx (where "xxxxxx" is the six-digit WellIID).

SOURCES OF MAP INFORMATION

Field work for this map was conducted in 2012 and 2013. Previous work by Albee (1964), Pampeyan and others (1967), Prostka and Hackman (1974), Mitchell and Bennett (1979) and Embree and Phillips (2011) were consulted and compiled. Water well logs from the Idaho Department of Water Resources (IDWR, 2014) were used, where possible, to trace bedrock units concealed beneath surficial deposits. Basalts were correlated with major and trace element analyses by wavelength dispersive x-ray fluorescence, and by paleomagnetic analyses using drilled cores, spinner magnetometer, and alternating field demagnetization. Fluxgate magnetometer determinations of basalt polarity were also used.

UNIT DESCRIPTIONS

ALLUVIAL SEDIMENTS

Qas **Alluvium of side streams (Holocene)**—Clay, silt, and sand; thickness generally less than 1 m (3 ft). Streams have intermittent flow; subject to flooding during thunderstorms and rain-on-snow events.

Qaf **Alluvial fan (Holocene)**—Unconsolidated, poorly sorted, subrounded to angular, clayey-silt, silty-sand, and cobbles. Occasional boulders in excess of 1 m (3 ft) diameter. Forms low relief fan at the mouth of a steep, narrow canyon draining the north central part of the quadrangle to the Teton River. Thickness is <1 to 4 m (< 3 to 13 ft). Clasts composed of rhyolite, basalt and glacial outwash material. Primarily formed by stream run-off and high energy precipitation events.

Qac **Alluvium of Conant Creek (Holocene-Late Pleistocene)**—Unconsolidated stratified silty-sand and pebble gravel; coarser gravel in thicker channel and floodplain deposits. Cobble and boulder gravel deposited by high-energy events. Clasts are composed of sandstone, quartzite, diorite, basalt, welded tuff, granite, gabbro, and hornblende porphyry. Largest boulders consist of very hard, gray aphyric basalt with quartz xenocrysts, and lithophysal rhyolite. Thickness is 3 to 5 m (10 to 16 ft).

Qgo **Glacial outwash deposits (Late–Middle Pleistocene)**—Poorly exposed boulders and cobbles, generally well-rounded; composed dominantly of basalt with lesser gneiss, sandstone, rhyolite, and quartzite. Water wells indicate thickness of about 8 to 9 m (25 to 30 ft). Best exposures are found along cuts of the former Ashton-Tetonia railroad grade found in the northeastern portion in the quadrangle. Overlain in most exposures by >1 m (>3 ft) of loess. Age and correlation with regional glacial periods is unknown. Most outwash in the map was derived from the western flank of the Teton Range.

Ts **Sand and clay (Pliocene?)**—Shown only in cross section. Lithologies encountered in well logs include: silt, clay, and gravel. Stratigraphically below the Huckleberry Ridge Tuff. Well 357387 in sec. 36, T. 7 N., R. 43 E. penetrates 73 m (240 ft) of sand, clay, and interspersed rock directly beneath *Qyh*. The sediments may be correlative to tuffaceous lacustrine deposits exposed in the Teton River canyon (Phillips and others, 2011) and in geothermal test well logs (Phillips, 2010) near Newdale.

MASS WAISTING DEPOSITS

Qls **Landslide deposits (Holocene)**—In Teton River canyon, landslides resulting from rapid drawdown of the Teton Reservoir after the failure of Teton Dam on June 7, 1976 (Schuster and Embree, 1980). Most landslides are translational earth slides with failure surfaces near contact between overburden (loess, colluvium, and/or slope wash) and underlying Qyh. Thickness from 0.3-0.6 m (1-2 ft) to ~3 m (~10 ft). Where overburden was >3m (>10 ft), landslides began as shallow rotational slumps 6-7.5 m (20-25 ft) thick, then evolved into earth flows and debris flows. Rock falls and slides involving tuff bedrock also occurred. Landslides more numerous on south side of Teton River because of greater thickness of unconsolidated material. Most slides occurred at or below the maximum reservoir elevation of 5,301.7 ft. Many slides are present that are too small to show on map.

EOLIAN SEDIMENTS

Qel **Loess (Late–Middle Pleistocene)**—Massive, light gray to light brownish-gray silt, clay, and very fine sand; locally and crudely bedded where reworked on hill slopes. Thickness in well logs averages 8 m (26 ft), with a range of 3 to 14 m (10 to 47 ft). Loess covered landforms in map display prominent linear geomorphic patterns that trend northeast, parallel to prevailing winds. Derived from deflation of outwash deposits during glaciations of the Yellowstone Plateau and Teton Range (Scott, 1982; Pierce and others, 2011). Several depositional units separated by buried soils are present in correlative deposits in the eastern Snake River Plain (Pierce and others, 1982; Scott, 1982). Not dated in the map area; regional ages range between 15-25 ka, 35-51 ka, 69-76 ka, and 141-154 ka (Phillips and others, 2009; Pierce and others, 2011).

VOLCANIC ROCKS

Qel Qbbr Qgo Qbbc Qbbr

Basalt of Bailey Reset (Middle to Early Pleistocene)—Light to medium gray medium-grained basalt with plagioclase and olivine phenocrysts 1-2 mm and patchy areas of diktytaxitic texture. Shown as *Qel/Qbbr* where covered by loess. Reverse magnetic polarity as determined in the field. Vent concealed by loess; geomorphology suggests the basalt was erupted from a topographic high labeled Bailey Reset. Outcrops in canyons range from 1 to 6 m (3 to 20 ft). No known wells penetrate this unit. Correlated on the basis of paleomagnetism (Table 1) and geochemistry (Table 2); however considerable variation of paleomagnetism and geochemistry suggests additional flows are present. Composition characterized by low TiO_2 (1.6-1.9 wt. percent), high MgO (10-10.7 wt. percent), and high Cr (>550 ppm.) (Table 2) Distribution of this unit seems influenced by existing structures and/or incision of the underlying units, suggesting it is younger than the basalt of Bitch Creek.

Qel Qba Qba

Basalt of Ard Farms (Middle-Early Pleistocene)—Light to medium gray fine-grained basalt with rare plagioclase phenocrysts <2 mm and patchy areas of diktytaxitic texture. Shown as *Qel/Qba* where covered by loess. Normal magnetic polarity as determined in the field. Vent concealed by loess; probably erupted from a north to southeast trending fissure ridge in E ½ -E ½ sec. 31, T. 7 N., R. 44 E. Outcrops in canyons range from 3 to 10 m (10 to 32 ft). Well 357391 near the vent shows 30 m (100 ft) of basalt present. Correlated on the basis of paleomagnetism and geochemistry (Table 2). The thick loess cover away from canyon edges and presence on both sides of the Teton River canyon in sec. 3, T. 6 N., R. 44 E. of the Lamont quadrangle suggests eruption prior to major stream incision during the Olduvai normal subchron at 1.79-1.95 Ma, rather than during the Brunhes normal chron after 0.78 ka. The name 'Ard Farms' was first applied to this unit by Prostka and Embree (1978); it does not appear on U.S Geological Survey 1:24,000-scale topographic maps.

Qel Qbbc Qgo Qbbc Qbbc

Basalt of Bitch Creek (Early Pleistocene)—Dark gray basalt with sparse olivine phenocrysts <0.5 mm and very fine-grained groundmass. Shown as *Qel/Qbbc* where covered by loess; as *Qgo/Qbbc* where covered by glacial outwash and loess. Reverse magnetic polarity (Table 1). Well-exposed along rims of Bitch Creek, Badger Creek and Teton River canyons, and across secs. 34 and 35, T. 8 N., R. 43 E. Preliminary correlations of outcrops are based on paleomagnetism (Table 1) and geochemistry (Table 2); however, considerable variation of geochemistry and paleomagnetism suggests additional flows are present. Thickness ranges from <2 m (6 ft), as evidenced in secs. 34 and 35, T. 8 N., R. 43 E., to as much as 12 m (39 ft) in well 403657. Vent location uncertain because of thick loess cover; most likely sourced at topographic high point labeled '6234' in the Lamont quadrangle (SW¼ sec. 20, T. 7 N., R. 45 E.) (Phillips and others, in press).

Qel Qyh Qgo Qyh Qyh

Huckleberry Ridge Tuff (Early Pleistocene)—Compound cooling unit of crystal rich, densely welded rhyolitic ignimbrite. Shown as Qel/Qyh where covered by loess, and *Qgo/Qyh* where covered by glacial outwash and loess. Major phenocrysts are sanidine and quartz, with lesser plagioclase and pyroxene. Phenocrysts are abundant (20-30%) in lower parts of the unit, becoming sparse near the top. Closely spaced 1 cm lithophysae are locally present. Maximum exposed thickness in map is about 183 m (600 ft) in Teton River canyon (SE¼ sec. 10, T. 7 N., R. 43 E.). Steeply dipping well-developed eutaxitic textured tuff can be found in the center of sec. 35, T. 8 N., R. 43 E. Erupted from the Big Bend Ridge Caldera in the Yellowstone volcanic field, and divided into three members A, B, and C (Christiansen, 2001). Only Member B is present in the map according to Christiansen (2001); however Wilson (2009) asserts that both Member A and B are present southwest of the caldera and Member A is the thickest. Paleomagnetic inclination and declination are anomalous (Reynolds, 1977) and correlated with the Reunion Normal-Polarity Subchron between 2.128-2.148 Ma. Mean $^{40}Ar/^{39}Ar$ ages for the three members are 2.135 ± 0.006 Ma, 2.131 ± 0.008 Ma, and 2.113 ± 0.004 Ma (Ellis and others, 2012).

REFERENCES

Albee, H.F., 1964, Preliminary geologic map of the Garns Mountain NE quadrangle, Teton County, Idaho: U.S. Geological Survey, Mineral Investigations Field Studies Map MF-274, scale 1:24,000.

Christiansen, R.L., 2001, The Quaternary and Pliocene Yellowstone Plateau Volcanic Field of Wyoming, Idaho, and Montana, U.S. Geological Survey Professional Paper 729-G, 145 p.

Ellis, B.S., D.F. Mark, C.J. Pritchard, and J.A. Wolff, 2012, Temporal dissection of the Huckleberry Ridge Tuff using the $^{40}Ar/^{39}Ar$ dating technique: Quaternary Geochronology, v. 9, p. 34-41.

Embree, G.F., and W.M. Phillips, 2011, Geologic map of the Linderman Dam 7.5' quadrangle, Fremont, Madison, and Teton counties, Idaho: Idaho Geological Survey Digital Web Map 133, scale 1:24,000.

Idaho Department of Water Resources, 2014, All Permitted Wells, in GIS Data, Maps and Spatial Data, Idaho Department of Water Resources. Available at: http://www.idwr.idaho.gov/GeographicInfo/GISdata/wells.htm (accessed 7 February 2014).

Mitchell, V.E., and E.H. Bennett, 1979, Geologic map of the Driggs quadrangle, Idaho: Idaho Geological Survey Geologic Map 6, scale 1:250,000.

Pampeyan, E.H., M.L. Schroeder, E.M. Schell, and E.R. Cressman, 1967, Geologic map of the Driggs quadrangle, Bonneville and Teton counties, Idaho, and Teton County, Wyoming: U.S. Geological Survey, Mineral Investigations Field Studies Map MF-300, scale 1:31,680.

Phillips, W.M., 2010, Well logs for the Union Oil UNST-7 and UNST-8 geothermal test wells, Newdale 7.5 minute quadrangle, Idaho: Idaho Geological Survey Staff Report 10-9.

Phillips, W.M., T.M. Rittenour, and Glenn Hoffmann, 2009, OSL chronology of late Pleistocene glacial outwash and loess deposits near Idaho Falls, Idaho: Geological Society of America Abstracts with Programs, v. 41, no. 6, p.12.

Phillips, W.M., G.F. Embree, and J.A. Welhan, 2011, Geologic map of the Newdale quadrangle, Fremont and Madison counties, Idaho: Idaho Geological Survey Digital Web Map 122, scale 1:24,000.

Phillips, W.M., D.L. Garwood, and D.M. Feeney, 2014, Geologic map of the Lamont quadrangle, Fremont and Teton counties, Idaho: Idaho Geological Survey Digital Web Map 166, scale 1:24,000.

Pierce, K.L., M.A. Fosberg, W.E. Scott, G.C. Lewis, and S.M. Colman, 1982, Loess deposits of southeastern Idaho: Age and correlation of the upper two loess units, *in* Bill Bonnichsen and R.M. Breckenridge, eds., Cenozoic Geology of Idaho: Idaho Bureau of Mines and Geology Bulletin 26, p. 717-725.

Pierce, K.L., D.R. Muhs, M.A. Fosberg, S.A. Mahan, J.G. Rosenbaum, J.M. Licciardi, and M.J. Pavich, 2011, A loess–paleosol record of climate and glacial history over the past two glacial–interglacial cycles (~ 150 ka), southern Jackson Hole, Wyoming: Quaternary Research v. 76, p. 119-141.

Prostka, H.J., and G.F. Embree, 1978, Geology and geothermal resources of the Rexburg area, eastern Idaho: U.S. Geological Survey Open-File Report 78-1009, 14 p., 2 plates, scale 1:48,000.

Prostka, H.J., and R.J. Hackman, 1974, Preliminary geologic map of the NW 1/4 Driggs 1° by 2° quadrangle, southeastern Idaho: U.S. Geological Survey, Open-File Report OF-74-105, scale 1:125,000.

Reynolds, R.L., 1977, Paleomagnetism of welded tuffs of the Yellowstone Group: Journal of Geophysical Research, v. 82, p. 3677-3693.

Schuster, R.L., and G.F. Embree, 1980, Landslides caused by rapid draining of Teton Reservoir, Idaho, *in* C.B. Humphrey and R.G. Charboneau, eds., roceedings of the 18th Annual Engineering Geology and Soils Engineering Symposium, Idaho Transportation Department, Division of Highways, Boise, Idaho, p. 1-14.

Scott, W.E., 1982, Surficial geologic map of the eastern Snake River plain and adjacent areas, 111 degree x 115 degree W., Idaho and Wyoming: U.S. Geological Survey, Miscellaneous Investigations Series Map I-1372, scale 1:250,000.

Wilson, C.J., 2009, Physical volcanology of the Huckleberry Ridge Tuff: Eos Transactions American Geophysical Union, 90(52), Fall Meeting Supplement, Abstract V23-C-2085.

ACKNOWLEDGMENTS

Thanks to the many land owners around the Drummond and Lamont quadrangles who allowed us access to their land to conduct our mapping; much of what we do is impossible without your support. To Dan Moore and Glenn Embree (BYU-Idaho) who spent a helpful and very informative day with us in the field. Thanks to Duane Champion (USGS) for analyzing paleomagnetic samples.

Table 1. Paleomagnetic data for the Drummond quadrangle.

Sample number	Unit name	Latitude	Longitude	n	D*	I*	α_{95}	R	κ	Polarity	Treatment
12P04*	Qbbc	43.89530	-111.27100	7/8	194	-53	2.5	6.99	577	R	PCA
14P06†	Qbbc	43.96500	-111.29812	6/8	0	63	2.1	5.99	993	N	PCA
14P07†	Qbbr	43.95990	-111.32150	8/8	214	-78	1.8	7.99	997	R	PCA
14P08‡	Qbbr	43.92750	-111.28340	8/10	341	62	3.6	7.97	239	N	PCA
14P09‡	Qbbc	43.95840	-111.32450	10/10	198	-82	3.7	9.95	169	R	PCA

n = number of cores used / number of cores measured
D* = site mean declination of characteristic remanent magnetization (ChRm).
I* = site mean inclination of ChRM.
α_{95} = confidence limit for the mean direction at the 95% level.
κ = precision parameter.
Polarity: N = normal; R = reverse.
Treatment: method used to isolate ChRM; PCA = principal component analysis.
*Analyses performed in IGS paleomagnetism laboratory, Moscow, Idaho.
†Analyses performed in the USGS paleomagnetism laboratory, Meno Park, California

Table 2. Major oxide and trace element chemistry of samples collected in the Drummond quadrangle.

Sample number	Latitude	Longitude	Unit name	Map unit	Major elements in weight percent										Trace elements in parts per million																					
					SiO_2	TiO_2	Al_2O_3	FeO*	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	Sum	LOI	Ni	Cr	Sc	V	Ba	Rb	Sr	Zr	Y	Nb	Ga	Cu	Zn	Pb	La	Ce	Th	Nd	U	Co
13DF107‡	43.91783	-111.29721	Basalt of Ard Farms	Qba	46.25	2.392	16.02	14.1	0.212	6.86	9.77	3.04	0.47	0.466	99.58	-0.29	103	62	30	312	355	5	278	206	37	18.5	21	39	135	3	23	48	0	25	2	na
13DF109‡	43.89569	-111.30465	Basalt of Ard Farms	Qba	47.23	2.311	15.67	13.57	0.211	6.72	9.93	2.98	0.44	0.499	99.55	0.15	96	60	28	291	495	6	308	231	36	19.5	22	46	136	4	26	51	1	27	2	na
12P04‡	43.89530	-111.27100	Basalt of Bitch Creek	Qbbc	44.11	2.088	12.99	10.19	0.16	6.23	14.36	2.24	0.5	0.415	93.29	5.56	75	181	26	249	429	9	333	173	27	15.9	17	41	97	2	17	44	3	24	1	na
13DF111‡	43.95248	-111.35594	Basalt of Bitch Creek	Qbbc	50.32	2.202	15.77	11.79	0.178	4.93	8.23	3.15	1.41	0.445	98.43	0.03	63	72	25	268	677	49	279	338	38	31.7	23	45	125	9	49	89	9	39	2	na
13DF112‡	43.94166	-111.37095	Basalt of Bitch Creek	Qbbc	48.69	2.508	15.22	12.22	0.191	6.88	11.16	2.66	0.49	0.477	100.48	-0.44	95	217	36	311	338	8	300	205	35	20.2	22	45	118	3	24	50	2	25	3	na
13DF114‡	43.97741	-111.33990	Basalt of Bitch Creek	Qbbc	49.28	2.393	14.91	11.93	0.18	7.56	9.58	2.47	0.72	0.59	99.61	-0.06	115	284	29	258	568	13	317	257	37	27	19	46	127	4	35	72	3	37	1	na
13DF116‡	43.88379	-111.26021	Basalt of Bitch Creek	Qbbc	49.38	1.596	16.02	10.76	0.168	8.35	10.29	2.65	0.47	0.288	99.98	-0.04	163	347	28	239	314	10	267	150	27	14.5	18	57	99	3	20	38	1	19	0	na
13DF118‡	43.96092	-111.36938	Basalt of Bitch Creek	Qbbc	47.53	2.618	15.01	12.5	0.194	6.79	11.28	2.68	0.39	0.512	99.51	0.03	92	203	35	318	402	6	312	209	36	21.2	19	34	119	4	24	58	2	29	0	na
13DG708‡	43.96512	-111.29782	Basalt of Bitch Creek	Qbbc	50.04	2.05	16.34	12.09	0.2	5.47	8.53	3.11	1.17	0.405	99.2	0.53	80	90	25	279	748	37	271	287	35	26.6	22	51	122	7	43	77	7	33	2	na
13DG701‡	43.96197	-111.31962	Basalt of Bitch Creek	Qbbc	47.88	2.266	15.91	11.96	0.181	4.78	9.94	3.11	1.16	0.475	97.66	1.54	59	69	22	271	771	27	310	338	39	32.4	23	14	129	10	53	97	10	41	3	na
13DG750‡	43.94327	-111.34522	Basalt of Bitch Creek	Qbbc	47.96	2.523	15.3	12.42	0.19	6.95	11.13	2.48	0.34	0.48	99.76	0.56	102	222	34	306	424	4	308	212	37	20.3	20	64	120	3	23	55	2	30	3	na
14P06†	43.96500	-111.29812	Basalt of Bitch Creek	Qbbc	49.68	2.13	15.83	11.84	0.19	5.04	7.95	3.26	1.26	0.42	99.6	0.82	65	82	24	264	719	34	294	329	39	32.3	21	52	112	2	34	61	9.6	na	<0.5	49
14P09†	43.95840	-111.32450	Basalt of Bitch Creek	Qbbc	46.82	1.59	14.17	12.91	0.19	10.52	2.18	0.26	0.3	99.72	0.48	258	555	32	266	237	3.1	238	177	35	17.2	17	72	104	1	16	33	1.5	na	<0.5	64
13DF110‡	43.92467	-111.30296	Basalt of Bailey Reset	Qbbr	48.11	1.89	14.55	11.59	0.185	10.19	10.24	2.29	0.4	0.408	99.86	-0.27	270	566	32	267	355	6	233	199	32	20.0	19	35	113	4	24	46	2	24	1	na
13DG702‡	43.94640	-111.31546	Basalt of Bailey Reset	Qbbr	48.49	1.637	14.72	10.97	0.179	10.69	10.55	2.27	0.41	0.306	100.21	0.11	276	607	30	248	298	9	217	175	28	17.7	18	33	104	3	23	39	1	21	2	na
13DG703‡	43.94097	-111.30283	Basalt of Bailey Reset	Qbbr	48.02	1.831	14.76	11.29	0.184	9.99	9.88	2.25	0.38	0.356	99.26	0.17	275	583	32	263	428	4	224	197	32	18.9	19	60	113	3	24	47	3	28	2	na
13DG705‡	43.92841	-111.28634	Basalt of Bailey Reset	Qbbr	48.66	1.781	14.67	11.39	0.18	10.56	10.34	2.32	0.38	0.342	100.62	-0.09	286	590	30	259	484	7	240	200	31	19.7	18	58	113	3	20	49	1	25	1	na
13DG706‡	43.95999	-111.32148	Basalt of Bailey Reset	Qbbr	48.28	1.644	15.19	11.03	0.178	10.4	10.57	2.27	0.28	0.286	100.12	-0.02	258	613	33	252	333	5	227	171	31	17.4	18	58	104	3	26	46	2	23	0	na
14P07†	43.95990	-111.32150	Basalt of Bailey Reset	Qbbr	47.72	1.53	14.41	12.59	0.19	10.72	10.08	2.21	0.37	0.28	100.1	0.29	258	550	31	249	253	9	226	165	36	16.7	16	96	109	<1	14	31	1.7	na	<0.5	65
14P08‡	43.92750	-111.28340	Basalt of Bailey Reset	Qbbr	44.95	2.39	15.50	16.25	0.22	7.19	9.92	2.86	0.28	0.44	100.0	-0.10	96	80	32	326	331	2	296	205	38	17.8	19	53	129	8	15	28	<0.5	na	<0.5	68
140524-1A‡	43.92750	-111.28340	Basalt of Bailey Reset	Qbbr	47.66	2.48	15.41	13.71	0.19	6.25	10.93	2.35	0.47	0.48	99.93	0.61	97	138	30	315	388	4	297	208	36	17.7	19	39	124	1	16	31	<0.5	na	<0.5	67

Major elements are not normalized.
*Total Fe expressed as FeO.
†Analyses performed at Washington State University GeoAnalytical Laboratory, Pullman, Washington.
‡Analyses performed at Franklin and Marshall College, Lancaster, Pennsylvannia.
na = Not Analyzed.
Samples 14P08 and 140524-1A are from same outcrop.

Published and sold by the Idaho Geological Survey
University of Idaho, Moscow, Idaho 83844-3014