Geologic Map of the Tamarack Quadrangle, Adams County, Idaho

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2009

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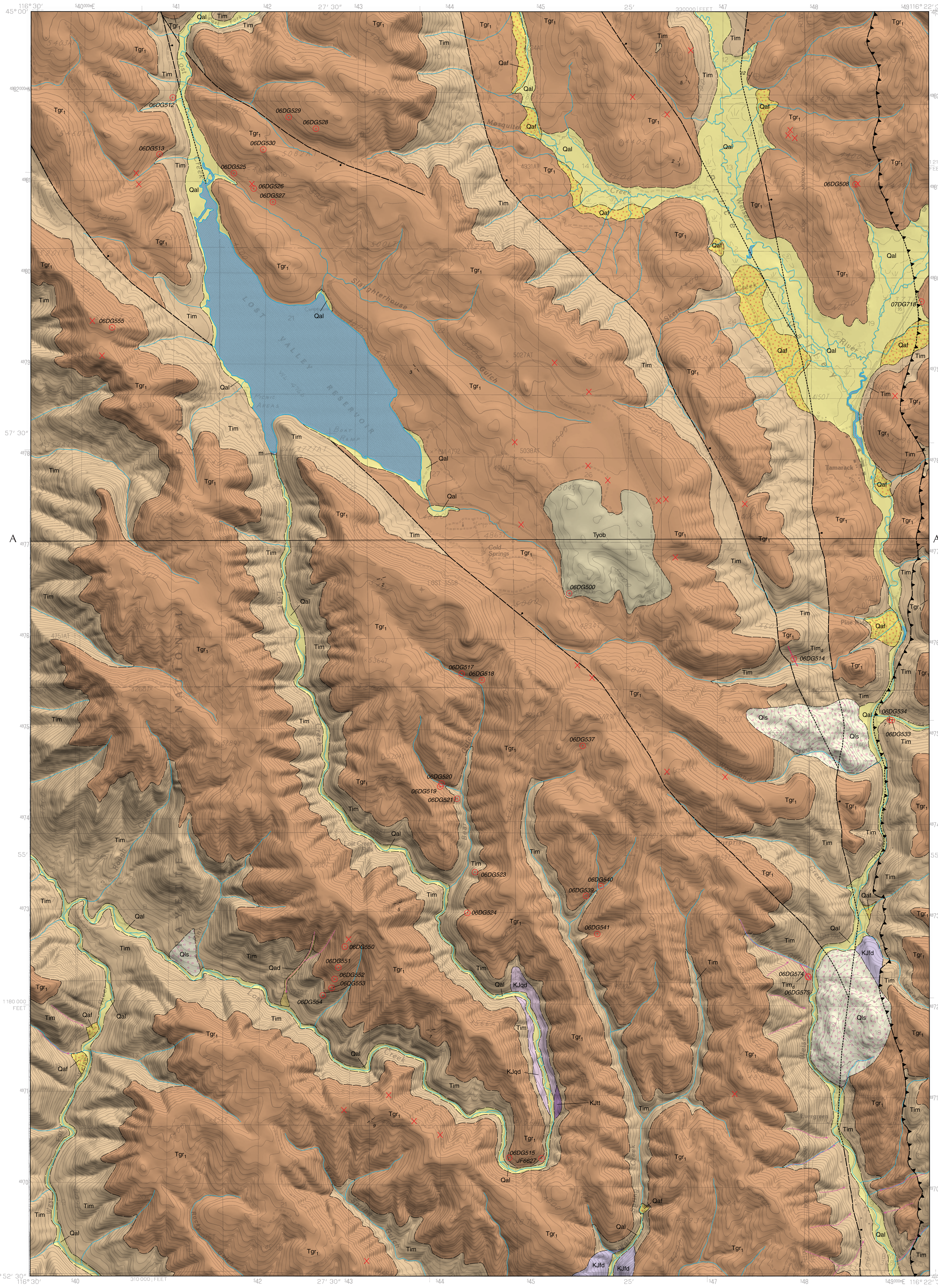


Base map scanned from USGS film positive, 1986.

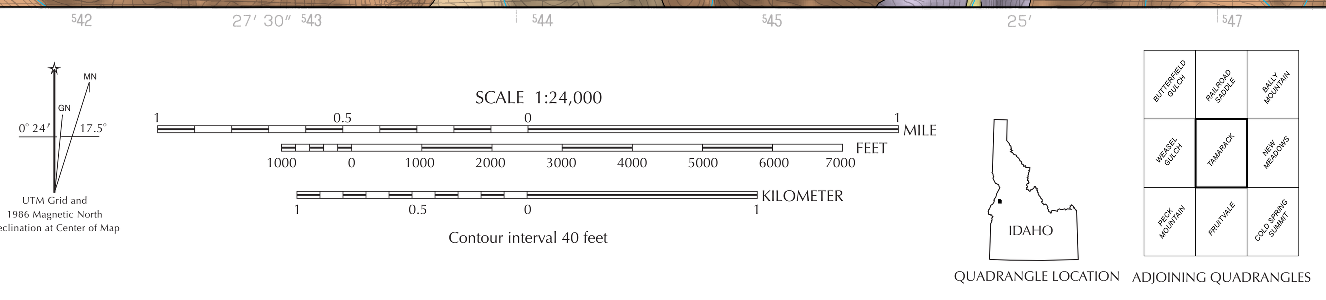
Shaded elevation from 10 m DEM.

Topography by photogrammetric methods from aerial photographs taken 1980. Field checked 1982. Photorevised 1986.

Transverse Mercator projection. 1927 North American Datum.

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

1000-meter Universal Transverse Mercator grid ticks, zone 11.



Field work conducted 2006-2008.

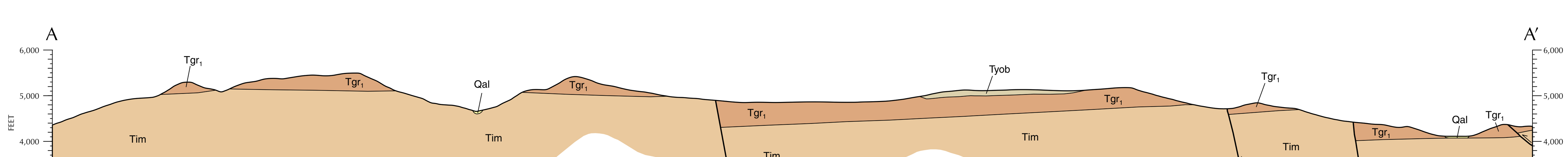
This geologic map was funded in part by the Idaho Transportation Department.

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

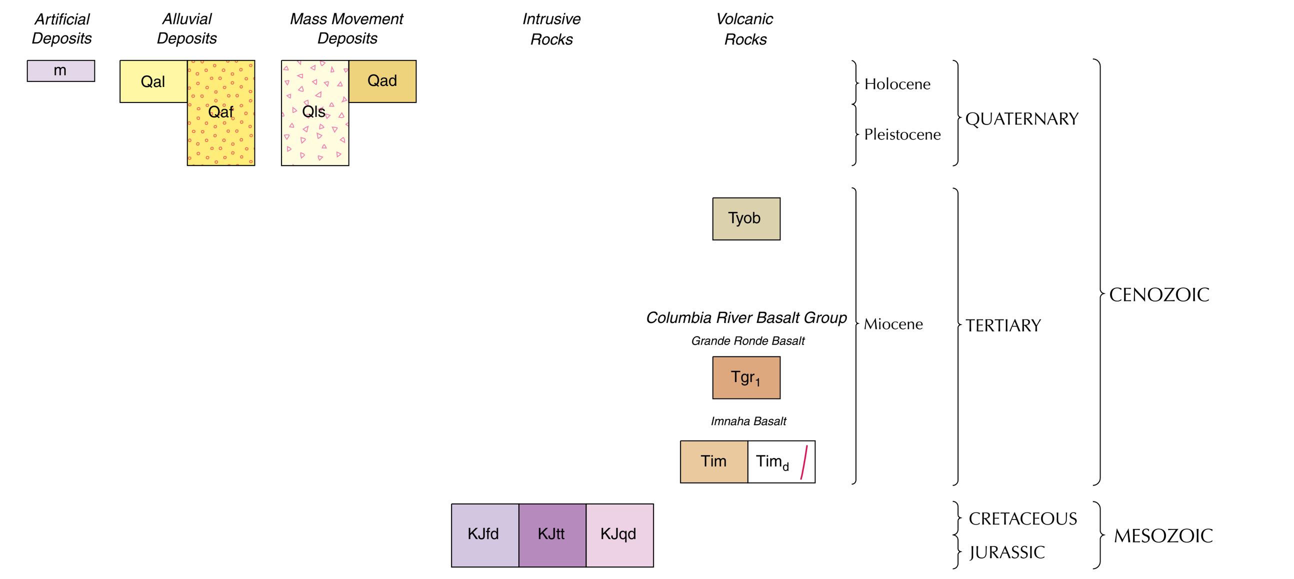
Note on printing: The map is reproduced at a high resolution of 600 dots per inch. The inks are resistant to run and fading but will deteriorate with long-term exposure to light.

Map version 5-19-2009.

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



CORRELATION OF MAP UNITS



INTRODUCTION

The geologic map of the Tamarack quadrangle depicts rock units exposed at the surface or underlying thin surficial cover of soil and colluvium. Surficial deposits of alluvium and landslide deposits are also depicted where they form significant mappable units. The map is the result of field work conducted in 2006-2008 by the authors and compilation from previous work, including that of Breeser (1972), Fitzgerald (1981, 1982), Othberg (1982) and Lund (2004). Rasmussen (2000) provided information about the soils in the map area.

The quadrangle is mostly underlain by Miocene basalt flows of the Columbia River Basalt Group. Exposures of prebasalt rocks are restricted to drainages in the southeast part of the quadrangle and consist of Jurassic to Cretaceous intrusive units. Prior to eruption of the Columbia River Basalt Group, the land mass was eroded to form steep, rugged topography. During the Miocene, the basalts were erupted from many linear vents hundreds of miles in length. Two dikes of Imnaha basalt were mapped in the Tamarack quadrangle during this study. The flows invaded the area, filling the irregular topography covering the older rocks. Near the contact of the basalt and the older rocks, discontinuous sediments were deposited and later were covered by subsequent basalt flows, forming local interbeds within the basalt sequence. Interbeds are very local and only one small roadcut in a landslide deposit in the northwest part of sec. 6, T. 18 N., R. 1 E., was discovered during this study. Structural warping of the basalt occurred both during and after emplacement, in part controlling the distribution of younger sediments and volcanic units, steam development, and the cutting of the Weiser River canyon, West Fork Weiser River canyon, and Lost Creek canyon. The faulting in the north and eastern part of the quadrangle developed after extrusion of Grande Ronde basalt and probably prior to extrusion of the younger olivine phyric flow (*Tyob*). Vertical displacements along these faults are variable with a maximum vertical displacement of 400-500 feet. These structures are poorly exposed and are primarily mapped based on their geomorphic expression. Landslides primarily occur where topography is over steepened by faulting or where the basalt sits on highly weathered older intrusive rocks.

DESCRIPTION OF MAP UNITS

ARTIFICIAL DEPOSITS

m **Made ground (Holocene)**—Artificial fills composed of excavated, transported, and emplaced construction materials of highly varying composition, but typically derived from local sources.

SEDIMENTARY AND MASS MOVEMENT DEPOSITS

Alluvial Deposits

Qal **Alluvium deposits (Holocene)**—Channel and flood-plain deposits that are part of the present river system. Two grain-size suites are present (Othberg, 1982): Fine-grained flood-plain overbank sediments in broad valley bottoms are restricted to the north part of the quadrangle and are upstream of nickpoints. Most of the sediment is black, gray, and grayish brown stratified silt, clay, and sand 5-10 feet thick. Drainageways in the valley bottom are composed of brown to yellowish brown stratified sand and pebble gravel. Downstream of the nickpoints high-energy stream channel sand and gravel predominate. The deposits vary from sand and pebble gravel to cobble and boulder gravel. Gravel clasts are predominately basalt. Many small side-stream alluvial fans are included in the unit.

Qaf **Alluvial-fan deposits (Holocene and Pleistocene)**—Crudely bedded, poorly sorted brown muddy gravel derived from basalt colluvium on steep canyon slopes. Gravel is composed of subangular and angular pebbles, cobbles, and boulders of basalt in a matrix of granules, sand, silt, and clay. Thickness highly variable, ranging 5-50 feet.

Mass Movement Deposits

Qad **Debris-flow deposits (Holocene)**—Primarily crudely bedded, poorly sorted brown muddy gravel and woody debris shed from canyon slopes of basalt colluvium. Gravel is composed of subangular and angular pebbles, cobbles, and boulders of basalt in a matrix of granules, sand, silt, and clay. Thickness varies, but typically ranges from 2-40 feet. Fans composed of alluvium and debris-flow deposits commonly occur in canyon bottoms below steep debris-flow chutes (see Symbols).

Qls **Landslide deposits (Holocene and Pleistocene)**—Poorly sorted and poorly stratified angular basalt cobbles and boulders mixed with silt and clay. Deposited by slumps, slides, and debris flows. Location of landslide deposits in steep canyons is typically controlled by the presence of over steepened slopes from faulting, sedimentary interbeds, and the interface between basalt units and underlying basement rocks. Landslides range in age from ancient, relatively stable features, to those that have been active within the past few years.

VOLCANIC ROCKS

Tyob **Younger olivine phyric basalt (Miocene?)**—Medium to light gray, fine- to medium-grained basalt with common olivine grains 1-2 mm in diameter and scarce plagioclase phenocrysts generally <2 mm in length. Normal magnetic polarity as determined in the field. Consists of one flow ranging from about 5-140 feet thick. Forms the capping flow near Lost Valley Reservoir. Probably erupted locally and filled part of the half graben and was likely restricted by a low volume eruption.

COLUMBIA RIVER BASALT GROUP

The stratigraphic nomenclature for the Columbia River Basalt Group follows that of Swanson and others (1979) and Camp (1981). In Idaho, the group is divided into four formations. From oldest to youngest, these are Imnaha Basalt, Grande Ronde Basalt, Wanapum Basalt, and Saddle Mountains Basalt. Imnaha Basalt is exposed in the canyons throughout the quadrangle. Grande Ronde Basalt, from oldest to youngest, has been subdivided into the informal R_1, N_1, R_2, and N_2 magnetostratigraphic units (Swanson and others, 1979). Of these units, flows of the R_1 are exposed in the quadrangle. No Wanapum Basalt or Saddle Mountains Basalt units occur in the quadrangle. Basalt units were identified using hand sample characteristics, paleomagnetic signatures, geochemical signatures, and compilation of previous data. Representative samples of most basalt units were collected for chemical analysis. These samples supplement previous ones collected by J. F. Fitzgerald (1981). Our sample locations and those of Fitzgerald are identified on the map. Analytical results are listed in Table 1. Samples were analyzed at Washington State University's GeoAnalytical Laboratory.

Grande Ronde Basalt

Tgr_1 **Grande Ronde R_1 magnetostratigraphic unit (Miocene)**—Mostly dark gray, fine- to medium-grained aphyric to microphyric basalt. Sugary texture. Rare clusters and individual plagioclase phenocrysts 4-12 mm in length occur in one or more flows in the lower part of the section. Reverse magnetic polarity as determined in the field. In general, the Grande Ronde is much more resistant to weathering than the Imnaha due to its finer grained nature. Consists of about six to eight flows with a total thickness of 500-600 feet. The upper part of the section is typically aphyric and commonly forms a well developed entablature. Most of the flowtops in the Grande Ronde are highly weathered and commonly very reddish in color.

Imnaha Basalt

Tim **Imnaha Basalt (Miocene)**—Medium- to coarse-grained, sparsely to abundantly plagioclase-phyric basalt; olivine common; plagioclase phenocrysts generally 0.5-2 cm long but some are as large as 3 cm. Normal magnetic polarity. About 1000 feet of Imnaha basalt is exposed in the West Fork Weiser canyon. Outcrops commonly deeply weathered or degraded forming granular detritus. Locally, hyaloclastic deposits and sediments in the middle of the unit are as much as 180 feet thick. This hyaloclastic unit is easily weathered and covered with colluvial debris. The hyaloclastic unit is best exposed in a gravel pit near Rough Creek (sec. 8, T. 18 N., R. 1 W).

Tim_d **Imnaha Basalt dike (Miocene)**—Two plagioclase-phyric basalt dikes cut the Imnaha in the Weiser River canyon.

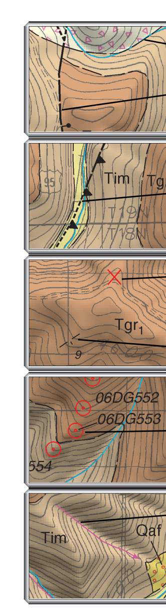
INTRUSIVE ROCKS

KJfd **Fine grained diorite (Jurassic and Cretaceous)**—Fine-grained, equigranular, massive diorite that occurs in Warm Spring Creek. This unit is poorly exposed and highly weathered. This exposure was previously unmapped (Fitzgerald, 1981, 1982; Lund, 2004).

KJtt **Biotite tonalite and hornblende biotite tonalite (Jurassic and Cretaceous))—Fine- to medium-grained biotite tonalite and lesser amounts of hornblende-biotite tonalite. Exposed along the road in Lost Creek at the southern part of the map. Contains about 7-15 percent biotite, 0-10 percent hornblende, and 1-3 percent epidote.

KJqd **Biotite hornblende quartz diorite (Jurassic and Cretaceous)**—Fine- to medium-grained, massive diorite that occurs along the road in Lost Creek at the southern part of the map. This unit is poorly exposed and highly weathered.

SYMBOLS



Contact: approximately located, dotted where concealed.

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

Reverse fault: approximately located, dotted where concealed; teeth on hanging wall.

Entablature: Location of thick basalt flow where the upper part is fractured into closely spaced blocks. Forms colluvium of cobble-sized clasts.

Estimated strike and dip of basalt flows.

Sample location and number.

Debris-flow chute in canyons: Thin and discontinuous alluvial-fan and debris-flow deposits (*Qad*) may be present, but are not mappable at this scale. High-energy, short duration floods and debris flows may occur in these chutes in response to severe climatic conditions, such as thunderstorms and rain-on-snow events. Debris flows can also be triggered by landslides. These events are historically infrequent, dependent on weather, with a recurrence cycle on the order of years to decades. The most prominent debris-flow chutes are shown on the map, but any steepp-sided canyon has the potential for these catastrophic events.

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Table 1. Major oxide and trace element chemistry of samples collected in the Tamarack 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	Ni	Cr	Sc	V	Ba	Rb	Sr	Zr	Y	Nb	Ga	Cu	Zn	Pb	La	Ce	Th	Nd
06DG500	44.94249	-116.42509	Younger olivine phyric basalt	Tyob	52.52	1.571	17.20	8.48	0.157	5.51	7.24	4.46	1.96	0.897	98	122	19	211	995	17	1211	162	28	21.1	22	59	107	8	42	76	1	44
06DG508	44.98292	-116.38521	Grande Ronde Basalt R_1	Tgr_1	55.19	2.246	13.85	12.04	0.200	3.76	7.43	3.21	1.72	0.360	18	10	33	366	640	42	316	201	38	12.5	22	54	129	9	24	49	3	30
06DG512	44.99151	-116.48028	Imnaha Basalt	Tim	48.43	2.167	17.05	11.65	0.189	6.81	10.24	2.92	0.28	0.261	119	134	33	323	249	2	419	144	28	9.3	23	58	108	4	10	34	1	23
06DG513	44.98589	-116.48211	Grande Ronde Basalt R_1	Tgr_1	54.17	2.330	14.00	12.03	0.191	4.28	7.84	3.28	1.48	0.394	28	31	35	338	546	37	321	191	35	12.3	23	78	122	8	21	49	3	30
06DG514	44.93611	-116.39334	Imnaha Basalt, dike	Tim_d	50.82	2.127	16.69	10.65	0.174	5.63	9.89	2.95	0.78	0.289	74	112	29	287	289	20	391	156	30	9.9	21	88	104	6	13	37	2	24
06DG515	44.8867	-116.43345	Grande Ronde Basalt R_1	Tgr_1	53.66	2.338	14.14	12.16	0.207	4.33	8.19	3.08	1.51	0.396	29	29	35	381	522	33	319	194	39	12.7	21	71	133	7	22	58	3	34
06DG517	44.93456	-116.44004	Grande Ronde Basalt R_1	Tgr_1	53.44	2.295	14.07	12.16	0.187	4.66	8.52	2.97	1.32	0.372	25	46	35	347	534	30	341	190	38	12.5	22	59	123	9	22	45	2	27
06DG518	44.93393	-116.43723	Grande Ronde Basalt R_1	Tgr_1	54.06	2.372	13.69	12.56	0.209	4.20	7.75	3.32	1.42	0.425	24	31	37	394	555	35	285	206	42	13.3	23	79	134	8	21	50	2	30
06DG519	44.92341	-116.44304	Grande Ronde Basalt R_1	Tgr_1	53.72	2.298	14.36	11.93	0.177	4.46	8.11	3.25	1.33	0.371	24	33	35	357	507	32	323	189	35	12.1	22	67	126	8	19	48	2	30
06DG520	44.92369	-116.44283	Grande Ronde Basalt R_1	Tgr_1	54.11	2.368	13.96	12.03	0.174	4.25	8.06	3.27	1.39	0.398	27	33	35	380	529	37	312	199	41	13.2	23	77	134	8	22	46	3	24
06DG521	44.92219	-116.44069	Imnaha Basalt	Tim	48.44	2.432	16.23	12.35	0.197	6.70	10.02	2.89	0.43	0.317	127	233	34	329	293	3	377	167	33	10.8	22	106	118	6	17	40	1	28
06DG523	44.91493	-116.43819	Imnaha Basalt	Tim	49.62	2.063	17.36	11.44	0.158	5.73	10.05	2.98	0.35	0.247	104	124	30	286	243	3	422	137	30	8.9	23	123	110	3	15	26	0	22
06DG524	44.91095	-116.4394	Grande Ronde Basalt R_1	Tgr_1	53.53	2.321	14.09	11.77	0.191	4.75	8.61	2.95	1.42	0.371	26	49	36	351	516	33	356	190	55	12.4	21	65	124	9	33	47	3	43
06DG525	44.98402	-116.47177	Grande Ronde Basalt R_1	Tgr_1	54.04	2.334	14.00	12.01	0.198	4.26	8.04	3.08	1.64	0.392	24	31	34	338	544	38	331	188	35	12.0	21	79	121	8	22	48	2	27
06DG526	44.98252	-116.469	Grande Ronde Basalt R_1	Tgr_1	53.76	2.369	14.22	12.21	0.194	4.39	8.04	2.99	1.46	0.376	26	36	34	335	568	35	342	193	36	13.1	22	78	124	9	23	48	2	26
06DG527	44.98118	-116.46632	Grande Ronde Basalt R_1	Tgr_1	54.43	2.229	14.09	11.73	0.195	4.21	8.03	3.31	1.41	0.359	21	30	33	349	558	28	322	192	35	12.0	23	83	122	8	21	50	2	28
06DG528	44.98843	-116.46034	Grande Ronde Basalt R_1	Tgr_1	54.78	2.154	14.21	11.46	0.191	4.24	8.23	2.95	1.44	0.341	19	40	30	298	991	39	397	181	33	11.6	22	48	117	8	23	49	2	29
06DG529	44.98958	-116.46413	Grande Ronde Basalt R_1	Tgr_1	54.80	2.189	14.41	11.08	0.175	4.19	8.19	2.99	1.66	0.321	19	41	33	315	582	40	363	187	35	11.7	23	51	120	9	23	46	3	30
06DG530	44.98637	-116.46768	Grande Ronde Basalt R_1	Tgr_1	54.69	2.172	14.36	11.11	0.181	4.41	8.10	3.14	1.50	0.319	20	40	32	320	594	40	362	185	33	12.4	22	47	120	9	20	48	4	27
06DG533	44.93005	-116.38016	Imnaha Basalt	Tim	51.32	3.065	13.86	13.80	0.203	4.10	8.80	3.27	1.12	0.451	24	53	39	382	468	12	297	246	48	17.3	24	127	142	6	27	58	3	38
06DG534	44.93011	-116.38043	Imnaha Basalt	Tim	51.61	2.987	13.45	13.66	0.228	4.57	8.88	3.08	1.10	0.442	25	52	38	371	447	27	288	239	44	16.4	23	142	140	6	24	54	2	35
06DG537	44.92742	-116.42321	Grande Ronde Basalt R_1	Tgr_1	54.93	2.279	14.31	11.21	0.154	4.19	7.84	3.23	1.53	0.330	17	32	32	319	551	47	341	193	36	12.8	21	57	121	9	23	46	2	30
06DG539	44.91259	-116.42274	Grande Ronde Basalt R_1	Tgr_1	51.27	2.233	15.76	12.06	0.190	5.44	8.77	3.02	0.91	0.341	21	23	30	288	507	17	420	169	31	14.1	22	17	124	6	22	43	2	28
06DG540	44.91356	-116.42068	Grande Ronde Basalt R_1	Tgr_1	53.85	2.388	14.39	11.70	0.184	4.21	8.40	3.03	1.46	0.392	21	31	36	377	527	34	339	198	44	12.4	22	63	130	8	23	46	2	29
06DG541	44.90883	-116.42118	Grande Ronde Basalt R_1	Tgr_1	52.15	2.210	15.32	11.77	0.179	5.21	8.71	3.02	1.11	0.339	19	21	28	287	493	25	403	165	29	13.2	23	14	118	5	19	47	2	28
06DG550	44.90757	-116.45629	Grande Ronde Basalt R_1	Tgr_1	55.15	2.249	13.72	12.34	0.196	3.82	7.31	3.16	1.68	0.361	15	13	33	366	616	43	308	200	41	12.2	21	58	130	8	22	56	5	33
06DG551	44.90551	-116.45719	Grande Ronde Basalt R_1	Tgr_1	54.03	2.227	14.66	11.62	0.181	4.43	8.09	2.94	1.51	0.314	20	42	32	311	549	36	361	187	31	12.0	21	45	118	11	21	47	4	30
06DG552	44.90437	-116.45771	Grande Ronde Basalt R_1	Tgr_1	52.00	2.138	15.47	11.67	0.182	5.33	8.77	3.05	1.07	0.325	19	21	28	288	529	23	412	161	28	12.9	21	13	117	6	18	39	2	23
06DG553	44.90349	-116.45812	Grande Ronde Basalt R_1	Tgr_1	53.58	2.315	14.03	12.00	0.191	4.60	8.54	2.93	1.43	0.376	25	47	35	352	533	36	341	191	36	12.6	22	65	120	6	20	44	2	25
06DG554	44.90275	-116.45935	Imnaha Basalt	Tim	49.90	2.190	16.55	11.65	0.183	5.81	9.86	2.99	0.58	0.281	100	125	32	321	277	8	406	148	31	10.2	23	110	109	4	12	31	0	21
06DG555	44.96878	-116.48871	Grande Ronde Basalt R_1	Tgr_1	55.03	2.286	13.72	12.24	0.199	3.65	7.33	3.19	1.98	0.385	24	9	32	375	657	43	316	211	43	13.3	21	63	126	9	24	52	5	29
06DG574	44.9045	-116.39188	Imnaha Basalt, dike	Tim_d	50.91	2.294	16.03	10.89	0.177	5.76	9.67	2.98	0.98	0.319	83	123	33	310	332	19	379	171	34	12.3	22	89	113	3	20	38	1	25
06DG575	44.90441	-116.39184	Imnaha Basalt	Tim	49.62	2.592	16.10	12.69	0.182	5.69	8.97	2.95	0.82	0.393	106	111	31	280	410	18	406	202	37	14.7	24	108	126	5	21	41	2	29
07DG718	44.97104	-116.37646	Grande Ronde Basalt R_1	Tgr_1	53.96	2.357	14.66	12.37	0.204	3.91	7.61	3.24	1.33	0.360	12	30	32	283	1130	29	371	202	47	11.9	21	62	126	7	32	59	4	39
JF6627	44.88663	-116.42892	Imnaha Basalt	Tim	50.32	2.280	16.96	11.09	0.190	5.77	9.62	2.72	0.78	0.270																		

* Major elements are normalized on a volatile-free basis, with total Fe expressed as FeO.
All analyses performed at Washington State University GeoAnalytical Laboratory, Pullman, Washington.