Geologic Map of the Culdesac North Quadrangle, Nez Perce County, Idaho

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2005

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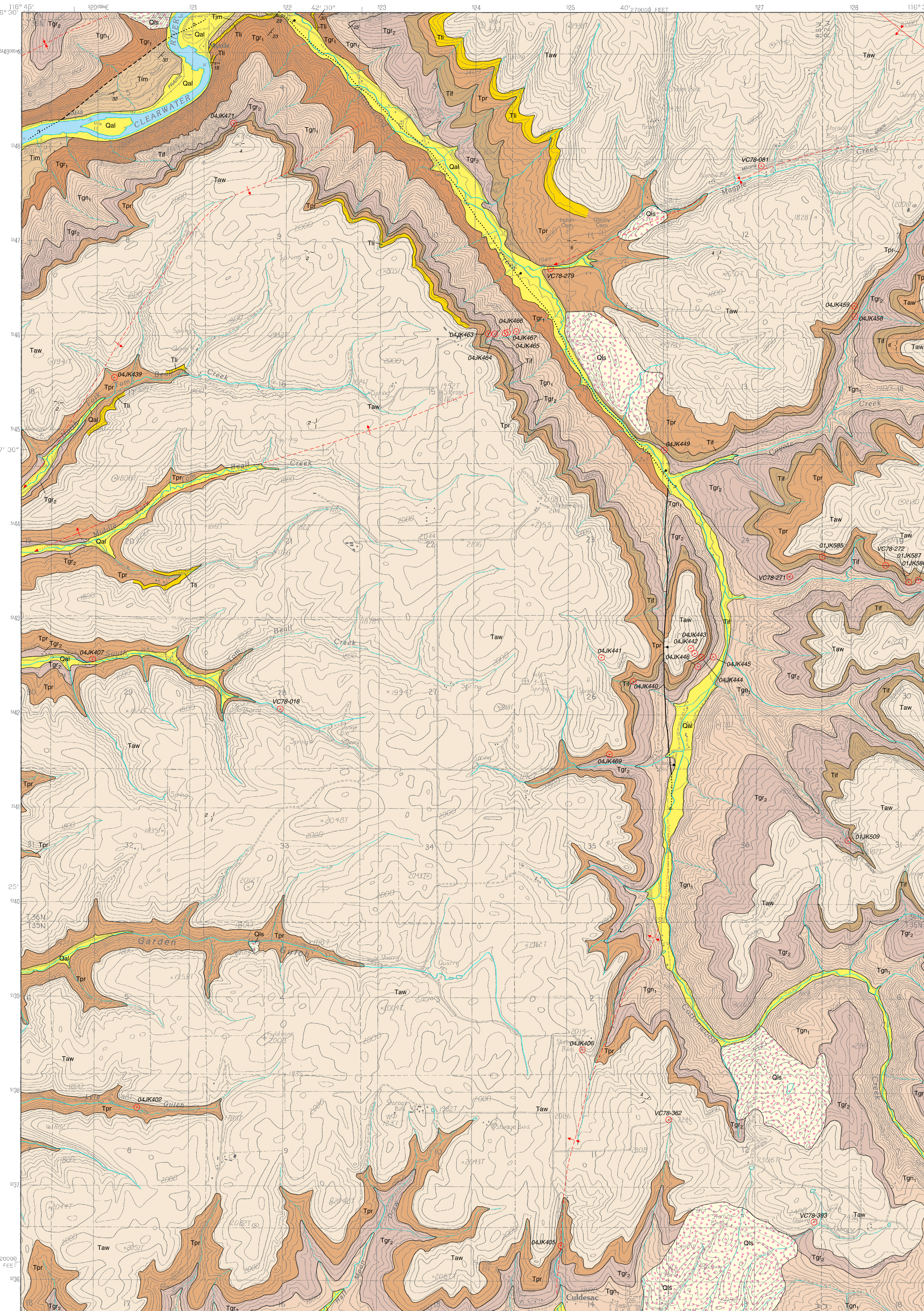


Base map scanned from USGS film-positive base, 1984.
Topography by photogrammetric methods from aerial photographs taken 1975 and 1980. Field checked 1982. Map edited 1984.
Polyconic projection. 1927 North American Datum.
10,000-foot grid ticks based on Idaho coordinate system, west zone.
1000-meter Universal Transverse Mercator grid ticks, zone 11.
National geodetic vertical datum of 1929.

UTM Grid and 1980 Magnetic North Declination at Center of Map

SCALE 1:24,000

Contour interval 40 feet

QUADRANGLE LOCATION

Field work conducted 2001 and 2004.

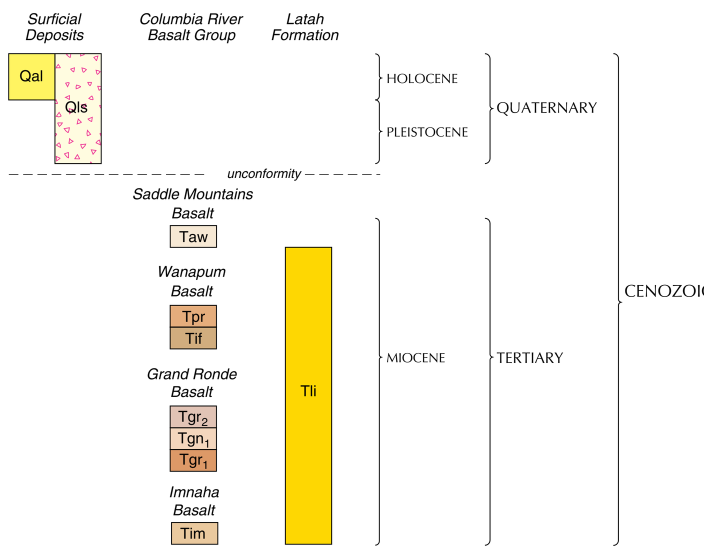
This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program.

Digital cartography by Loudon R. Stanford and Jesse S. Bird 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 but not to the fading caused by long-term exposure to light.

Map version 6-23-2005.

CORRELATION OF MAP UNITS



INTRODUCTION

The geologic map of the Culdesac North quadrangle depicts rock units exposed at the surface or underlying thin surficial cover of soil and colluvium. Thicker surficial deposits of alluvium and landslide deposits are also depicted where they mask or modify the underlying rock units. The map is the result of field work conducted in 2001 and 2004 by the author. Previous work includes that of Bond (1963) and reconnaissance mapping and sampling in the area from 1978 to 1980 (Camp, 1981; Swanson and others, 1979a).

The quadrangle is underlain by Miocene basalt flows of the Columbia River Basalt Group. The basalt flows invaded ancestral drainages and buried the preexisting topography. Structural warping of the basalt occurred both during and after emplacement, in part controlling the distribution of younger basalt units and the later development of streams.

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 V.E. Camp (written commun., 2002). Our sample locations and those of Camp are identified on the map. Analytical results are listed in Table 1. Samples were analyzed at Washington State University's GeoAnalytical Laboratory.

DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS

Qal **Stream alluvium (Quaternary)**—Mostly stream alluvium but may include some slope-wash and fan deposits. Primarily coarse channel gravels deposited during high-energy stream flow. Subrounded to rounded pebbles, cobbles, and boulders in a sand matrix. May include intercalated colluvium and debris-flow deposits from steep side slopes.

Qls **Landslide deposits (Quaternary)**—Landslide, slump, and other mass gravity movement deposits. Consists of poorly sorted and poorly stratified angular basalt fragments mixed with silt and clay.

TERTIARY SEDIMENTS

Latah Formation

Tli **Latah Formation sedimentary interbeds (Miocene)**—Clay, silt, sand, pebble, and cobble deposits interbedded with Columbia River Basalt units. Interbed near the base of Grande Ronde R_1 at the mouth of Cottonwood Creek includes a tuffaceous component. Interbed above the Priest Rapids Member is equivalent of the Sweetwater Creek interbed of Bond (1963).

COLUMBIA RIVER BASALT GROUP

The stratigraphic nomenclature for the Columbia River Basalt Group follows that of Swanson and others (1979b). 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 occurs only in the northwest part of 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, 1979b). Of these units, flows of the R_1, N_1 and R_2 are exposed in the quadrangle. The basalt of Icicle Flat and the Priest Rapids Member compose the Wanapum Basalt in the area. Saddle Mountains Basalt is restricted to the undivided flows of the Asotin Member and Wilbur Creek Member.

Saddle Mountains Basalt

Taw **Asotin Member and Wilbur Creek Member, undivided (Miocene)**—Dark gray, fine-grained basalt with scattered plagioclase phenocrysts 1-4 mm in length and occasional to common olivine grains <1 mm in diameter. Normal magnetic polarity. Entablature forms cliffs or prominent patterned-ground pavement outcrops along upper slopes. Possibly two or more flow units occur along Magpie Creek. Thickness ranges from 100-200 feet and appears to thin over older structural warps on the basalt surface. Chemistry typical of both members and intermediate between members is documented in the quadrangle.

Wanapum Basalt

Tpr **Priest Rapids Member (Miocene)**—Medium to dark gray, fine- to coarse-grained basalt with common plagioclase phenocrysts 2-8 mm in length and common olivine grains 1-2 mm in diameter. Coarser grained varieties tend to have the larger phenocrysts of both plagioclase and olivine. Reverse magnetic polarity. Approximately 150 feet thick near the west edge of the quadrangle, but thins to about 50 feet or less in the northeast part of the quadrangle and pinches out in the southeast part. On steep slopes, the Priest Rapids crops out as a ledge of large-diameter columns. Consists of one flow of Lolo chemical type (Wright and others, 1973). Pebbles and cobbles from the Sweetwater Creek interbed are common in the soils above the Priest Rapids.

Tif **Basalt of Icicle Flat (Miocene)**—Medium to dark gray, fine- to coarse-grained basalt with common plagioclase phenocrysts 4-10 mm in length and rare to uncommon olivine grains about 1 mm in diameter. In places, the Icicle Flat texturally resembles the Priest Rapids Member. Normal magnetic polarity. One flow with a maximum thickness of about 100 feet, but generally 40-60 feet thick. Probably fills a structural depression developed on Grand Ronde Basalt. Thins and pinches out over structural irregularities on the Grande Ronde surface. Typically crops out as a 6- to 10-foot-high ledge of 3- to 5-foot-diameter columns, similar to outcroppings of Priest Rapids basalt. Previously included in the Saddle Mountains Basalt (Camp, 1981) but recently proposed to be older than Priest Rapids (Kauffman, 2004). During this study, the Icicle Flat was documented to directly underlie the Priest Rapids Member and overlie Grande Ronde R_2 at several locations. It was also extended west of Cottonwood Creek and north of the Clearwater River (in the Juliaetta and Lenore quadrangles) where it had not previously been mapped.

Grande Ronde Basalt

Tgr_2 **Grande Ronde R_2 magnetostratigraphic unit (Miocene)**—Medium to dark gray, fine-grained basalt, commonly with a sugary texture. Some units have uncommon to common 1-2 mm plagioclase phenocrysts. Reverse magnetic polarity, although fluxgate magnetometer readings commonly give weak normal or conflicting results. One or two flows with a maximum thickness of about 150 feet. Analyzed samples are chemically similar to the Wapshilla Ridge unit of Reidel and others (1989). Thins and pinches out near the southeast corner of the quadrangle.

Tgn_1 **Grande Ronde N_1 magnetostratigraphic unit (Miocene)**—Dark gray, fine-grained generally aphyric to plagioclase microphyric basalt. Uppermost units commonly are sugary textured with scarce small plagioclase phenocrysts 1-3 mm in length. Normal magnetic polarity. Three or four flows, some of which may have several flow units or internal vesicular zones, with a total thickness of 400-500 feet. Individual flows range from 50 feet to more than 150 feet thick. Colonnades of thin flows and entablatures of thick flows tend to form tiered cliffs on steep slopes, such as the slope south of Myrtle along the Clearwater River. Some sampled units have chemical characteristics similar to the China Creek unit of Reidel and others (1989).

Tgr_1 **Grande Ronde R_1 magnetostratigraphic unit (Miocene)**—Dark gray, fine-grained aphyric to microphyric basalt. Very rare plagioclase phenocrysts 2-4 mm in length in one or more units. Reverse magnetic polarity. Flows near the R_1-N_1 boundary commonly have inconsistent and weak fluxgate magnetometer polarity readings; therefore the mapped contact is poorly constrained. Outcrop characteristics are similar to Grande Ronde N_1 units. Consists of 4-6 flows with a total thickness of about 600 feet along the Clearwater River south of Myrtle.

Tim **Imnaha Basalt (Miocene)**—Dark brownish gray to dark gray, plagioclase-phyric basalt. Plagioclase phenocrysts are abundant and range from several mm to about 2 cm in length. Olivine grains as large as 2 mm are common. Normal magnetic polarity. Crops out only in the northwest part of the quadrangle along the Clearwater River where part of one flow is exposed.

STRUCTURE

The main structural features in the quadrangle are: 1) the northwest-trending Cottonwood Creek fault; 2) northeast-trending low amplitude folds; and 3) a fault-fold couplet along the Clearwater River in the northwest corner of the map.

The Cottonwood Creek fault was mapped north of the area by Garwood and others (1999). The fault continues southeastward to about the east-central part the Culdesac North quadrangle where it may connect to a north-south fault. Relative movement is down to the east and maximum displacement is about 500 feet in the area between Magpie Creek and Coyote Creek. All of the basalt units are displaced by this fault.

West of Cottonwood Creek, northeast-trending subtle monoclinal flexures warp the basalt surface. Two opposing monoclines, one following the North Fork of Tom Beall Creek and the other following the Middle Fork of Tom Beall Creek probably merge west of the map to form what farther west becomes the Lewiston syncline. East of Cottonwood Creek, a synclinal axis along Magpie Creek is probably the eastward continuation of the Lewiston syncline structure.

The fault mapped in the northwest corner of the quadrangle north of the Clearwater River is interpreted as a faulted segment of the anticline mapped to the west by Bush and Garwood (2001). Relative movement is up to the southeast, juxtaposing Imnaha Basalt against Grande Ronde R_1 basalt. The synclinal warp north of the fault connects with a syncline mapped by Garwood and others (1999) and Bush and Garwood (2001).

Some deformation, probably westward tilting of the area, began by at least Grande Ronde R_2 extrusion. The R_2 thickens westward and thins toward the east, pinching out on the adjoining Gifford quadrangle (Kauffman, 2004). A shallow northwest-trending trough may have then developed in the vicinity of Cottonwood Creek and was filled with the basalt of Icicle Flat. This unit pinches out within one mile west of Cottonwood Creek and also pinches out to the east on the Gifford quadrangle (Kauffman, 2004). The Priest Rapids Member also pinches out to the east on the Gifford quadrangle (Kauffman, 2004) but thickens westward toward the Lewiston basin, indicating a relatively flat but westward-tilted surface after extrusion of the Icicle Flat. The youngest units, undivided flows of the Asotin and Wilbur Creek members, cover the entire area but thicken and thin locally, most likely in response to minor folding of the older units. The Cottonwood Creek fault developed at some time after the Asotin and Wilbur Creek members were extruded and postbasalt folding continued to warp the basalt surface.

SYMBOLS

Contact: approximately located.

Fault: approximately located; dashed where inferred; dotted where concealed; bar and ball on downthrown side; on cross section; arrow indicates direction of relative movement.

Axial trace of fold: arrow indicates plunge direction; dotted where concealed.

Syncline.

Monocline.

Monocline, synclinal bend: shorter arrow indicates steeper dip.

45 Strike and dip of basalt flow.

4 Estimated strike and dip of basalt flow.

04DG109 Sample location and number.

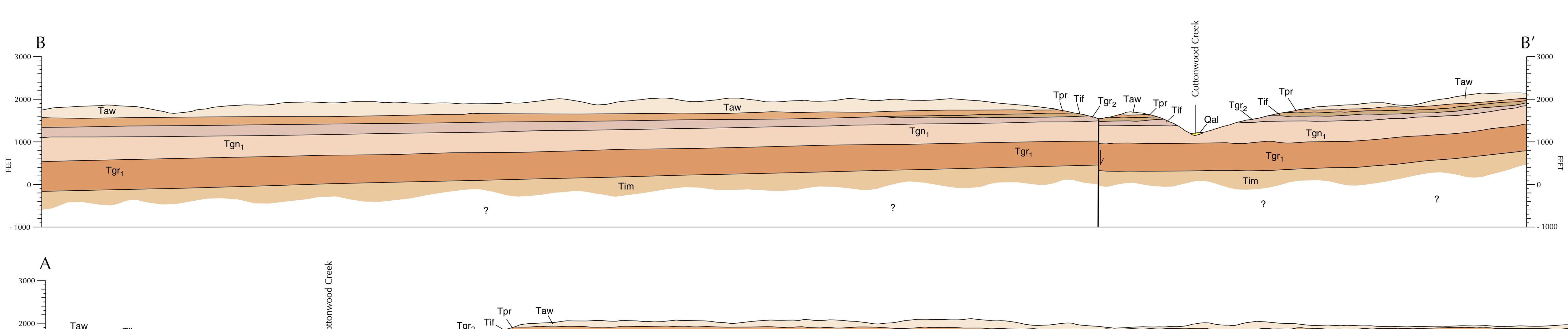
Table 1. Major oxide and trace element chemistry of basalt samples collected in the Culdesac North quadrangle

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
01JK509	46.42104	-116.63605	Grande Ronde R_2	Tgr_2	57.52	2.678	14.89	8.49	0.162	3.17	7.08	3.22	2.26	0.525	11	27	35	416	1355	52	374	216	44	14.4	22	12	141	11	35	75	4
01JK585	46.44811	-116.63957	Icicle Flat	Tif	52.17	1.392	15.14	11.37	0.212	5.84	9.75	2.98	0.81	0.343	37	104	44	348	447	11	343	101	32	8.5	16	85	104	7	13	24	4
01JK586	46.44587	-116.62633	Grande Ronde R_2	Tgr_2	55.06	2.585	14.03	11.71	0.189	3.51	7.46	3.04	1.94	0.481	14	28	30	398	734	45	328	198	42	15.5	22	18	132	11	26	24	4
01JK587	46.44567	-116.62766	Icicle Flat	Tif	51.70	1.467	15.44	11.75	0.203	5.57	9.89	3.02	0.62	0.330	37	104	48	369	434	9	349	105	34	9.0	18	95	108	9	19	32	1
04JK402	46.39563	-116.73406	Priest Rapids	Tpr	49.59	3.224	13.60	14.06	0.236	5.59	9.15	2.58	1.18	0.783	42	93	38	363	528	28	287	184	44	15.1	22	36	140	5	26	65	4
04JK405	46.38244	-116.67562	Priest Rapids	Tpr	49.04	3.239	13.88	14.16	0.241	5.65	9.35	2.61	1.05	0.780	48	100	37	369	541	24	294	184	45	15.2	23	29	138	5	26	63	3
04JK406	46.4011	-116.67268	Asotin-Wilbur Ck. mix	Taw	51.93	1.582	17.16	8.74	0.155	5.51	11.72	2.48	0.51	0.217	114	296	34	268	343	11	278	132	38	10.0	18	97	116	7	21	34	3
04JK407	46.43835	-116.7402	Priest Rapids	Tpr	49.42	3.192	13.77	14.02	0.239	5.55	9.24	2.63	1.16	0.770	43	96	37	360	501	26	291	186	45	15.4	22	32	144	5	23	62	4
04JK439	46.46519	-116.73718	Priest Rapids	Tpr	50.34	3.708	14.08	13.42	0.233	3.33	10.08	2.74	1.11	0.961	20	97	41	414	789	25	324	219	53	18.1	20	41	156	7	31	76	5
04JK440	46.43622	-116.66563	Icicle Flat	Tif	52.32	1.425	16.32	9.85	0.174	5.14	10.78	2.95	0.74	0.305	40	116	43	369	432	13	370	106	34	6.4	18	121	117	5	11	32	2
04JK441	46.43851	-116.67003	Wilbur Creek	Taw	54.34	1.920	14.74	11.09	0.168	4.19	8.63	2.64	1.77	0.516	35	33	27	276	933	39	297	250	45	16.8	21	22	125	11	43	87	6
04JK442	46.43938	-116.65769	Asotin-Wilbur Ck. mix	Taw	52.92	1.789	15.00	10.48	0.171	5.11	9.94	2.55	1.61	0.437	64	91	29	268	756	33	285	218	40	15.1	19	38	118	13	40	78	5
04JK443	46.43889	-116.65716	Asotin	Taw	49.90	1.413	16.29	9.67	0.159	8.37	11.30	2.20	0.52	0.172	135	303	32	250	231	10	246	108	25	8.6	20	93	84	5	13	28	2
04JK444	46.43852	-116.65622	Priest Rapids	Tpr	49.69	3.166	13.71	13.89	0.231	5.56	9.31	2.58	1.07	0.788	48	98	37	361	519	25	296	190	45	15.9	20	37	144	6	24	55	4
04JK445	46.43855	-116.65459	Grande Ronde N_1	Tgn_1	54.84	2.149	14.11	11.27	0.202	4.25	8.10	3.13	1.59	0.365	8	7	34	380	579	36	333	165	37	10.2	21	16	129	7	15	42	2
04JK446	46.43763	-116.65675	Grande Ronde R_2	Tgr_2	55.05	2.501	13.88	12.27	0.195	3.36	7.27	3.08	1.92	0.458	11	3	31	396	735	49	323	202	41	13.3	24	21	136	11	31	55	6
04JK449	46.45828	-116.66137	Icicle Flat	Tif	51.69	1.431	15.30	11.56	0.212	5.85	9.71	3.08	0.82	0.332	35	85	41	374	408	12	344	106	33	6.8	19	116	113	5	14	30	1
04JK458	46.471	-116.63505	Icicle Flat	Tif	51.21	1.338	15.31	11.55	0.217	6.52	9.93	2.84	0.77	0.310	42	112	40	352	470	13	341	100	31	6.1	19	96	106	5	13	26	2
04JK459	46.47199	-116.6351	Priest Rapids	Tpr	49.71	3.194	13.61	14.04	0.229	5.22	9.40	2.60	1.18	0.816	43	93	37	354	580	26	297	194	47	15.9	22	37	145	5	19	58	3
04JK463	46.46937	-116.68563	Icicle Flat	Tif	51.48	1.373	15.24	11.69	0.211	6.15	9.78	2.92	0.84	0.314	36	103	42	359	461	14	343	103	32	6.6	20	100	108	3	11	34	2
04JK464	46.46935	-116.68473	Grande Ronde R_2	Tgr_2	54.93	2.502	13.88	12.72	0.188	3.21	7.22	3.00	1.89	0.455	12	3	30	391	739	50	330	204	40	13.9	23	24	135	11	23	62	5
04JK465	46.46941	-116.68332	Grande Ronde N_1	Tgn_1	54.63	1.689	14.70	10.37	0.185	4.97	8.81	2.99	1.39	0.267	10	15	36	318	623	30	338	149	33	9.3	20	29	110	5	19	42	4
04JK466	46.46951	-116.68298	Grande Ronde N_1	Tgn_1	54.16	1.857	14.53	12.04	0.196	4.40	8.45	2.97	1.08	0.309	7	11	35	357	526	26	333	162	37	10.2	22	36	120	9	20	51	3
04JK467	46.46958	-116.68177	Grande Ronde N_1	Tgn_1	54.87	1.887	14.23	11.62	0.195	4.42	8.09	2.96	1.39	0.338	9	11	34	363	571	33	335	164	36	10.3	19	39	119	7	20	45	3
04JK469	46.42926	-116.66895	Priest Rapids	Tpr	49.74	3.189	13.73	13.71	0.224	5.57	9.27	2.59	1.20	0.780	43	95	37	361	599	30	297	186	45	15.0	21	37	141	8	28	59	4
04JK471	46.48942	-116.72076	Icicle Flat	Tif	51.34	1.381	15.41	11.42	0.207	6.14	10.05	2.97	0.78	0.301	39	110	41	359	391	12	345	103	31	6.6	19	118	107	6	13	35	2
**VC78-018	46.4336	-116.71432	basalt of Lapwai	Taw	52.63	1.62	15.43	10.51	0.18	6.27	9.48	2.10	1.24	0.34																	
**VC78-081	46.48536	-116.64795	basalt of Lapwai	Taw	52.59	1.69	15.65	10.77	0.17	5.69	9.56	1.99	1.33	0.36																	
**VC78-271	46.44621	-116.64408	Grande Ronde R_2	Tgr_2	54.74	2.51	14.86	12.02	0.20	3.33	7.32	2.54	1.88	0.40																	
**VC78-272	46.44728	-116.63083	Priest Rapids	Tpr	50.65	3.21	14.68	13.07	0.23	4.45	9.57	2.36	0.85	0.74																	
**VC78-279	46.47558	-116.67705	Priest Rapids	Tpr	50.05	3.00	14.41	13.64	0.23	5.52	9.11	2.17	1.03	0.64																	
**VC78-362	46.39445	-116.66078	Asotin	Taw	50.78	1.35	17.00	9.54	0.16	7.17	11.27	1.96	0.39	0.18																	
**VC78-393	46.38468	-116.64077	Wilbur Creek	Taw	53.45	1.82	15.25	11.64	0.18	4.47	8.46	2.28	1.81	0.45																	

* Major elements are normalized on a volatile-free basis, with total Fe expressed as FeO.
** Samples collected by V. Camp in 1978. Analytical results used with permission (Camp, written commun., 2002).
All analyses performed at Washington State University GeoAnalytical Laboratory, Pullman, Washington.

ACKNOWLEDGMENTS

I thank the landowners for access to their property. Dean L. Garwood provided helpful discussions regarding structure and basalt stratigraphy. V.E. Camp kindly provided copies of his field maps and notebooks of the area, and gave permission to publish his sample analyses.



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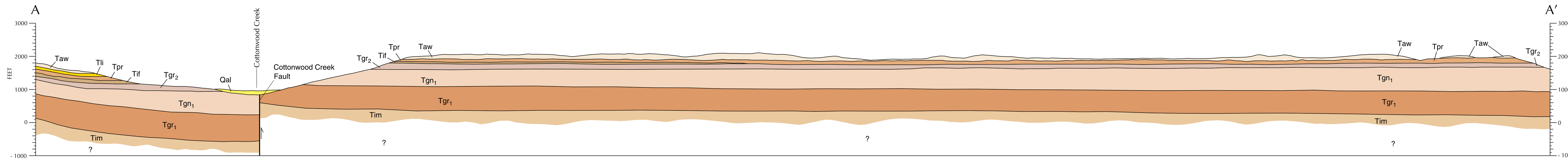

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