

Northwest Research Obsidian Studies Laboratory

Table A-1. Results of XRF Studies: Glass Buttes Source Complex, Lake County, Oregon

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Glass Buttes	15	GLB-O26	48 ± 6	15 2	90 3	24 7	51 3	99 7	12 1	352 96	350 47	1155 14	0.78 0.11	23.6	72.8	Glass Buttes 1
Glass Buttes	9	GLB-O20	40 ± 6	14 2	85 3	25 7	52 3	98 7	12 1	331 96	357 47	1073 13	0.78 0.11	22.9	76.6	Glass Buttes 1
Glass Buttes	1	GLB-O12	48 ± 6	16 3	87 3	26 7	50 3	97 7	13 1	381 96	346 47	1104 13	0.82 0.11	25.0	70.4	Glass Buttes 1
Glass Buttes	2	GLB-O13	36 ± 6	16 2	86 3	27 7	53 3	99 7	10 1	371 96	323 47	1125 13	0.81 0.11	26.6	71.4	Glass Buttes 1
Glass Buttes	4	GLB-O15	54 ± 6	19 2	84 3	28 7	61 3	95 7	13 1	376 96	449 48	1046 13	0.82 0.11	18.5	71.1	Glass Buttes 1
Glass Buttes	7	GLB-O18	40 ± 6	18 2	88 3	28 7	50 3	95 7	13 1	338 96	324 47	1138 13	0.82 0.11	26.8	78.6	Glass Buttes 1
Glass Buttes	5	GLB-O16	44 ± 6	18 2	83 3	29 7	60 3	94 7	14 2	338 96	398 47	944 13	0.70 0.11	18.5	68.7	Glass Buttes 1
Glass Buttes	13	GLB-O24	38 ± 6	17 2	85 3	29 7	53 3	99 7	13 1	339 96	304 47	1045 13	0.74 0.11	26.5	72.0	Glass Buttes 1
Glass Buttes	10	GLB-O21	42 ± 6	15 2	79 3	30 7	57 3	94 7	14 1	315 96	430 47	971 13	0.73 0.11	17.5	75.7	Glass Buttes 1
Glass Buttes 304	116-4	GLB-304A	32 ± 6	13 3	85 3	23 5	45 2	99 6	14 2	330 105	306 29	1038 16	0.73 0.11	21.4	72.0	Glass Buttes 1
Glass Buttes 304	116-1	GLB-304A	34 ± 9	9 5	81 3	26 5	46 2	97 6	12 2	267 104	248 29	1064 17	0.58 0.11	21.5	71.5	Glass Buttes 1
Glass Buttes 304	116-3	GLB-304A	40 ± 6	14 3	88 3	28 5	48 2	100 6	16 2	253 105	267 29	1006 16	0.69 0.11	23.4	88.8	Glass Buttes 1
Glass Buttes 304	116-2	GLB-304B	42 ± 7	16 4	86 3	29 5	50 2	98 6	12 2	314 105	340 29	1079 16	0.72 0.11	18.9	74.6	Glass Buttes 1
Glass Buttes 306	117-1	GLB-306A	40 ± 6	16 3	83 3	24 5	51 2	98 6	14 2	268 104	274 29	1035 16	0.68 0.11	22.6	82.8	Glass Buttes 1
Glass Buttes 306	117-2	GLB-306B	36 ± 6	17 3	87 3	24 5	47 2	100 6	11 2	300 105	295 29	1013 16	0.70 0.11	21.5	76.4	Glass Buttes 1
Glass Buttes 306	117-3	GLB-306C	35 ± 6	18 3	86 3	25 5	45 2	96 6	13 2	289 104	254 29	1032 17	0.66 0.11	23.6	74.5	Glass Buttes 1

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Glass Buttes 306	117-4	GLB-306D	30 ± 7	17 3	86 3	26 5	50 2	101 6	12 2	295 105	258 29	974 16	0.65 0.11	23.1	72.8	Glass Buttes 1
Glass Buttes 337	118-1	GLB-337A	46 ± 6	21 3	85 3	25 5	50 2	97 6	10 2	347 105	327 29	1122 17	0.78 0.11	21.2	73.0	Glass Buttes 1
Glass Buttes 337	118-2	GLB-337B	37 ± 6	18 3	85 3	25 5	49 2	97 6	13 2	388 105	307 29	1080 16	0.79 0.11	22.9	66.3	Glass Buttes 1
Glass Buttes 337	118-3	GLB-337C	41 ± 6	17 3	90 3	26 5	49 2	99 6	13 2	279 104	252 29	1054 17	0.59 0.11	21.6	70.0	Glass Buttes 1
Glass Buttes 337	118-4	GLB-337D	35 ± 6	17 3	81 3	27 5	48 2	97 6	15 2	293 104	269 29	1011 17	0.66 0.11	22.2	73.4	Glass Buttes 1
Glass Buttes DD	20	GLB-DD5	27 ± 8	19 4	87 3	25 9	50 3	99 8	15 2	301 96	261 47	1097 13	0.64 0.11	27.7	70.5	Glass Buttes 1
Glass Buttes FF	27	GLB-FF2	32 ± 7	15 4	88 3	24 9	54 3	97 8	12 2	335 96	301 47	1091 13	0.70 0.11	25.6	69.4	Glass Buttes 1
Glass Buttes FF	26	GLB-FF1	44 ± 7	17 4	89 3	25 9	53 3	102 8	12 1	351 96	313 47	1111 13	0.78 0.11	26.6	72.5	Glass Buttes 1
Glass Buttes FF	29	GLB-FF4	39 ± 7	15 4	85 3	25 9	54 3	101 8	10 2	359 96	314 47	1059 13	0.75 0.11	25.6	68.5	Glass Buttes 1
Glass Buttes FF	30	GLB-FF5	41 ± 7	19 4	88 3	26 9	53 3	96 8	13 1	392 96	332 47	1104 13	0.84 0.11	26.7	70.0	Glass Buttes 1
Glass Buttes FF	28	GLB-FF3	49 ± 7	13 4	85 3	27 9	53 3	100 8	11 1	380 96	343 47	1106 13	0.81 0.11	24.8	69.6	Glass Buttes 1
Glass Buttes GG	34	GLB-GG4	42 ± 7	15 4	78 3	24 9	51 3	95 8	8 2	339 96	296 47	1097 13	0.78 0.11	28.5	75.4	Glass Buttes 1
Glass Buttes GG	33	GLB-GG3	37 ± 7	13 4	89 3	25 9	49 3	96 8	10 2	379 96	309 47	1123 13	0.72 0.11	25.2	62.9	Glass Buttes 1
Glass Buttes GG	32	GLB-GG2	43 ± 7	17 4	86 3	27 9	53 3	98 8	15 1	346 96	298 47	1236 14	0.73 0.11	26.8	69.7	Glass Buttes 1
Glass Buttes GG	31	GLB-GG1	52 ± 7	18 4	94 3	28 9	56 3	101 8	14 1	376 96	348 47	1129 13	0.80 0.11	24.4	70.1	Glass Buttes 1
Glass Buttes GG	35	GLB-GG5	45 ± 7	17 4	90 3	28 9	51 3	98 8	13 1	377 96	316 47	1164 13	0.80 0.11	27.1	69.7	Glass Buttes 1

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	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Glass Buttes I	1	NA	28 ± 6	18 3	86 3	20 6	52 2	92 5	13 2	338 80	326 30	971 15	0.72 0.10	23.7	77.5	Glass Buttes 1
Glass Buttes II	1	NA	27 ± 6	15 3	86 3	24 6	52 2	99 5	8 2	281 80	256 29	980 16	0.54 0.10	24.0	75.8	Glass Buttes 1
Glass Buttes II	3	NA	40 ± 5	16 3	82 3	25 6	50 2	101 5	10 2	361 80	292 30	1052 15	0.66 0.10	24.8	67.0	Glass Buttes 1
Glass Buttes II	2	NA	30 ± 5	16 2	86 3	26 6	50 2	97 5	10 1	444 80	345 30	1077 15	0.78 0.10	24.0	61.1	Glass Buttes 1
Glass Buttes II	5	NA	41 ± 6	16 3	90 3	26 6	49 2	103 5	9 2	304 80	253 30	1012 16	0.60 0.10	26.2	74.6	Glass Buttes 1
Glass Buttes II	4	NA	31 ± 6	14 3	86 3	29 6	50 2	102 5	8 2	341 80	295 30	1067 16	0.69 0.10	25.3	73.9	Glass Buttes 1
Glass Buttes III	3	NA	34 ± 5	16 3	84 3	25 6	50 2	96 5	11 2	372 80	296 30	1059 15	0.68 0.10	24.9	66.0	Glass Buttes 1
Glass Buttes III	4	NA	39 ± 5	13 3	89 3	25 6	52 2	99 5	14 1	412 80	329 30	1074 15	0.78 0.10	25.0	66.0	Glass Buttes 1
Glass Buttes III	5	NA	38 ± 5	14 2	89 3	27 6	53 2	101 5	15 1	383 81	365 30	1080 15	0.83 0.10	24.0	76.4	Glass Buttes 1
Glass Buttes N	61	GLB-N1	43 ± 7	18 4	87 3	24 9	53 3	103 8	13 1	317 96	316 47	1097 13	0.77 0.11	26.2	79.6	Glass Buttes 1
Glass Buttes O	66	GLB-01	37 ± 7	12 4	87 3	25 9	55 3	98 8	12 1	394 96	317 47	1125 13	0.83 0.11	27.9	69.1	Glass Buttes 1
Glass Buttes O	68	GLB-03	31 ± 7	17 4	89 3	25 9	52 3	96 8	12 1	363 96	326 47	1137 13	0.79 0.11	25.9	71.7	Glass Buttes 1
Glass Buttes O	70	GLB-05	34 ± 7	15 4	89 3	25 9	55 3	97 8	12 1	363 96	340 47	1143 13	0.83 0.11	25.6	74.2	Glass Buttes 1
Glass Buttes O	67	GLB-07	44 ± 6	19 2	87 3	25 7	56 3	100 7	13 1	317 96	291 47	1047 13	0.73 0.11	27.6	76.0	Glass Buttes 1
Glass Buttes O	68	GLB-08	37 ± 7	16 3	87 3	26 7	52 3	99 7	15 2	228 95	234 47	1140 14	0.53 0.11	27.0	77.6	Glass Buttes 1
Glass Buttes O	70	GLB-10	45 ± 6	19 2	89 3	26 7	52 3	99 7	11 1	318 96	327 47	1125 14	0.75 0.11	24.4	76.7	Glass Buttes 1

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	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Glass Buttes O	67	GLB-02	43 ± 7	13 4	75 3	29 9	63 3	97 8	14 1	365 96	429 47	987 13	0.71 0.11	17.3	64.9	Glass Buttes 1
Glass Buttes O	70	GLB-11	52 ± 6	19 2	87 3	31 7	61 3	95 7	14 1	392 96	429 47	1030 13	0.71 0.11	17.2	60.3	Glass Buttes 1
Glass Buttes Q	79	GLB-Q4	51 ± 7	15 4	87 3	23 9	53 3	98 8	11 1	339 96	343 47	1090 13	0.78 0.11	24.1	75.1	Glass Buttes 1
Glass Buttes Q	78	GLB-Q3	41 ± 7	20 4	88 3	24 9	50 3	97 8	11 2	292 96	321 47	1070 13	0.79 0.11	26.3	87.7	Glass Buttes 1
Glass Buttes Q	77	GLB-Q2	46 ± 7	14 4	87 3	25 9	50 3	102 8	11 1	314 96	329 47	1077 13	0.81 0.11	26.0	83.3	Glass Buttes 1
Glass Buttes Q	80	GLB-Q5	36 ± 7	12 4	89 3	25 9	53 3	100 8	14 1	357 96	336 47	1161 13	0.79 0.11	24.9	72.3	Glass Buttes 1
Glass Buttes Q	76	GLB-Q1	44 ± 7	16 4	88 3	26 9	52 3	99 8	12 1	380 96	349 47	1108 13	0.81 0.11	24.5	70.2	Glass Buttes 1
Glass Buttes QQ	5	GLB-QQ5	40 ± 6	13 3	86 3	23 7	55 3	99 7	13 2	340 96	304 47	1078 13	0.69 0.11	24.7	66.9	Glass Buttes 1
Glass Buttes QQ	4	GLB-QQ4	34 ± 7	14 3	88 3	25 7	51 3	99 7	10 2	326 96	309 47	1143 13	0.73 0.11	25.6	73.5	Glass Buttes 1
Glass Buttes QQ	2	GLB-QQ2	37 ± 7	15 3	88 3	26 7	51 3	91 7	13 1	324 96	320 47	1120 13	0.74 0.11	24.8	74.7	Glass Buttes 1
Glass Buttes QQ	3	GLB-QQ3	46 ± 6	15 2	86 3	26 7	50 3	92 7	10 2	363 96	319 47	1109 13	0.74 0.11	24.9	67.0	Glass Buttes 1
Glass Buttes QQ	1	GLB-QQ1	32 ± 7	12 3	89 3	28 7	51 3	96 7	14 2	192 95	210 47	1155 14	0.44 0.11	26.3	77.5	Glass Buttes 1
Glass Buttes R	81	GLB-R1	32 ± 7	13 4	84 3	25 9	54 3	101 8	13 2	324 96	303 47	1088 13	0.76 0.11	27.0	76.4	Glass Buttes 1
Glass Buttes R	84	GLB-R4	37 ± 7	14 4	89 3	27 9	56 3	98 8	14 1	407 96	335 47	1138 13	0.82 0.11	25.9	66.1	Glass Buttes 1
Glass Buttes R	82	GLB-R2	38 ± 7	12 4	87 3	28 9	52 3	99 8	8 2	344 96	315 47	1080 13	0.80 0.11	27.3	76.3	Glass Buttes 1
Glass Buttes RR	6	GLB-RR1	36 ± 6	18 2	86 3	26 7	52 3	97 7	13 1	393 96	320 47	1142 13	0.77 0.11	25.9	64.9	Glass Buttes 1

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	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Glass Buttes RR	10	GLB-RR5	44 ± 6	14 2	87 3	27 7	53 3	101 7	13 1	400 96	334 47	1135 13	0.82 0.11	26.1	67.6	Glass Buttes 1
Glass Buttes S	88	GLB-S3	37 ± 7	16 4	84 3	25 9	53 3	103 8	10 2	358 96	327 47	1081 13	0.77 0.11	25.2	70.8	Glass Buttes 1
Glass Buttes S	86	GLB-S1	38 ± 7	15 4	84 3	27 9	51 3	99 8	11 1	363 96	339 47	1071 13	0.77 0.11	24.0	69.3	Glass Buttes 1
Glass Buttes T	91	GLB-T1	45 ± 7	14 4	87 3	25 9	52 3	98 8	9 2	375 96	331 47	1132 13	0.84 0.11	26.9	73.3	Glass Buttes 1
Glass Buttes T	92	GLB-T2	39 ± 7	16 4	84 3	25 9	53 3	99 8	12 1	304 96	343 47	1116 13	0.80 0.11	24.6	85.3	Glass Buttes 1
Glass Buttes T	95	GLB-T5	34 ± 7	15 4	90 3	26 9	52 3	100 8	13 1	412 96	317 47	1132 13	0.81 0.11	27.1	64.3	Glass Buttes 1
Glass Buttes T	94	GLB-T4	44 ± 7	20 4	89 3	27 9	52 3	99 8	10 2	330 96	315 47	1075 13	0.74 0.11	25.3	73.5	Glass Buttes 1
Glass Buttes T	93	GLB-T3	45 ± 7	17 4	90 3	29 9	53 3	100 8	13 2	288 96	309 47	1081 13	0.73 0.11	25.6	82.8	Glass Buttes 1
Glass Buttes U	100	GLB-U5	37 ± 7	14 4	85 3	23 9	53 3	96 8	14 1	437 96	343 47	1150 13	0.84 0.11	25.8	63.4	Glass Buttes 1
Glass Buttes U	97	GLB-U2	41 ± 7	17 4	87 3	25 9	51 3	100 8	10 2	348 96	299 47	1065 13	0.77 0.11	28.0	72.6	Glass Buttes 1
Glass Buttes U	99	GLB-U4	49 ± 7	16 4	85 3	25 9	52 3	99 8	13 1	374 96	325 47	1128 13	0.78 0.11	25.6	68.6	Glass Buttes 1
Glass Buttes U	98	GLB-U3	42 ± 7	12 4	87 3	26 9	52 3	97 8	11 1	361 96	341 47	1133 13	0.81 0.11	25.2	73.7	Glass Buttes 1
Glass Buttes U	96	GLB-U1	42 ± 7	17 4	88 3	27 9	53 3	102 8	11 1	341 96	304 47	1123 13	0.79 0.11	27.8	75.3	Glass Buttes 1
Glass Buttes V	103	GLB-V3	28 ± 7	17 4	88 3	23 9	49 3	97 8	13 1	366 96	329 47	1122 13	0.81 0.11	26.1	72.4	Glass Buttes 1
Glass Buttes V	101	GLB-V1	36 ± 7	13 4	85 3	25 9	50 3	100 8	13 1	360 96	314 47	1104 13	0.77 0.11	26.5	70.5	Glass Buttes 1
Glass Buttes V	102	GLB-V2	45 ± 7	14 4	86 3	25 9	53 3	96 8	14 1	389 96	345 47	1132 13	0.85 0.11	25.9	71.6	Glass Buttes 1

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Glass Buttes V	104	GLB-V4	46 ± 7	15 4	91 3	26 9	53 3	101 8	10 1	391 96	328 47	1152 13	0.85 0.11	27.4	71.1	Glass Buttes 1
Glass Buttes V	105	GLB-V5	43 ± 7	12 4	82 3	27 9	54 3	96 8	13 1	352 96	331 47	1092 13	0.80 0.11	25.8	74.4	Glass Buttes 1
Glass Buttes W	107	GLB-W2	36 ± 7	15 4	88 3	24 9	53 3	99 8	14 1	423 96	341 47	1139 13	0.87 0.11	26.8	67.3	Glass Buttes 1
Glass Buttes W	110	GLB-W5	43 ± 7	15 4	86 3	24 9	49 3	95 8	11 1	325 96	329 47	1108 13	0.81 0.11	26.1	81.1	Glass Buttes 1
Glass Buttes W	108	GLB-W3	43 ± 7	18 4	90 3	25 9	51 3	108 8	12 1	369 96	339 47	1096 13	0.82 0.11	25.5	72.5	Glass Buttes 1
Glass Buttes W	106	GLB-W1	40 ± 7	14 4	87 3	26 9	54 3	98 8	10 2	349 96	322 47	1083 13	0.78 0.11	26.0	73.5	Glass Buttes 1
Glass Buttes W	109	GLB-W4	37 ± 7	14 4	90 3	26 9	52 3	96 8	11 2	319 96	330 47	1102 13	0.79 0.11	25.4	80.3	Glass Buttes 1
Glass Buttes X	112	GLB-X2	43 ± 7	15 4	86 3	25 9	52 3	96 8	13 1	389 96	363 47	1114 13	0.82 0.11	23.6	69.3	Glass Buttes 1
Glass Buttes X	115	GLB-X5	51 ± 7	15 4	88 3	25 9	50 3	99 8	11 1	346 96	363 47	1154 13	0.83 0.11	23.9	78.2	Glass Buttes 1
Glass Buttes X	111	GLB-X1	42 ± 7	16 4	89 3	26 9	52 3	98 8	13 1	336 96	321 47	1072 13	0.80 0.11	26.5	77.3	Glass Buttes 1
Glass Buttes X	113	GLB-X3	41 ± 7	16 4	87 3	26 9	50 3	98 8	12 1	440 96	343 47	1103 13	0.83 0.11	25.4	61.9	Glass Buttes 1
Glass Buttes X	114	GLB-X4	43 ± 7	15 4	87 3	27 9	52 3	97 8	12 1	340 96	333 47	1098 13	0.82 0.11	26.1	78.4	Glass Buttes 1
Glass Buttes Y	120	GLB-Y5	34 ± 7	17 4	84 3	24 9	53 3	99 8	10 1	349 96	344 47	1109 13	0.85 0.11	25.8	78.8	Glass Buttes 1
Glass Buttes Y	116	GLB-Y1	32 ± 7	16 4	84 3	26 9	50 3	95 8	12 1	346 96	329 47	1107 13	0.84 0.11	26.9	78.8	Glass Buttes 1
Glass Buttes Y	117	GLB-Y2	30 ± 7	15 4	86 3	27 9	52 3	97 8	14 2	295 96	292 47	1022 13	0.68 0.11	25.7	76.2	Glass Buttes 1
Glass Buttes Y	119	GLB-Y4	38 ± 7	19 4	89 3	27 9	52 3	99 8	13 1	347 96	330 47	1105 13	0.82 0.11	26.4	77.2	Glass Buttes 1

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Glass Buttes Y	118	GLB-Y3	37 ± 7	13 4	86 3	29 9	52 3	99 8	12 1	354 96	337 47	1135 13	0.81 0.11	25.3	74.5	Glass Buttes 1
Glass Buttes Z	122	GLB-Z2	48 ± 7	19 4	90 3	25 9	53 3	102 8	11 1	408 96	327 47	1137 13	0.84 0.11	27.2	67.5	Glass Buttes 1
Glass Buttes Z	121	GLB-Z1	46 ± 7	17 4	90 3	26 9	55 3	103 8	11 2	412 96	332 47	1213 13	0.79 0.11	25.4	63.5	Glass Buttes 1
Glass Buttes Z	124	GLB-Z4	43 ± 7	16 4	88 3	26 9	51 3	96 8	15 1	403 96	341 47	1132 13	0.82 0.11	25.4	67.0	Glass Buttes 1
Glass Buttes Z	125	GLB-Z5	38 ± 7	13 4	86 3	26 9	52 3	99 8	11 1	385 96	335 47	1144 13	0.85 0.11	26.8	72.4	Glass Buttes 1
Glass Buttes Z	123	GLB-Z3	52 ± 7	15 4	89 3	27 9	55 3	102 8	13 1	385 96	351 47	1164 13	0.82 0.11	24.4	69.7	Glass Buttes 1
Juniper Spring B	10	JUNIP-B10	41 ± 7	14 4	97 3	24 9	57 3	101 8	15 2	314 96	319 47	1170 14	0.76 0.11	25.4	78.7	Glass Buttes 1
Juniper Spring B	25	JUNIP-B25	43 ± 7	17 4	85 3	24 9	54 3	95 8	15 2	317 96	275 47	1160 14	0.67 0.11	27.1	69.8	Glass Buttes 1
Juniper Spring B	23	JUNIP-B23	40 ± 7	13 4	92 3	25 9	56 3	105 8	14 2	272 96	269 47	1217 14	0.64 0.11	26.8	77.6	Glass Buttes 1
Juniper Spring B	26	JUNIP-B26	41 ± 7	20 4	83 3	25 9	54 3	99 8	12 2	344 96	298 47	1105 14	0.71 0.11	25.9	68.0	Glass Buttes 1
Juniper Spring B	27	JUNIP-B27	35 ± 7	15 4	88 3	25 9	52 3	94 8	15 1	310 96	306 47	1162 14	0.75 0.11	26.6	79.3	Glass Buttes 1
Juniper Spring B	15	JUNIP-B15	44 ± 7	16 4	92 3	29 9	54 3	102 8	13 2	273 96	285 47	1172 14	0.68 0.11	26.3	81.3	Glass Buttes 1
Juniper Spring Hill	15	JUNIP-A15	45 ± 7	15 4	90 3	28 9	58 3	103 8	13 2	329 96	239 47	1284 15	0.56 0.11	27.8	58.3	Glass Buttes 1
Juniper Springs	8	JUNIP-C8	39 ± 6	15 2	85 3	26 7	49 3	97 7	13 1	417 96	306 47	1115 13	0.79 0.11	27.9	62.8	Glass Buttes 1
Juniper Springs	2	JUNIP-C2	42 ± 6	13 3	88 3	28 7	51 3	97 7	9 2	280 96	280 47	1233 14	0.69 0.11	27.4	80.9	Glass Buttes 1
Glass Buttes	6	GLB-O17	33 ± 6	14 2	72 3	46 7	48 3	115 7	12 1	608 97	351 47	1295 13	0.94 0.11	27.6	50.7	Glass Buttes 2

All trace element values reported in parts per million; ± = analytical uncertainty estimate (in ppm). Iron content reported as weight percent oxide. NA = Not available; ND = Not detected; NM = Not measured.; * = Small sample.

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Table A-1. Results of XRF Studies: Glass Buttes Source Complex, Lake County, Oregon

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Glass Buttes	8	GLB-O19	40 ± 6	16 2	72 3	47 7	47 3	113 7	7 2	615 97	378 47	1252 13	0.99 0.11	26.8	52.9	Glass Buttes 2
Glass Buttes	11	GLB-O22	48 ± 6	15 2	77 3	49 7	46 3	117 7	12 1	674 97	351 47	1220 13	0.97 0.11	28.6	47.6	Glass Buttes 2
Glass Buttes	3	GLB-O14	40 ± 6	12 2	71 3	51 7	49 3	123 7	12 1	542 97	346 47	1302 13	0.94 0.11	28.1	56.7	Glass Buttes 2
Glass Buttes	14	GLB-O25	33 ± 6	14 2	73 3	53 7	46 3	121 7	14 1	563 96	318 47	1216 13	0.91 0.11	30.0	53.0	Glass Buttes 2
Glass Buttes	12	GLB-O23	44 ± 6	13 2	74 3	55 7	47 3	123 7	10 1	634 97	332 47	1235 13	1.00 0.11	31.1	51.5	Glass Buttes 2
Glass Buttes III	1	NA	40 ± 5	14 2	77 3	49 6	46 2	120 5	13 1	620 81	327 30	1272 16	0.89 0.10	28.5	47.5	Glass Buttes 2
Glass Buttes III	2	NA	43 ± 5	13 3	78 3	50 6	45 2	119 5	10 1	552 81	334 30	1209 15	0.86 0.10	27.1	52.3	Glass Buttes 2
Glass Buttes M	56	GLB-M1	37 ± 7	9 4	73 3	50 9	50 3	120 8	12 2	532 96	304 47	1196 13	0.83 0.11	29.1	51.5	Glass Buttes 2
Glass Buttes M	57	GLB-M2	39 ± 7	16 4	73 3	51 9	51 3	125 8	12 1	647 97	345 47	1299 13	1.00 0.11	29.9	50.6	Glass Buttes 2
Glass Buttes M	58	GLB-M3	31 ± 7	13 4	69 3	51 9	49 3	120 8	13 1	597 97	329 47	1249 13	0.96 0.11	30.3	52.7	Glass Buttes 2
Glass Buttes M	60	GLB-M5	43 ± 7	13 4	71 3	54 9	46 3	119 8	12 1	606 97	340 47	1339 13	0.98 0.11	29.9	53.0	Glass Buttes 2
Glass Buttes M	59	GLB-M4	38 ± 7	11 4	78 3	55 9	49 3	131 8	14 1	609 96	322 47	1253 13	0.90 0.11	29.5	49.1	Glass Buttes 2
Glass Buttes N	62	GLB-N2	43 ± 7	18 4	74 3	52 9	46 3	124 8	11 1	628 97	347 47	1322 13	1.00 0.11	29.8	52.4	Glass Buttes 2
Glass Buttes N	64	GLB-N4	45 ± 7	14 4	72 3	54 9	49 3	120 8	14 2	517 96	324 47	1192 13	0.84 0.11	27.5	53.9	Glass Buttes 2
Glass Buttes N	63	GLB-N3	41 ± 7	12 4	68 3	60 9	44 3	141 8	10 2	709 97	292 47	1167 13	1.00 0.11	36.3	46.3	Glass Buttes 2
Glass Buttes N	65	GLB-N5	45 ± 7	11 4	72 3	62 9	46 3	134 8	12 1	707 97	301 47	1236 13	1.01 0.11	35.2	46.9	Glass Buttes 2

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Table A-1. Results of XRF Studies: Glass Buttes Source Complex, Lake County, Oregon

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Glass Buttes O	66	GLB-06	39 ± 6	13 3	76 3	45 7	47 3	116 7	13 1	594 97	335 47	1267 13	0.94 0.11	29.2	51.9	Glass Buttes 2
Glass Buttes O	69	GLB-09	48 ± 6	18 2	79 3	53 7	48 3	119 7	11 2	484 96	304 47	1174 13	0.80 0.11	28.2	54.6	Glass Buttes 2
Glass Buttes O	69	GLB-04	47 ± 7	12 4	69 3	55 9	48 3	126 8	11 1	635 97	338 47	1259 13	1.01 0.11	30.8	51.9	Glass Buttes 2
Glass Buttes P	71	GLB-P1	41 ± 7	15 4	73 3	48 9	46 3	122 8	13 1	622 97	340 47	1241 13	0.92 0.11	28.3	48.9	Glass Buttes 2
Glass Buttes P	72	GLB-P2	41 ± 7	14 4	72 3	48 9	47 3	118 8	13 1	521 97	330 47	1319 13	0.95 0.11	30.0	59.5	Glass Buttes 2
Glass Buttes P	73	GLB-P3	46 ± 7	11 4	75 3	49 9	48 3	121 8	11 1	562 97	327 47	1289 13	0.94 0.11	29.9	54.7	Glass Buttes 2
Glass Buttes P	74	GLB-P4	49 ± 7	14 4	73 3	49 9	47 3	121 8	13 1	573 97	355 47	1251 13	0.94 0.11	27.5	54.1	Glass Buttes 2
Glass Buttes P	75	GLB-P5	41 ± 7	11 4	74 3	49 9	47 3	117 8	12 1	535 96	326 47	1234 13	0.91 0.11	29.2	55.7	Glass Buttes 2
Glass Buttes R	85	GLB-R5	37 ± 7	14 4	70 3	53 9	45 3	128 8	12 1	613 97	334 47	1302 13	1.01 0.11	31.4	54.0	Glass Buttes 2
Glass Buttes R	83	GLB-R3	38 ± 7	12 4	71 3	56 9	47 3	121 8	14 1	605 97	326 47	1256 13	0.99 0.11	31.6	53.6	Glass Buttes 2
Glass Buttes S	87	GLB-S2	42 ± 7	14 4	75 3	49 9	50 3	117 8	14 1	660 96	344 47	1228 13	0.98 0.11	29.4	48.7	Glass Buttes 2
Glass Buttes S	89	GLB-S4	39 ± 7	11 4	77 3	56 9	47 3	130 8	13 1	603 97	317 47	1256 13	0.94 0.11	31.0	51.1	Glass Buttes 2
Glass Buttes S	90	GLB-S5	40 ± 7	13 4	70 3	56 9	46 3	125 8	14 1	603 97	337 47	1234 13	1.02 0.11	31.4	55.4	Glass Buttes 2
Juniper Spring B	14	JUNIP-B14	43 ± 7	10 4	71 3	53 9	48 3	123 8	13 2	507 96	299 47	1250 14	0.90 0.11	31.9	58.1	Glass Buttes 2
Juniper Spring B	6	JUNIP-B6	37 ± 7	12 4	75 3	55 9	47 3	127 8	14 2	504 96	268 47	1409 14	0.75 0.11	31.1	50.0	Glass Buttes 2
Juniper Springs	1	JUNIP-C1	43 ± 6	11 3	69 3	53 7	47 3	124 7	10 1	572 96	315 47	1365 14	0.91 0.11	30.5	52.4	Glass Buttes 2

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Table A-1. Results of XRF Studies: Glass Buttes Source Complex, Lake County, Oregon

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Juniper Springs	3	JUNIP-C3	40 ± 6	12 3	74 3	61 7	47 3	127 7	13 2	584 96	286 47	1277 14	0.83 0.11	31.4	47.3	Glass Buttes 2
Glass Buttes	2	GLB-KK2	40 ± 6	15 3	103 3	70 7	26 3	105 7	8 2	569 96	326 47	1224 13	0.86 0.11	27.8	49.9	Glass Buttes 3
Glass Buttes	4	GLB-LL4	28 ± 6	20 2	102 3	70 7	29 3	105 7	9 1	622 97	352 47	1264 13	0.96 0.11	28.2	50.8	Glass Buttes 3
Glass Buttes	4	GLB-MM4	27 ± 6	17 2	103 3	71 7	28 3	105 7	7 2	579 97	332 47	1292 13	0.94 0.11	29.5	53.2	Glass Buttes 3
Glass Buttes	2	GLB-LL2	35 ± 6	19 2	102 3	73 7	28 3	107 7	8 1	598 97	359 47	1267 13	0.95 0.11	27.4	52.4	Glass Buttes 3
Glass Buttes	3	GLB-LL3	34 ± 6	15 2	100 3	73 7	25 3	107 7	6 2	564 96	318 47	1229 13	0.86 0.11	28.7	50.5	Glass Buttes 3
Glass Buttes	5	GLB-LL5	42 ± 6	17 2	101 3	73 7	26 3	109 7	6 2	601 96	343 47	1272 13	0.88 0.11	26.8	48.3	Glass Buttes 3
Glass Buttes	2	GLB-MM2	50 ± 6	17 2	98 3	73 7	26 3	110 7	9 2	571 96	317 47	1221 13	0.87 0.11	29.0	50.2	Glass Buttes 3
Glass Buttes	3	GLB-MM3	38 ± 6	19 2	102 3	73 7	27 3	111 7	7 2	652 97	343 47	1315 13	0.93 0.11	28.1	47.0	Glass Buttes 3
Glass Buttes	1	GLB-KK1	33 ± 6	20 2	106 3	74 7	27 3	113 7	7 2	689 96	330 47	1261 13	0.98 0.11	30.9	46.9	Glass Buttes 3
Glass Buttes	3	GLB-KK3	42 ± 6	17 2	103 3	74 7	25 3	112 7	7 2	649 97	367 47	1234 13	1.00 0.11	27.9	50.5	Glass Buttes 3
Glass Buttes	5	GLB-MM5	49 ± 6	19 2	102 3	74 7	28 3	109 7	12 1	661 97	383 47	1299 13	0.97 0.11	25.8	48.3	Glass Buttes 3
Glass Buttes	4	GLB-KK4	42 ± 6	18 2	101 3	75 7	27 3	114 7	8 1	748 97	386 47	1270 13	1.07 0.11	28.1	47.0	Glass Buttes 3
Glass Buttes	1	GLB-LL1	34 ± 6	17 2	100 3	75 7	26 3	111 7	8 1	628 97	333 47	1300 13	0.94 0.11	29.5	49.4	Glass Buttes 3
Glass Buttes	1	GLB-MM1	47 ± 6	23 2	100 3	75 7	28 3	109 7	7 2	663 97	404 47	1304 13	0.93 0.11	23.3	46.1	Glass Buttes 3
Glass Buttes A	120-6	GLB-A6	36 ± 6	15 3	103 3	64 5	30 2	113 6	7 2	522 105	271 29	1164 17	0.79 0.11	26.1	49.8	Glass Buttes 3

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Table A-1. Results of XRF Studies: Glass Buttes Source Complex, Lake County, Oregon

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Glass Buttes A	120-9	GLB-A9	29 ± 6	18 3	92 3	66 5	28 2	107 6	7 2	482 105	263 29	1174 17	0.79 0.11	27.1	54.0	Glass Buttes 3
Glass Buttes A	120-1	GLB-A1	32 ± 6	15 3	94 3	67 5	26 2	106 6	11 2	587 105	312 29	1194 17	0.89 0.11	25.0	49.2	Glass Buttes 3
Glass Buttes A	120-8	GLB-A8	34 ± 6	19 3	99 3	68 5	27 2	106 6	9 2	551 105	304 29	1209 17	0.90 0.11	26.0	52.9	Glass Buttes 3
Glass Buttes A	120-10	GLB-A10	30 ± 6	13 3	97 3	68 5	26 2	106 6	8 2	598 105	333 29	1253 17	0.94 0.11	24.8	51.1	Glass Buttes 3
Glass Buttes A	120-3	GLB-A3	31 ± 6	19 3	100 3	69 5	28 2	106 6	7 2	614 105	315 29	1204 16	0.95 0.11	26.5	50.4	Glass Buttes 3
Glass Buttes A	120-4	GLB-A4	37 ± 6	15 3	100 3	70 5	25 2	112 6	8 2	640 105	305 29	1306 17	0.93 0.11	26.7	47.1	Glass Buttes 3
Glass Buttes A	120-5	GLB-A5	31 ± 6	15 3	102 3	70 5	25 2	109 6	7 2	620 105	286 29	1205 17	0.81 0.11	25.3	43.2	Glass Buttes 3
Glass Buttes A	120-7	GLB-A7	35 ± 6	14 3	94 3	70 5	27 2	107 6	5 2	506 105	288 29	1195 17	0.84 0.11	25.8	54.0	Glass Buttes 3
Glass Buttes A	120-2	GLB-A2	36 ± 6	16 3	103 3	71 5	25 2	112 6	7 2	451 105	236 29	1195 17	0.69 0.11	26.7	50.8	Glass Buttes 3
Glass Buttes EE	24	GLB-EE4	33 ± 7	15 4	100 3	70 9	27 3	110 8	9 1	613 97	342 47	1295 13	0.95 0.11	28.7	50.8	Glass Buttes 3
Glass Buttes EE	22	GLB-EE2	26 ± 7	15 4	103 3	71 9	28 3	107 8	4 2	610 96	339 47	1280 13	0.93 0.11	28.7	50.5	Glass Buttes 3
Glass Buttes EE	25	GLB-EE5	41 ± 7	15 4	102 3	71 9	26 3	113 8	7 2	664 97	336 47	1373 13	0.97 0.11	30.1	48.3	Glass Buttes 3
Glass Buttes EE	21	GLB-EE1	32 ± 7	16 4	103 3	72 9	25 3	110 8	7 2	595 96	344 47	1272 13	0.88 0.11	26.8	49.0	Glass Buttes 3
Glass Buttes EE	23	GLB-EE3	42 ± 7	13 4	103 3	73 9	30 3	111 8	9 2	638 96	376 47	1285 13	0.92 0.11	25.1	47.6	Glass Buttes 3
Glass Buttes I	4	NA	36 ± 6	11 3	104 3	68 6	30 2	114 5	12 2	464 80	275 30	1159 16	0.70 0.10	27.6	52.8	Glass Buttes 3
Glass Buttes I	3	NA	24 ± 6	17 3	100 3	69 6	29 2	107 5	7 2	546 81	323 30	1150 15	0.80 0.10	26.4	49.9	Glass Buttes 3

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Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Glass Buttes I	5	NA	32 ± 5	16 3	101 3	71 6	24 2	108 5	5 2	588 81	334 30	1251 16	0.85 0.10	26.9	48.5	Glass Buttes 3
Glass Buttes I	2	NA	38 ± 5	21 3	104 3	72 6	24 2	107 5	10 1	536 81	326 30	1185 16	0.84 0.10	27.0	52.7	Glass Buttes 3
Glass Buttes RR	9	GLB-RR4	24 ± 7	16 3	104 3	70 7	28 3	109 7	7 2	540 96	306 47	1246 13	0.86 0.11	29.9	52.5	Glass Buttes 3
Glass Buttes RR	7	GLB-RR2	33 ± 6	19 2	105 3	75 7	27 3	111 7	9 1	631 96	344 47	1345 13	0.90 0.11	27.2	47.1	Glass Buttes 3
Glass Buttes SS	15	GLB-SS5	37 ± 6	15 2	101 3	74 7	29 3	111 7	9 2	641 96	336 47	1225 13	0.95 0.11	29.3	48.6	Glass Buttes 3
Glass Buttes SS	12	GLB-SS2	36 ± 6	15 2	98 3	75 7	28 3	109 7	8 1	733 97	352 47	1243 13	1.01 0.11	29.5	45.2	Glass Buttes 3
Glass Buttes TT	20	GLB-TT5	40 ± 6	17 2	100 3	71 7	26 3	109 7	9 1	565 97	343 47	1233 13	0.94 0.11	28.5	54.6	Glass Buttes 3
Glass Buttes TT	16	GLB-TT1	33 ± 7	22 3	107 3	73 7	24 3	108 7	7 2	594 96	335 47	1192 13	0.88 0.11	27.7	49.3	Glass Buttes 3
Glass Buttes TT	18	GLB-TT3	41 ± 6	19 2	100 3	73 7	24 3	107 7	12 1	671 97	354 47	1282 13	0.96 0.11	28.1	47.3	Glass Buttes 3
Glass Buttes TT	19	GLB-TT4	30 ± 6	22 2	103 3	75 7	29 3	111 7	7 2	590 97	322 47	1252 13	0.88 0.11	28.9	49.4	Glass Buttes 3
Glass Buttes TT	17	GLB-TT2	47 ± 7	16 3	103 3	76 7	27 3	108 7	8 2	646 97	401 47	1304 13	0.93 0.11	23.7	47.7	Glass Buttes 3
Glass Buttes UU	21	GLB-UU1	24 ± 7	19 3	101 3	70 7	28 3	106 7	7 2	503 96	289 47	1105 13	0.75 0.11	28.2	49.6	Glass Buttes 3
Glass Buttes UU	24	GLB-UU4	27 ± 6	17 2	103 3	70 7	27 3	108 7	11 1	642 97	347 47	1249 13	0.94 0.11	28.1	48.3	Glass Buttes 3
Glass Buttes UU	22	GLB-UU2	31 ± 6	19 2	100 3	71 7	28 3	107 7	8 1	594 96	351 47	1249 13	0.92 0.11	27.1	50.9	Glass Buttes 3
Glass Buttes UU	23	GLB-UU3	35 ± 7	17 3	97 3	72 7	27 3	108 7	7 2	530 96	302 47	1174 13	0.79 0.11	28.3	49.9	Glass Buttes 3
Glass Buttes UU	25	GLB-UU5	30 ± 6	19 2	100 3	72 7	25 3	111 7	10 1	627 97	348 47	1254 13	0.93 0.11	27.7	48.8	Glass Buttes 3

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Table A-1. Results of XRF Studies: Glass Buttes Source Complex, Lake County, Oregon

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Glass Buttes WW	31	GLB-WW1	37 ± 7	14 3	100 3	71 7	30 3	106 7	7 2	617 97	331 47	1248 13	0.96 0.11	30.1	51.0	Glass Buttes 3
Glass Buttes WW	35	GLB-WW5	39 ± 6	16 2	100 3	72 7	26 3	105 7	8 1	575 97	336 47	1295 13	0.95 0.11	29.4	54.1	Glass Buttes 3
Glass Buttes WW	33	GLB-WW3	43 ± 6	14 3	101 3	73 7	27 3	107 7	9 1	592 97	366 47	1295 13	0.94 0.11	26.4	52.2	Glass Buttes 3
Glass Buttes WW	32	GLB-WW2	39 ± 7	16 2	99 3	74 7	26 3	108 7	5 2	618 97	373 47	1293 13	0.93 0.11	25.7	49.8	Glass Buttes 3
Glass Buttes WW	34	GLB-WW4	34 ± 6	16 2	104 3	74 7	25 3	106 7	9 1	608 96	341 47	1305 13	0.93 0.11	28.3	50.3	Glass Buttes 3
Juniper Spring B	30	JUNIP-B30	37 ± 7	18 4	105 3	74 9	30 3	117 8	9 2	506 96	295 47	1396 14	0.78 0.11	28.8	51.5	Glass Buttes 3
Juniper Spring B	12	JUNIP-B12	37 ± 7	17 4	109 3	78 9	26 3	114 8	7 2	550 96	313 47	1414 14	0.83 0.11	28.4	50.3	Glass Buttes 3
Juniper Spring Hill	12	JUNIP-A12	38 ± 7	20 4	108 3	78 9	28 3	115 8	9 2	694 97	336 47	1435 14	0.95 0.11	29.5	45.4	Glass Buttes 3
Juniper Springs	13	JUNIP-C13	29 ± 6	19 2	112 3	60 7	34 3	106 7	6 2	547 96	347 47	1087 13	0.79 0.11	23.9	48.0	Glass Buttes 3
Juniper Springs	10	JUNIP-C10	28 ± 6	19 2	100 3	70 7	29 3	113 7	10 2	466 96	233 47	1373 14	0.58 0.11	29.5	43.1	Glass Buttes 3
Juniper Springs	6	JUNIP-C6	30 ± 7	15 3	111 3	74 7	28 3	110 7	11 2	488 96	278 47	1145 14	0.70 0.11	28.0	48.6	Glass Buttes 3
Juniper Springs	5	JUNIP-C5	36 ± 6	21 2	102 3	78 7	28 3	114 7	9 1	753 97	340 47	1291 14	0.99 0.11	30.3	43.4	Glass Buttes 3
Juniper Springs	12	JUNIP-C12	41 ± 6	20 2	102 3	80 7	28 3	117 7	8 2	731 96	324 47	1291 14	1.01 0.11	32.4	45.4	Glass Buttes 3
Little Glass Butte B	190-4	LGLB-B4	30 ± 6	17 3	99 3	66 5	27 2	111 6	7 2	543 105	296 29	1156 17	0.84 0.11	25.1	50.5	Glass Buttes 3
Little Glass Butte B	190-1	LGLB-B1	30 ± 6	19 3	101 3	68 5	27 2	110 6	8 2	519 105	281 29	1115 17	0.75 0.11	24.0	47.7	Glass Buttes 3
Little Glass Butte B	190-3	LGLB-B3	35 ± 6	16 3	97 3	69 5	25 2	110 6	8 2	581 105	311 29	1182 17	0.88 0.11	24.8	49.2	Glass Buttes 3

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Table A-1. Results of XRF Studies: Glass Buttes Source Complex, Lake County, Oregon

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Little Glass Butte B	190-2	LGLB-B2	31 ± 7	19 3	101 3	70 5	29 2	112 6	8 2	461 105	237 29	1108 17	0.64 0.11	24.6	46.2	Glass Buttes 3
Little Glass Butte B	190-7	LGLB-B7	33 ± 6	15 3	99 3	70 5	28 2	109 6	7 2	604 105	328 29	1268 16	0.97 0.11	25.9	52.1	Glass Buttes 3
Little Glass Butte B	190-8	LGLB-B8	38 ± 6	20 3	100 3	70 5	28 2	110 6	6 2	614 105	321 29	1215 16	0.90 0.11	24.7	47.7	Glass Buttes 3
Little Glass Butte B	190-5	LGLB-B5	43 ± 6	18 3	103 3	71 5	25 2	115 6	11 2	604 105	317 29	1273 17	0.87 0.11	24.2	46.9	Glass Buttes 3
Little Glass Butte B	190-6	LGLB-B6	37 ± 7	17 4	108 3	72 5	27 2	113 6	10 2	512 105	279 29	1176 17	0.75 0.11	24.3	48.5	Glass Buttes 3
Little Glass Butte B	190-9	LGLB-B9	36 ± 6	17 3	105 3	72 5	26 2	111 6	8 2	628 105	315 29	1223 17	0.89 0.11	25.0	46.4	Glass Buttes 3
Little Glass Butte B	190-10	LGLB-B10	39 ± 6	16 3	110 3	73 5	25 2	115 6	11 2	573 105	292 29	1243 17	0.85 0.11	25.8	48.5	Glass Buttes 3
Little Glass Butte C	191-5	LGLB-C5	35 ± 6	15 3	97 3	66 5	27 2	107 6	7 2	584 105	287 29	1195 17	0.84 0.11	26.0	47.2	Glass Buttes 3
Little Glass Butte C	161-6	LGLB-C6	29 ± 6	15 3	101 3	69 5	25 2	108 6	8 2	623 105	299 29	1182 16	0.87 0.11	25.9	45.9	Glass Buttes 3
Little Glass Butte C	191-7	LGLB-C7	27 ± 6	14 3	102 3	69 5	28 2	110 6	9 2	507 105	281 29	1131 17	0.79 0.11	25.1	51.2	Glass Buttes 3
Little Glass Butte C	191-2	LGLB-C2	34 ± 6	15 3	102 3	70 5	27 2	110 6	12 2	642 105	328 29	1224 16	0.94 0.11	25.0	47.5	Glass Buttes 3
Little Glass Butte C	191-1	LGLB-C1	38 ± 6	17 3	103 3	71 5	27 2	112 6	7 2	517 105	284 29	1185 17	0.81 0.11	25.4	51.2	Glass Buttes 3
Little Glass Butte C	191-4	LGLB-C4	39 ± 6	13 3	107 3	72 5	26 2	112 6	9 2	563 105	292 29	1175 17	0.79 0.11	24.2	46.2	Glass Buttes 3
Little Glass Butte C	191-3	LGLB-C3	36 ± 6	18 3	100 3	73 5	25 2	110 6	10 2	622 105	329 29	1281 17	0.93 0.11	24.7	48.6	Glass Buttes 3
Little Glass Buttes	1	LGLB-D1	34 ± 7	14 3	109 3	66 7	24 3	111 7	7 2	558 96	334 47	1162 13	0.84 0.11	26.6	50.1	Glass Buttes 3
Little Glass Buttes	4	LGLB-D4	27 ± 7	21 2	105 3	68 7	28 3	106 7	10 1	618 96	334 47	1198 13	0.86 0.11	27.1	46.2	Glass Buttes 3

All trace element values reported in parts per million; ± = analytical uncertainty estimate (in ppm). Iron content reported as weight percent oxide. NA = Not available; ND = Not detected; NM = Not measured.; * = Small sample.

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Table A-1. Results of XRF Studies: Glass Buttes Source Complex, Lake County, Oregon

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Little Glass Buttes	11	LGLB-D11	32 ± 6	16 2	101 3	69 7	27 3	105 7	11 1	550 96	327 47	1174 13	0.84 0.11	27.3	50.9	Glass Buttes 3
Little Glass Buttes	13	LGLB-D13	26 ± 7	20 2	107 3	70 7	27 3	104 7	7 2	535 96	316 47	1129 13	0.78 0.11	26.3	48.6	Glass Buttes 3
Little Glass Buttes	2	LGLB-D2	36 ± 7	12 3	103 3	71 7	26 3	107 7	8 2	582 96	317 47	1194 13	0.85 0.11	28.4	48.3	Glass Buttes 3
Little Glass Buttes	3	LGLB-D3	33 ± 6	15 2	104 3	71 7	29 3	108 7	7 2	631 96	361 47	1251 13	0.94 0.11	26.8	48.9	Glass Buttes 3
Little Glass Buttes	6	LGLB-D6	25 ± 7	20 2	101 3	71 7	28 3	113 7	6 2	582 96	314 47	1184 13	0.85 0.11	28.7	48.2	Glass Buttes 3
Little Glass Buttes	9	LGLB-D9	33 ± 6	21 2	103 3	71 7	27 3	106 7	8 1	596 96	351 47	1259 13	0.93 0.11	27.4	51.3	Glass Buttes 3
Little Glass Buttes	15	LGLB-D15	29 ± 6	17 2	98 3	71 7	26 3	102 7	8 2	500 96	300 47	1192 13	0.74 0.11	26.7	49.4	Glass Buttes 3
Little Glass Buttes	12	LGLB-D12	34 ± 6	17 2	104 3	72 7	26 3	111 7	8 2	591 96	339 47	1229 13	0.89 0.11	27.4	49.8	Glass Buttes 3
Little Glass Buttes	7	LGLB-D7	37 ± 6	18 2	112 3	73 7	25 3	113 7	8 2	514 96	307 47	1237 14	0.78 0.11	27.4	50.6	Glass Buttes 3
Little Glass Buttes	10	LGLB-D10	32 ± 6	15 2	107 3	73 7	27 3	109 7	8 2	569 96	334 47	1185 13	0.86 0.11	27.2	50.1	Glass Buttes 3
Little Glass Buttes	14	LGLB-D14	42 ± 6	18 2	106 3	73 7	30 3	114 7	10 2	616 96	335 47	1252 13	0.89 0.11	27.9	47.9	Glass Buttes 3
Little Glass Buttes	5	LGLB-D5	32 ± 7	20 3	107 3	75 7	29 3	111 7	9 2	526 96	299 47	1223 14	0.79 0.11	28.5	49.9	Glass Buttes 3
Little Glass Buttes	8	LGLB-D8	36 ± 6	16 2	102 3	75 7	28 3	107 7	5 2	632 96	352 47	1256 13	0.93 0.11	27.3	48.5	Glass Buttes 3
Little Glass Buttes B	131	LGLB-B1	33 ± 7	14 4	97 3	67 9	28 3	113 8	9 1	571 96	329 47	1284 13	0.89 0.11	28.5	51.6	Glass Buttes 3
Little Glass Buttes B	134	LGLB-B4	32 ± 7	13 4	105 3	69 9	31 3	114 8	8 2	621 96	319 47	1210 13	0.83 0.11	27.6	44.5	Glass Buttes 3
Little Glass Buttes B	132	LGLB-B2	33 ± 7	17 4	102 3	72 9	26 3	112 8	9 2	568 96	307 47	1240 13	0.82 0.11	28.6	48.1	Glass Buttes 3

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Table A-1. Results of XRF Studies: Glass Buttes Source Complex, Lake County, Oregon

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Little Glass Buttes B	135	LGLB-B5	34 ± 7	18 4	102 3	72 9	26 3	113 8	9 2	540 96	298 47	1214 13	0.84 0.11	30.3	51.6	Glass Buttes 3
Little Glass Buttes B	133	LGLB-B3	38 ± 7	15 4	106 3	73 9	26 3	111 8	8 2	606 96	320 47	1266 14	0.89 0.11	29.4	48.6	Glass Buttes 3
Musser Reservoir	119-2	MUSSER-A2	36 ± 6	17 3	100 3	68 5	26 2	112 6	11 2	502 105	289 29	1167 17	0.80 0.11	24.7	52.2	Glass Buttes 3
Musser Reservoir	119-4	MUSSER-A4	43 ± 6	16 3	103 3	68 5	26 2	112 6	9 2	553 105	313 29	1229 17	0.91 0.11	25.5	53.3	Glass Buttes 3
Musser Reservoir	119-6	MUSSER-A6	32 ± 6	14 3	100 3	68 5	24 2	109 6	9 2	625 105	338 29	1199 16	0.95 0.11	24.5	49.2	Glass Buttes 3
Musser Reservoir	119-5	MUSSER-A5	28 ± 6	18 3	100 3	69 5	26 2	110 6	5 2	611 105	316 29	1233 17	0.92 0.11	25.5	48.9	Glass Buttes 3
Musser Reservoir	8	MUSSR-C8	42 ± 6	14 3	95 3	69 7	27 3	109 7	10 1	528 96	328 47	1202 13	0.86 0.11	27.7	54.0	Glass Buttes 3
Musser Reservoir	12	MUSSR-C12	23 ± 6	16 2	101 3	69 7	27 3	106 7	10 1	554 96	324 47	1241 13	0.87 0.11	28.3	51.8	Glass Buttes 3
Musser Reservoir	18	MUSSR-C18	30 ± 6	16 2	108 3	70 7	27 3	112 7	8 2	563 97	336 47	1283 13	0.90 0.11	28.1	52.9	Glass Buttes 3
Musser Reservoir	19	MUSSR-C19	29 ± 6	15 2	102 3	70 7	26 3	110 7	10 1	558 97	365 47	1256 13	0.93 0.11	26.3	54.9	Glass Buttes 3
Musser Reservoir	4	MUSSR-C4	40 ± 6	19 2	100 3	71 7	27 3	107 7	7 2	565 96	333 47	1245 13	0.88 0.11	27.7	51.2	Glass Buttes 3
Musser Reservoir	9	MUSSR-C9	35 ± 6	17 3	106 3	71 7	28 3	109 7	9 2	575 96	308 47	1230 13	0.81 0.11	28.1	46.9	Glass Buttes 3
Musser Reservoir	13	MUSSR-C13	33 ± 6	19 2	103 3	71 7	29 3	108 7	7 2	565 96	294 47	1211 13	0.83 0.11	30.4	48.9	Glass Buttes 3
Musser Reservoir	119-1	MUSSER-A1	29 ± 6	16 3	101 3	72 5	25 2	110 6	5 2	622 105	325 29	1239 17	0.93 0.11	25.1	48.4	Glass Buttes 3
Musser Reservoir	15	MUSSR-C15	43 ± 6	13 2	100 3	72 7	27 3	108 7	6 2	621 97	384 47	1294 13	0.96 0.11	25.5	50.7	Glass Buttes 3
Musser Reservoir	17	MUSSR-C17	27 ± 7	25 2	108 3	72 7	28 3	110 7	11 1	537 97	367 47	1246 13	0.89 0.11	25.2	54.9	Glass Buttes 3

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Table A-1. Results of XRF Studies: Glass Buttes Source Complex, Lake County, Oregon

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Musser Reservoir	21	MUSSR-C21	24 ± 7	17 2	105 3	72 7	26 3	111 7	7 1	579 97	343 47	1236 13	0.94 0.11	28.6	53.6	Glass Buttes 3
Musser Reservoir	119-3	MUSSER-A3	28 ± 6	21 3	109 3	73 5	24 2	114 6	9 2	524 105	278 29	1234 17	0.79 0.11	25.5	49.8	Glass Buttes 3
Musser Reservoir	2	MUSSR-C2	42 ± 6	17 2	104 3	73 7	27 3	107 7	8 2	635 97	352 47	1254 13	0.93 0.11	27.5	48.5	Glass Buttes 3
Musser Reservoir	1	MUSSR-C1	32 ± 6	16 3	102 3	74 7	28 3	105 7	10 1	589 97	343 47	1207 13	0.95 0.11	28.7	53.0	Glass Buttes 3
Musser Reservoir	3	MUSSR-C3	29 ± 6	18 2	99 3	74 7	26 3	110 7	8 1	595 97	329 47	1284 13	0.93 0.11	29.8	51.7	Glass Buttes 3
Musser Reservoir	11	MUSSR-C11	34 ± 6	22 2	109 3	76 7	27 3	111 7	10 2	551 96	306 47	1225 13	0.82 0.11	28.8	49.5	Glass Buttes 3
Musser Reservoir	20	MUSSR-C20	39 ± 6	17 3	110 3	76 7	29 3	111 7	8 2	532 96	313 47	1185 13	0.82 0.11	27.9	51.1	Glass Buttes 3
Musser Reservoir	5	MUSSR-C5	38 ± 6	18 3	107 3	78 7	27 3	111 7	6 2	487 96	290 47	1264 14	0.78 0.11	29.1	53.1	Glass Buttes 3
Musser Reservoir	10	MUSSR-C10	31 ± 6	12 3	104 3	78 7	26 3	111 7	9 2	543 96	328 47	1247 14	0.86 0.11	27.7	52.5	Glass Buttes 3
Musser Reservoir	14	MUSSR-C14	40 ± 6	17 3	105 3	78 7	27 3	112 7	6 2	563 96	296 47	1273 13	0.83 0.11	30.3	49.2	Glass Buttes 3
Potato Hills	7	POTAT-A7	39 ± 7	17 3	104 3	72 6	26 1	112 7	6 1	546 76	292 22	1306 14	0.84 0.11	28.3	48.6	Glass Buttes 3
Glass Buttes	2	GLB-OO2	45 ± 6	19 2	118 3	8 7	66 3	91 7	13 1	370 95	449 47	236 12	0.73 0.11	16.8	65.6	Glass Buttes 4
Glass Buttes	1	GLB-PP1	42 ± 7	13 3	123 3	8 7	69 3	92 7	14 2	326 95	389 47	211 12	0.63 0.11	17.2	64.5	Glass Buttes 4
Glass Buttes	2	GLB-PP2	45 ± 7	23 3	125 3	8 7	67 3	96 7	13 2	308 95	363 47	226 12	0.53 0.11	16.2	59.1	Glass Buttes 4
Glass Buttes	3	GLB-PP3	40 ± 6	16 2	124 3	8 7	68 3	90 7	14 1	357 95	434 47	239 12	0.69 0.11	16.6	64.2	Glass Buttes 4
Glass Buttes	5	GLB-OO5	44 ± 7	21 2	122 3	9 7	67 3	88 7	14 2	291 95	400 47	201 12	0.62 0.11	16.5	70.9	Glass Buttes 4

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Table A-1. Results of XRF Studies: Glass Buttes Source Complex, Lake County, Oregon

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Glass Buttes	1	GLB-OO1	46 ± 6	23 2	118 3	10 7	71 3	91 7	15 1	356 95	415 47	223 12	0.66 0.11	16.8	62.3	Glass Buttes 4
Glass Buttes	3	GLB-OO3	41 ± 6	20 2	125 3	10 7	69 3	91 7	11 2	303 95	396 47	222 12	0.61 0.11	16.6	67.6	Glass Buttes 4
Glass Buttes	4	GLB-OO4	38 ± 6	15 2	116 3	10 7	65 3	91 7	13 1	319 95	395 47	215 12	0.63 0.11	17.0	66.1	Glass Buttes 4
Glass Buttes B	121-4	GLB-B4	41 ± 6	23 3	117 3	7 5	67 2	91 6	13 2	342 104	396 29	224 16	0.64 0.11	14.6	61.9	Glass Buttes 4
Glass Buttes B	121-1	GLB-B1	43 ± 6	19 3	117 3	8 5	66 2	91 6	15 2	348 104	398 29	225 16	0.69 0.11	15.5	65.2	Glass Buttes 4
Glass Buttes B	121-8	GLB-B8	39 ± 6	19 3	116 3	8 5	64 2	90 6	12 2	329 104	415 29	207 16	0.68 0.11	14.6	67.8	Glass Buttes 4
Glass Buttes B	121-2	GLB-B2	46 ± 6	19 3	120 3	9 5	69 2	98 6	15 2	314 104	337 29	209 16	0.55 0.11	15.0	58.7	Glass Buttes 4
Glass Buttes B	121-7	GLB-B7	49 ± 5	15 3	116 3	9 5	62 2	91 6	16 2	335 104	419 29	223 16	0.68 0.11	14.6	67.2	Glass Buttes 4
Glass Buttes B	121-9	GLB-B9	42 ± 6	17 3	118 3	9 5	63 2	91 6	14 2	309 104	365 29	206 16	0.62 0.11	15.4	66.7	Glass Buttes 4
Glass Buttes B	121-10	GLB-B10	42 ± 6	17 3	115 3	10 5	63 2	92 6	16 2	296 104	358 29	224 16	0.61 0.11	15.5	68.1	Glass Buttes 4
Glass Buttes HH	37	GLB-HH2	47 ± 7	19 4	123 3	8 9	70 3	91 8	16 1	350 95	442 47	231 12	0.70 0.11	16.4	66.2	Glass Buttes 4
Glass Buttes HH	38	GLB-HH3	43 ± 7	16 4	116 3	8 9	72 3	93 8	14 2	307 95	387 47	205 12	0.59 0.11	16.3	64.2	Glass Buttes 4
Glass Buttes HH	40	GLB-HH5	42 ± 7	16 4	122 3	8 9	66 3	93 8	14 1	330 95	437 47	222 12	0.69 0.11	16.5	69.6	Glass Buttes 4
Glass Buttes HH	36	GLB-HH1	42 ± 7	19 4	123 3	9 9	67 3	89 8	15 1	371 95	438 47	228 12	0.69 0.11	16.5	62.3	Glass Buttes 4
Glass Buttes HH	39	GLB-HH4	37 ± 7	19 4	120 3	10 9	68 3	89 8	14 2	297 95	367 47	209 12	0.51 0.11	15.5	59.4	Glass Buttes 4
Glass Buttes II	43	GLB-II3	38 ± 7	18 4	121 3	7 9	68 3	90 8	13 2	343 95	409 47	241 12	0.62 0.11	16.1	60.8	Glass Buttes 4

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Table A-1. Results of XRF Studies: Glass Buttes Source Complex, Lake County, Oregon

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Glass Buttes II	45	GLB-II5	42 ± 7	14 4	128 3	7 9	69 3	94 8	13 1	373 95	433 47	227 12	0.66 0.11	15.9	59.2	Glass Buttes 4
Glass Buttes II	41	GLB-II1	47 ± 7	18 4	120 3	8 9	67 3	93 8	13 1	395 95	454 47	243 12	0.69 0.11	15.7	58.3	Glass Buttes 4
Glass Buttes II	44	GLB-II4	51 ± 7	21 4	119 3	8 9	67 3	94 8	14 1	309 95	407 47	249 12	0.61 0.11	15.9	65.7	Glass Buttes 4
Glass Buttes II	42	GLB-II2	40 ± 7	17 4	124 3	10 9	67 3	94 8	16 1	404 95	414 47	254 12	0.66 0.11	16.8	55.1	Glass Buttes 4
Glass Buttes K	187-1	GLB-K1	33 ± 6	20 3	117 3	8 5	64 2	92 6	13 2	297 104	352 29	210 16	0.58 0.11	15.0	64.8	Glass Buttes 4
Glass Buttes K	187-2	GLB-K2	38 ± 6	20 3	117 3	8 5	64 2	90 6	13 2	246 104	356 29	212 16	0.57 0.11	14.7	76.8	Glass Buttes 4
Glass Buttes K	187-3	GLB-K3	48 ± 6	19 3	117 3	8 5	61 2	89 6	16 2	368 104	408 29	227 16	0.70 0.11	15.4	62.8	Glass Buttes 4
Glass Buttes K	187-5	GLB-K5	50 ± 6	18 3	121 3	9 5	65 2	90 6	17 2	332 104	368 29	226 16	0.60 0.11	14.9	60.4	Glass Buttes 4
Glass Buttes L	51	GLB-L1	50 ± 7	20 4	128 3	7 9	71 3	89 8	11 2	340 95	389 47	217 12	0.58 0.11	16.2	58.2	Glass Buttes 4
Glass Buttes L	52	GLB-L2	44 ± 7	19 4	127 3	7 9	70 3	93 8	13 1	407 95	434 47	231 12	0.68 0.11	16.4	56.2	Glass Buttes 4
Glass Buttes L	54	GLB-L4	42 ± 7	20 4	120 3	7 9	71 3	94 8	13 1	383 95	438 47	231 12	0.67 0.11	16.0	58.6	Glass Buttes 4
Glass Buttes L	188-1	GLB-L1	39 ± 6	19 3	123 3	8 5	66 2	92 6	16 2	339 104	391 29	210 16	0.63 0.11	14.6	61.7	Glass Buttes 4
Glass Buttes L	188-2	GLB-L2	40 ± 6	20 3	115 3	8 5	61 2	93 6	12 2	350 104	384 29	216 16	0.68 0.11	15.9	64.0	Glass Buttes 4
Glass Buttes L	53	GLB-L3	48 ± 7	19 4	124 3	8 9	69 3	90 8	15 1	349 95	449 47	237 12	0.68 0.11	15.7	64.6	Glass Buttes 4
Glass Buttes L	55	GLB-L5	52 ± 7	20 4	123 3	8 9	70 3	91 8	13 1	282 95	442 47	211 12	0.67 0.11	15.7	77.8	Glass Buttes 4
Glass Buttes L	188-3	GLB-L3	43 ± 6	16 3	119 3	9 5	64 2	91 6	11 2	360 104	398 29	229 16	0.68 0.11	15.2	62.0	Glass Buttes 4

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Table A-1. Results of XRF Studies: Glass Buttes Source Complex, Lake County, Oregon

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Glass Buttes L	188-4	GLB-L4	53 ± 6	20 3	124 3	9 5	67 2	93 6	13 2	358 104	411 29	213 16	0.63 0.11	13.9	58.6	Glass Buttes 4
Glass Buttes L	188-5	GLB-L5	39 ± 6	17 3	119 3	9 5	64 2	90 6	13 2	317 104	389 29	206 16	0.63 0.11	14.6	65.3	Glass Buttes 4
Glass Buttes L	188-6	GLB-L6	47 ± 6	19 3	118 3	9 5	64 2	92 6	15 2	365 104	397 29	217 16	0.68 0.11	15.3	61.2	Glass Buttes 4
Glass Buttes L	188-7	GLB-L7	49 ± 6	21 3	124 3	9 5	68 2	95 6	15 2	333 104	401 29	233 16	0.67 0.11	15.1	66.6	Glass Buttes 4
Glass Buttes L	188-8	GLB-L8	44 ± 6	20 3	117 3	10 5	65 2	91 6	13 2	273 104	309 29	202 16	0.52 0.11	15.8	64.6	Glass Buttes 4
Juniper Spring B	21	JUNIP-B21	53 ± 7	22 4	134 3	4 10	71 3	95 8	11 2	343 95	372 47	238 13	0.54 0.11	16.0	54.4	Glass Buttes 4
Juniper Spring B	17	JUNIP-B17	41 ± 7	21 4	120 3	7 9	68 3	90 8	15 2	272 95	345 47	249 13	0.51 0.11	16.6	64.0	Glass Buttes 4
Juniper Spring B	20	JUNIP-B20	39 ± 7	19 4	117 3	7 9	68 3	91 8	11 2	239 95	369 47	241 13	0.53 0.11	15.9	74.9	Glass Buttes 4
Juniper Spring B	28	JUNIP-B28	51 ± 7	16 4	123 3	7 9	67 3	90 8	15 2	314 95	397 47	251 13	0.62 0.11	16.6	65.6	Glass Buttes 4
Juniper Spring B	19	JUNIP-B19	43 ± 7	17 4	123 3	8 9	68 3	91 8	18 1	355 95	425 47	236 12	0.67 0.11	16.5	62.7	Glass Buttes 4
Juniper Spring B	22	JUNIP-B22	39 ± 7	17 4	115 3	8 9	69 3	94 8	14 1	342 95	420 47	248 12	0.67 0.11	16.8	65.4	Glass Buttes 4
Juniper Spring B	2	JUNIP-B2	42 ± 7	17 4	122 3	9 9	69 3	95 8	17 1	325 95	447 47	238 12	0.67 0.11	15.7	68.5	Glass Buttes 4
Juniper Spring B	11	JUNIP-B11	46 ± 7	21 4	127 3	9 9	75 3	96 8	16 2	366 95	421 47	238 12	0.67 0.11	16.6	60.9	Glass Buttes 4
Juniper Spring B	29	JUNIP-B29	41 ± 7	22 4	122 3	9 9	71 3	93 8	16 2	318 95	401 47	230 13	0.63 0.11	16.8	66.3	Glass Buttes 4
Juniper Springs	7	JUNIP-C7	47 ± 6	20 2	123 3	8 7	71 3	95 7	14 2	323 95	345 47	239 13	0.56 0.11	17.8	58.7	Glass Buttes 4
Glass Buttes B	121-3	GLB-B3	49 ± 7	20 4	131 3	5 5	73 2	90 6	12 2	245 104	375 29	27 16	0.54 0.11	13.2	73.0	Glass Buttes 5

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Table A-1. Results of XRF Studies: Glass Buttes Source Complex, Lake County, Oregon

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Glass Buttes B	121-6	GLB-B6	48 ± 6	18 3	132 3	5 5	68 2	93 6	17 2	289 104	410 29	35 16	0.62 0.11	13.7	71.1	Glass Buttes 5
Glass Buttes J	48	GLB-J3	49 ± 7	19 4	131 3	3 10	72 3	87 8	13 2	270 95	448 47	40 12	0.66 0.11	15.3	80.3	Glass Buttes 5
Glass Buttes J	186-3	GLB-J3	46 ± 6	20 3	131 3	4 5	73 2	89 6	13 2	270 104	368 29	30 16	0.58 0.11	14.4	71.4	Glass Buttes 5
Glass Buttes J	47	GLB-J2	58 ± 7	20 4	127 3	4 10	76 3	88 8	15 2	261 95	433 47	40 12	0.63 0.11	15.3	79.3	Glass Buttes 5
Glass Buttes J	49	GLB-J4	43 ± 7	21 4	133 3	4 9	78 3	85 8	16 1	287 95	442 47	35 12	0.66 0.11	15.5	75.3	Glass Buttes 5
Glass Buttes J	186-2	GLB-J2	47 ± 6	18 3	132 3	5 5	72 2	93 6	17 2	320 104	427 29	48 16	0.65 0.11	13.7	67.0	Glass Buttes 5
Glass Buttes J	186-4	GLB-J4	49 ± 6	15 3	123 3	5 5	69 2	87 6	15 2	230 104	361 29	22 17	0.52 0.11	13.4	75.9	Glass Buttes 5
Glass Buttes J	46	GLB-J1	56 ± 7	17 4	133 3	5 9	74 3	87 8	17 1	295 95	477 47	35 12	0.66 0.11	14.3	73.7	Glass Buttes 5
Glass Buttes J	50	GLB-J5	57 ± 7	17 4	134 3	5 9	75 3	87 8	13 2	295 95	437 47	34 12	0.66 0.11	15.8	73.9	Glass Buttes 5
Glass Buttes J	186-6	GLB-J6	45 ± 6	14 3	121 3	6 5	67 2	90 6	16 2	242 104	367 29	39 16	0.56 0.11	13.9	76.4	Glass Buttes 5
Glass Buttes J	186-7	GLB-J7	49 ± 6	22 3	128 3	6 5	69 2	90 6	14 2	255 104	379 29	56 16	0.55 0.11	13.3	71.8	Glass Buttes 5
Glass Buttes J	186-8	GLB-J8	42 ± 7	18 3	130 3	6 5	70 2	91 6	13 2	214 104	320 29	40 16	0.46 0.11	13.5	72.0	Glass Buttes 5
Glass Buttes J	186-1	GLB-J1	40 ± 6	21 3	123 3	7 5	68 2	88 6	15 2	282 104	429 29	46 16	0.63 0.11	13.2	73.3	Glass Buttes 5
Glass Buttes J	186-5	GLB-J5	44 ± 6	20 3	123 3	7 5	67 2	92 6	14 2	311 104	451 29	40 16	0.68 0.11	13.4	71.4	Glass Buttes 5
Glass Buttes K	187-4	GLB-K4	54 ± 6	18 3	123 3	4 5	69 2	94 6	12 2	242 104	366 29	36 16	0.54 0.11	13.7	74.7	Glass Buttes 5
Glass Buttes K	187-6	GLB-K6	41 ± 6	21 3	127 3	5 5	68 2	89 6	13 2	313 104	455 29	34 16	0.68 0.11	13.3	71.1	Glass Buttes 5

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Table A-1. Results of XRF Studies: Glass Buttes Source Complex, Lake County, Oregon

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Glass Buttes WW	9	GLB-WW4	48 ± 6	19 2	129 3	ND ND	75 3	89 7	14 2	248 95	434 47	28 13	0.63 0.11	15.3	83.7	Glass Buttes 5
Glass Buttes WW	8	GLB-WW3	43 ± 7	19 3	130 3	4 15	74 3	87 7	14 2	226 95	401 47	28 13	0.59 0.11	15.7	85.5	Glass Buttes 5
Glass Buttes WW	6	GLB-WW1	44 ± 6	21 2	131 3	5 7	76 3	90 7	16 1	269 95	479 47	20 13	0.70 0.11	15.0	84.9	Glass Buttes 5
Glass Buttes WW	10	GLB-WW5	50 ± 6	22 2	128 3	5 7	75 3	85 7	16 1	271 95	498 47	13 14	0.70 0.11	14.4	84.1	Glass Buttes 5
Glass Buttes WW	7	GLB-WW2	51 ± 6	21 2	130 3	6 7	70 3	87 7	12 2	368 95	438 47	18 13	0.61 0.11	14.8	56.4	Glass Buttes 5
Glass Buttes XX	15	GLB-XX5	56 ± 6	19 2	128 3	3 50	74 3	94 7	18 2	294 95	368 47	10 19	0.49 0.11	14.9	57.9	Glass Buttes 5
Glass Buttes XX	11	GLB-XX1	46 ± 6	14 2	125 3	4 7	74 3	84 7	15 2	348 95	402 47	12 15	0.56 0.11	15.1	55.2	Glass Buttes 5
Glass Buttes XX	12	GLB-XX2	45 ± 6	21 2	132 3	4 7	74 3	87 7	14 1	337 95	424 47	20 13	0.58 0.11	14.6	58.2	Glass Buttes 5
Glass Buttes XX	13	GLB-XX3	47 ± 6	20 2	132 3	5 7	76 3	89 7	16 2	320 95	417 47	16 14	0.58 0.11	14.9	61.1	Glass Buttes 5
Glass Buttes XX	14	GLB-XX4	45 ± 6	20 2	129 3	5 7	77 3	86 7	18 2	252 95	432 47	10 20	0.62 0.11	15.1	80.5	Glass Buttes 5
Juniper Spring B	4	JUNIP-B4	50 ± 7	20 4	138 3	3 10	78 3	95 8	15 2	204 95	403 47	19 13	0.53 0.11	14.4	86.5	Glass Buttes 5
Juniper Spring B	8	JUNIP-B8	39 ± 7	19 4	136 3	3 10	75 3	92 8	17 2	234 95	431 47	15 14	0.59 0.11	14.5	82.9	Glass Buttes 5
Juniper Spring B	13	JUNIP-B13	42 ± 7	19 4	126 3	3 10	74 3	88 8	18 1	331 95	440 47	52 12	0.64 0.11	15.4	64.9	Glass Buttes 5
Juniper Spring B	5	JUNIP-B5	52 ± 7	19 4	128 3	4 9	75 3	90 8	14 2	164 95	314 47	36 13	0.40 0.11	14.9	82.0	Glass Buttes 5
Juniper Spring B	18	JUNIP-B18	48 ± 7	19 4	129 3	4 9	73 3	89 8	16 2	270 95	432 47	46 12	0.59 0.11	14.6	73.2	Glass Buttes 5
Juniper Spring B	16	JUNIP-B16	65 ± 7	19 4	132 3	5 9	75 3	89 8	15 2	166 95	333 47	19 13	0.39 0.11	13.8	80.5	Glass Buttes 5

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Table A-1. Results of XRF Studies: Glass Buttes Source Complex, Lake County, Oregon

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Juniper Spring B	24	JUNIP-B24	52	17	134	5	79	91	17	259	370	18	0.50	15.1	66.3	Glass Buttes 5
			± 7	4	3	9	3	8	2	95	47	14	0.11			
Juniper Spring Hill	13	JUNIP-A13	49	23	135	4	78	91	16	395	467	17	0.76	16.7	63.9	Glass Buttes 5
			± 7	4	3	9	3	8	1	95	47	13	0.11			
Juniper Springs	11	JUNIP-C11	48	26	140	5	75	91	19	288	383	46	0.55	15.6	64.5	Glass Buttes 5
			± 6	2	3	7	3	7	2	95	47	13	0.11			
Juniper Springs	4	JUNIP-C4	52	19	136	6	78	94	16	275	433	30	0.63	15.3	75.4	Glass Buttes 5
			± 6	2	3	7	3	7	1	95	47	13	0.11			
Potato Hills	11	POTAT-A11	60	19	125	ND	69	89	16	244	214	25	0.45	22.5	59.1	Glass Buttes 5
			± 7	3	3	ND	2	7	2	74	22	14	0.11			
Potato Hills	1	POTAT-A1	49	20	133	3	73	90	13	206	394	26	0.52	13.9	76.8	Glass Buttes 5
			± 7	3	3	8	2	7	2	74	22	14	0.11			
Potato Hills	6	POTAT-A6	51	22	145	4	74	89	15	224	277	17	0.43	16.8	61.2	Glass Buttes 5
			± 7	3	3	6	2	7	2	74	22	16	0.11			
Potato Hills	9	POTAT-A9	50	19	134	4	71	90	16	144	252	23	0.35	15.9	76.1	Glass Buttes 5
			± 7	3	3	6	2	7	2	74	22	14	0.11			
Potato Hills	10	POTAT-A10	44	18	131	4	71	88	14	155	280	21	0.38	15.2	75.9	Glass Buttes 5
			± 7	3	3	6	2	7	2	74	22	15	0.11			
Potato Hills	2	POTAT-A2	50	15	129	5	71	93	13	163	256	26	0.34	15.2	67.1	Glass Buttes 5
			± 7	3	3	6	2	7	2	74	22	15	0.11			
Potato Hills	3	POTAT-A3	49	16	128	5	73	90	17	146	312	42	0.42	14.7	85.8	Glass Buttes 5
			± 7	3	3	6	2	7	2	74	22	13	0.11			
Potato Hills	5	POTAT-A5	48	18	135	5	75	92	21	184	347	38	0.44	13.8	74.5	Glass Buttes 5
			± 7	3	3	6	2	7	2	74	22	14	0.11			
Potato Hills	8	POTAT-A8	53	20	124	5	69	83	15	114	171	13	0.24	17.5	68.9	Glass Buttes 5
			± 8	3	3	6	2	7	2	74	22	24	0.11			
Potato Hills	4	POTAT-A4	38	18	134	6	72	95	13	254	256	14	0.39	16.7	50.5	Glass Buttes 5
			± 8	3	3	6	2	7	2	74	22	21	0.11			
Glass Buttes	1	GLB-NN1	32	21	115	58	30	99	12	526	396	970	0.75	19.7	47.7	Glass Buttes 6
			± 6	2	3	7	3	7	1	96	47	13	0.11			
Glass Buttes	2	GLB-NN2	41	17	116	60	29	101	9	533	402	1021	0.78	20.1	48.9	Glass Buttes 6
			± 6	2	3	7	3	7	1	96	47	13	0.11			

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Table A-1. Results of XRF Studies: Glass Buttes Source Complex, Lake County, Oregon

Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Glass Buttes	3	GLB-NN3	34 ± 6	21 2	112 3	61 7	31 3	100 7	9 2	508 96	374 47	1001 13	0.77 0.11	21.7	50.9	Glass Buttes 6
Glass Buttes	4	GLB-NN4	54 ± 6	19 2	117 3	61 7	31 3	100 7	10 2	503 96	362 47	987 13	0.73 0.11	21.3	48.7	Glass Buttes 6
Glass Buttes	5	GLB-NN5	41 ± 6	15 2	116 3	62 7	27 3	100 7	11 1	550 96	378 47	1071 13	0.81 0.11	22.4	49.2	Glass Buttes 6
Glass Buttes B	121-5	GLB-B5	39 ± 6	13 3	115 3	58 5	25 2	105 6	6 2	411 105	304 29	931 16	0.66 0.11	19.7	53.4	Glass Buttes 6
Glass Buttes RR	8	GLB-RR3	30 ± 6	17 2	110 3	62 7	28 3	101 7	11 1	561 96	375 47	1065 13	0.84 0.11	23.1	49.6	Glass Buttes 6
Juniper Spring B	1	JUNIP-B1	27 ± 8	19 4	115 3	57 9	30 3	103 8	9 2	439 96	348 47	1038 13	0.76 0.11	23.1	57.5	Glass Buttes 6
Juniper Spring Hill	14	JUNIP-A14	36 ± 7	16 4	124 3	63 9	32 3	105 8	10 2	539 96	332 47	1071 13	0.74 0.11	23.8	46.0	Glass Buttes 6
Little Glass Butte A	189-1	LGLB-A1	39 ± 5	16 3	109 3	55 5	27 2	98 6	9 2	527 105	374 29	986 16	0.79 0.11	18.8	49.5	Glass Buttes 6
Little Glass Butte A	189-4	LGLB-A4	36 ± 6	20 3	112 3	56 5	28 2	103 6	8 2	447 105	321 29	973 16	0.75 0.11	21.0	55.4	Glass Buttes 6
Little Glass Butte A	189-3	LGLB-A3	36 ± 6	14 3	103 3	57 5	27 2	99 6	6 2	507 105	354 29	952 16	0.80 0.11	20.1	51.9	Glass Buttes 6
Little Glass Butte A	189-2	LGLB-A2	46 ± 6	17 3	106 3	60 5	27 2	101 6	11 2	328 104	245 29	878 17	0.54 0.11	20.5	55.3	Glass Buttes 6
Little Glass Butte A	189-5	LGLB-A5	38 ± 6	14 3	109 3	61 5	28 2	104 6	8 2	445 105	308 29	935 16	0.71 0.11	20.6	52.4	Glass Buttes 6
Little Glass Buttes A	130	LGLB-A5	32 ± 7	17 4	107 3	57 9	29 3	98 8	8 2	409 96	332 47	983 13	0.71 0.11	22.9	57.7	Glass Buttes 6
Little Glass Buttes A	128	LGLB-A3	36 ± 7	21 4	113 3	59 9	30 3	105 8	11 1	500 96	380 47	1050 13	0.84 0.11	22.8	55.4	Glass Buttes 6
Little Glass Buttes A	129	LGLB-A4	42 ± 7	18 4	116 3	59 9	31 3	105 8	6 2	502 96	352 47	1014 13	0.76 0.11	22.8	50.6	Glass Buttes 6
Little Glass Buttes A	126	LGLB-A1	37 ± 7	21 4	116 3	60 9	29 3	103 8	11 1	576 96	359 47	1041 13	0.81 0.11	23.6	46.8	Glass Buttes 6

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Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Little Glass Buttes A	127	LGLB-A2	29 ± 7	13 4	116 3	60 9	29 3	102 8	8 2	508 96	386 47	1029 13	0.83 0.11	22.3	54.2	Glass Buttes 6
Glass Buttes	5	GLB-KK5	40 ± 6	11 3	85 3	109 7	29 3	147 7	4 2	1348 97	396 48	1171 13	1.72 0.11	42.6	41.1	Glass Buttes 7
Glass Buttes E	185-1	GLB-E1	40 ± 6	15 3	87 3	96 5	26 2	139 6	7 2	1073 105	325 29	1086 16	1.32 0.11	34.8	39.4	Glass Buttes 7
Glass Buttes E	185-3	GLB-E3	38 ± 6	11 3	86 3	101 5	26 2	139 6	6 2	1105 106	362 29	1127 16	1.47 0.11	34.6	42.5	Glass Buttes 7
Glass Buttes E	185-5	GLB-E5	33 ± 6	13 3	94 3	102 5	25 2	142 6	5 2	1077 106	360 29	1134 16	1.40 0.11	33.3	41.6	Glass Buttes 7
Glass Buttes E	185-2	GLB-E2	40 ± 6	15 3	87 3	103 5	25 2	145 6	8 2	1185 106	356 29	1164 16	1.54 0.11	36.6	41.3	Glass Buttes 7
Glass Buttes E	185-4	GLB-E4	38 ± 6	17 3	95 3	107 5	25 2	142 6	7 2	1057 106	345 29	1125 17	1.39 0.11	34.4	42.0	Glass Buttes 7
Glass Buttes SS	14	GLB-SS4	40 ± 7	9 3	85 3	100 7	27 3	137 7	5 2	999 97	323 47	1109 13	1.30 0.11	41.3	42.4	Glass Buttes 7
Glass Buttes SS	11	GLB-SS1	40 ± 6	16 3	88 3	105 7	25 3	137 7	6 2	1120 97	351 47	1131 13	1.45 0.11	41.3	41.8	Glass Buttes 7
Glass Buttes SS	13	GLB-SS3	35 ± 6	18 2	83 3	107 7	30 3	142 7	9 1	1335 97	395 47	1183 13	1.65 0.11	41.0	39.8	Glass Buttes 7
Juniper Spring B	9	JUNIP-B9	39 ± 7	15 4	96 3	94 9	25 3	137 8	7 2	801 97	325 47	1253 14	1.18 0.11	37.3	47.9	Glass Buttes 7
Juniper Spring Hill	11	JUNIP-A11	48 ± 7	16 4	98 3	90 9	28 3	129 8	8 2	897 97	372 47	1199 13	1.22 0.11	32.9	44.3	Glass Buttes 7
Musser Reservoir	7	MUSSR-C7	39 ± 6	16 2	91 3	97 7	27 3	132 7	7 2	992 97	374 47	1206 13	1.43 0.11	37.9	46.5	Glass Buttes 7
Glass Buttes	2	GLB-JJ2	85 ± 6	13 3	77 3	125 7	32 3	167 7	9 2	1817 98	507 48	1091 13	2.11 0.11	39.2	37.1	Glass Buttes 8
Glass Buttes	3	GLB-JJ3	43 ± 7	11 3	72 3	129 7	27 3	171 7	6 2	1605 97	368 47	1020 13	1.82 0.11	48.7	36.4	Glass Buttes 8
Glass Buttes	4	GLB-JJ4	43 ± 6	12 3	75 3	131 7	30 3	166 7	9 2	1763 98	392 48	1081 13	2.04 0.11	50.5	37.0	Glass Buttes 8

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Site	Specimen		Trace Element Concentrations											Ratios		Geochemical Source
	No.	Catalog No.	Zn	Pb	Rb	Sr	Y	Zr	Nb	Ti	Mn	Ba	Fe ₂ O ₃ ^T	Fe:Mn	Fe:Ti	
Glass Buttes	5	GLB-JJ5	68 ± 6	16 3	80 3	137 7	32 3	172 7	5 2	1859 98	439 48	1115 13	2.07 0.11	45.1	35.6	Glass Buttes 8
Glass Buttes	1	GLB-JJ1	53 ± 7	13 3	79 3	139 7	33 3	178 7	9 2	1729 98	424 48	1100 13	2.04 0.11	46.1	37.7	Glass Buttes 8
Glass Buttes VV	29	GLB-VV4	48 ± 6	12 3	79 3	127 7	30 3	167 7	9 2	1735 98	399 48	1033 13	2.00 0.11	48.5	36.8	Glass Buttes 8
Glass Buttes VV	28	GLB-VV3	40 ± 7	11 3	75 3	128 7	29 3	169 7	10 2	1617 97	378 47	1014 13	1.87 0.11	48.3	37.1	Glass Buttes 8
Glass Buttes VV	30	GLB-VV5	62 ± 6	16 2	75 3	129 7	30 3	172 7	9 1	2056 98	452 48	1108 13	2.27 0.11	47.9	35.3	Glass Buttes 8
Glass Buttes VV	26	GLB-VV1	39 ± 7	16 3	76 3	134 7	28 3	169 7	7 2	1773 98	405 48	1028 13	2.04 0.11	48.8	36.9	Glass Buttes 8
Glass Buttes VV	27	GLB-VV2	37 ± 7	12 3	81 3	134 7	32 3	172 7	12 2	1845 98	408 48	1060 13	2.07 0.11	48.9	35.8	Glass Buttes 8
Musser Reservoir	6	MUSSR-C6	45 ± 6	10 3	80 3	128 7	29 3	164 7	5 2	1764 98	410 48	1126 13	2.08 0.11	49.0	37.7	Glass Buttes 8
Glass Buttes	4	GLB-PP4	46 ± 6	16 3	107 3	14 7	59 3	96 7	10 2	548 96	289 47	630 13	0.63 0.11	24.3	39.4	Glass Buttes 9
Glass Buttes	5	GLB-PP5	43 ± 6	19 2	109 3	14 7	59 3	97 7	11 1	526 96	383 47	618 13	0.75 0.11	20.6	47.9	Glass Buttes 9

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