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Portenga, E.W., Bierman¸ P.R., Trodick, C.D., Jr., Greene, S.E., DeJong, B.D., Rood, D.H., and Pavich, M.J., 2016, Background rates of erosion and sediment generation in the Potomac River basin, USA, derived using in situ ^{10}Be, meteoric ^{10}Be, and ^{9}Be: GSA Bulletin, doi:10.1130/B31543.1.

DATA REPOSITORY TABLES

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DETAILED METHODS

We collected stream sediment from 70 subcatchments within the Potomac River watershed (main text Figure 2, Table DR1) for analysis of in situ-produced ^{10}Be, meteoric ^{10}Be, weathered ^{9}Be in the reactive phase, and unweathered ^{9}Be left remaining in the mineral phase ($^{10}Be_i$, $^{10}Be_m$, $^{9}Be_{reac}$, and $^{9}Be_{min}$, respectively). Samples from each catchment were used for $^{10}Be_m$ analysis (*n* = 70); sufficient amounts of pure quartz was extracted from samples for the majority of catchments (*n* = 62) from which $^{10}Be_i$ was used to calculate basin-averaged, long-term erosion rates; $^{9}Be_{reac}$ was measured on aliquots of all samples (*n* = 70); $^{9}Be_{min}$ was successfully extracted from bulk sediment from 57 of the 70 catchments. $^{10}Be_m$ was measured from sandier intervals of core sediment from the Hybla Valley (Core 7) (Litwin et al., 2013).

All samples were processed at the University of Vermont Cosmogenic Nuclide Laboratory (www.uvm.edu/~cosmolab). $^{9}Be_{reac}$ was extracted from sediment grain coatings by leaching ~0.25 g of powdered sediment in 2 mL of 6 M HCl in centrifuge tubes for 24 h. Subsequent leaching experiments show that native ^{9}Be, that which is naturally found in situ within mineral crystal lattices, remains locked in the mineral grains and does not interfere with ^{9}Be sample measurement (Greene et al., 2015). Samples were diluted with 10 mL of 0.2 M HNO3 and 0.1 M HCl in order to match the matrix of multi-element inductively coupled plasma optical emission spectrometry (ICP-OES) standard solutions. Diluted samples were weighed and centrifuged at 3,200 rpm for 5 min and the supernatant was transferred to a clean centrifuge tube for analysis using ICP-OES. Beryllium emission was measured with the monochromator at 313.107 nm. The mass of the sample and the solution added were used to calculate atoms of ^{9}Be per gram of sample. ^{10}Be concentrations are 8–9 orders of magnitude lower than ^{9}Be concentrations, well below the detection limit of the ICP-OES and thus do not interfere with ^{9}Be measurements.

$^{9}Be_{min}$ was extracted from the same sample material as $^{9}Be_{reac}$. Following the HCl leaching, sediment was rinsed with MilliQ water and dried. Material from each sample was digested in 2.5 Ml of 1:1 HNO_3 in a beaker heated to 95 °C and refluxed for 15 min; refluxing was done twice more with 1 mL of concentrated HNO_3 added after each reflux. Samples were heated for two hours at 95 °C until ~1 mL of solution remained in the beaker. Samples were colled and 1 mL of 18 MΩ water and 1 mL of 30% H_2O_2 was added. Samples were covered and heated to 85 °C for 1 h. Following a second cooling step, an additional 1 mL of 30% H_2O_2 was added and heated at 85 °C for another hour. The H_2O_2 step was repeated in full and samples were then heated for ~2 h at 95 °C or until there was ~1 mL of solution remaining in the beaker. Samples were cooled again and a mixture of 3 mL of concentrated HF with 1% H_2SO_4, 0.5 mL of concentrated HNO_3, and 1 mL of concentrated $HClO_4$ were added to each beaker. Samples were covered, left overnight at 105 °C, and evaporated the next morning at 110 °C until dry. Samples were subsequently heated to 230 °C to drive off $HClO_4$. Samples were then cooled and gravimetrically diluted with 0.01 M HNO_3 and analyzed using ICP-OES. Often, white crystalline TiO_2 was observed at the end of the leaching steps and was subsequently centrifuged before ICP-OES analysis. Such a precipitate has been previously observed in $^{10}Be_i$ digestions and does not appear to incorporate beryllium (Hunt et al., 2008).

$^{10}Be_m$ samples were powdered and spiked with ~300 μg of ^9Be standard solution (SPEX 1000 ppm; $^9Be_{spex}$; Table DR2). A modification of Stone's (1998) total fusion method was used to extract $^{10}Be_m$ from each sample as a beryllium-hydroxide gel, which was subsequently ignited to produce BeO and mixed with Nb powder at a 1:1 molar ratio before being packed into stainless steel accelerator mass spectrometry (AMS) cathodes. Samples were processed in batches of 16 including one full process blank.

Samples processed for $^{10}Be_i$ (Table DR2) were first etched in 6 N HCl and then in a series of 1% HF/HNO_3 acids to dissolve all carbonates and remove grain coatings and non-quartz minerals (Kohl and Nishiizumi, 1992). Each sample was then heated to 500 °C for 5 h to burn off any organic material, including coal. Some samples required further density separations using sodium-polytungstate to isolate quartz. All quartz was then etched for one week in 0.5% HF/HNO_3 and tested for purity (that is <100 ppm Al, Fe, Ti and ~10 ppm Na, Ca, K). About 20 g of pure quartz was dissolved in HF along with ~250 μg ^9Be carrier ($^9Be_{carr}$; ^9Be carrier 285–2A, created in-house from beryl, $\rho = 1.012$ g mL^{-1}). Aliquots from each sample were analyzed to demonstrate that the only substantial ^9Be in each $^{10}Be_i$ sample was that added as a carrier, ensuring erosion rate determinations are accurate (Portenga et al., 2015). Beryllium was subsequently isolated from Fe, Ti, and Al using procedures outlined in Corbett et al. (2011), oxidized, and mixed with Nb at a 1:1 molar ratio before being packed into stainless steel AMS cathodes. All sample batches (12 unknowns) contained one full process blank.

$^{10}Be_m/^9Be_{spex}$ and $^{10}Be_i/^9Be_{carr}$ ratios were measured at the Lawrence Livermore National laboratory Center for AMS and normalized to the AMS beryllium standard, 07KNSTD, assuming a nominal standard ratio of 2.85×10^{-12} (Nishiizumi et al., 2007; Table DR2). $^{10}Be_i$ and $^{10}Be_m$ concentrations presented here, and used in subsequent analyses, were derived from blank-corrected $^{10}Be_m/^9Be_{spex}$ and $^{10}Be_i/^9Be_{carr}$ AMS ratios ($2.11 \times 10^{-14} \pm 9.31 \times 10^{-15}$ for meteoric ^{10}Be, n = 6; $1.23 \times 10^{-14} \pm 5.41 \times 10^{-16}$ for in situ ^{10}Be, n = 5), which include all AMS measurement uncertainties and the propagated uncertainty of the average process blank ratio (Table DR3).

We summarized $^{10}Be_i$ production across each sampled basin to a single point in space and calculated basin-scale erosion rates from $^{10}Be_i$ data using the CRONUS online calculator (Balco et al., 2008, main calculator version 2.1, wrapper script 2.2, objective function 2.0, constants 2.2.1, muons 1.1; main text Table 1), incorporating standard atmospheric pressure and a sample thickness of 1 cm. ^{10}Be production rates were scaled from global production rates at high latitude-sea level using Lal's (1991) and Stone's (2000) polynomials. The effective elevation (Portenga and Bierman, 2011), mean latitude, and mean longitude for each catchment were used as input parameters to the CRONUS calculator. Some sampled catchments are nested within others; thus, we derive effective erosion rates for unnested portions of larger catchments following Granger et al. (1996). $^{10}Be_i$ erosion rates referred to in the remainder of this study are either the CRONUS erosion rates for unnested catchments or the effective erosion rates. In this way, erosion rates and catchment data are assigned to unoverlapped portions of the field area. $^{10}Be_i$ erosion rates were converted to long-term sediment fluxes using a bulk rock density of 2.7 g/cm^3.

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Table DR1 - Sample Basin Location Data

Sample ID[a]	USGS Gauging Station ID	Latitude (°N)	Longitude (°W)	Mean Latitude (°N)[b]	Mean Longitude (°W)[b]	Mean Elevation (m asl)[b]	Average Basin Slope (°)	Basin Area (km^2)	Basin Relief (m)	Phys. Prov.[c]	Land-use[d]	Mean Annual Precip ($cm\ yr^{-1}$)
POT01	01646580	38.9306	77.1161	39.1646	78.3821	387	8.8	30000	1482	VR	T	100
POT02	01650500	39.0647	77.0284	39.1077	77.0333	130	3.5	55	90	P	U	107
POT04	01647740	39.1059	77.1250	39.1480	77.1409	143	3	44	96	P	U	105
POT05	01647720	39.1179	77.1009	39.1463	77.0953	140	2.8	24	74	P	U	106
POT06	01638500	39.2724	77.5462	39.1331	78.5789	432	10	25021	1425	VR	T	100
POT09	01656120	38.6401	77.5123	38.6458	77.6740	113	2.8	459	359	P	A	103
POT10	01631000	38.9142	78.2100	38.3639	78.8516	494	9.4	4227	1211	VR	F	102
POT11	01603000	39.6215	78.7737	39.5320	79.0409	658	10.5	2274	1080	AP	F	108
POT12	01614500	39.7157	77.8242	39.9156	77.7381	266	5.6	1321	628	VR	A	102
POT13	01639000	39.7157	77.8242	39.8122	77.2481	192	3.1	449	507	P	A	105
POT14		39.5870	77.4641	39.5889	77.4863	477	8.7	15	298	BR	F	111
POT15		39.3069	77.6511	39.2838	77.6720	167	4.9	33	357	BR	A	100
POT16		39.7084	77.4116	39.7046	77.4442	361	8.2	27	296	BR	F	109
POT17		39.4797	77.3276	39.4753	77.2971	152	5.4	10	109	P	A	101
POT18		39.2107	77.3108	39.2305	77.3077	173	5	14	86	P	A	102
POT19		39.1543	77.1320	39.1742	77.1376	155	2.6	15	66	P	A	105
POT20		39.0218	76.8604	39.0238	76.8481	53	2	25	56	C	U	108
POT21		38.8312	76.9197	38.8347	76.9004	79	2.7	18	42	C	U	105
POT22		38.7554	76.8417	38.7840	76.8573	73	1.8	27	40	C	U	105
POT23		38.7590	76.9419	38.7815	76.9091	76	2.2	30	47	C	U	105
POT24		38.6645	76.8794	38.6820	76.8701	69	0.9	11	21	C	A	105
POT25		38.5421	77.0176	38.5761	76.9937	57	2.8	42	55	C	F	104
POT26		38.4229	77.2132	38.4612	77.2141	33	1.8	36	43	C	F	101
POT27		38.4830	77.0841	38.5142	77.0821	47	3.4	22	52	C	F	103
POT28		38.4417	77.5406	38.4614	77.5592	99	2.9	16	61	P	F	104
POT29		38.5664	77.6727	38.5507	77.6748	109	2.2	10	63	P	F	104
POT30		38.6293	77.7641	38.6472	77.7873	140	1.9	22	81	P	A	105
POT31		38.6688	77.5374	38.6784	77.5692	74	1.4	27	54	P	A	100
POT32		38.6174	77.3721	38.6389	77.4061	108	3.7	21	66	P	F	101
POT33		38.7818	77.3880	38.8084	77.3677	110	4.1	44	94	P	U	101
POT34		38.7980	77.3519	38.8216	77.3337	121	4	16	74	P	U	102
POT35		38.9593	77.5383	38.9644	77.5740	110	2.5	23	69	P	A	101
POT36		38.9508	77.7196	38.9100	77.7497	184	5.4	64	291	P	A	104
POT37		39.0616	77.7543	39.0953	77.8036	210	5.3	49	431	BR	A	102
POT38		39.0828	78.1264	39.0804	78.1632	216	2.9	13	55	VR	A	96
POT39		38.9735	78.0820	38.9555	78.0571	377	11.6	13	533	BR	F	103
POT40		38.7358	78.5306	38.7440	78.5545	605	13.8	9	441	VR	F	103
POT41		38.3471	78.6120	38.3203	78.6222	602	17.5	14	545	BR	F	110
POT42		38.2510	78.8920	38.2594	78.9283	369	3.9	16	148	VR	A	98
POT43		38.1014	78.8603	38.0935	78.8106	575	13.8	26	521	BR	F	111
POT44		37.9403	78.9682	37.9132	79.0043	693	16.3	30	674	BR	F	117
POT45		38.5582	79.1520	38.5328	79.1694	990	21.9	29	635	VR	F	113
POT46		38.4926	79.6653	38.4727	79.6798	1198	12.7	16	295	VR	F	133
POT47		38.8096	78.9457	38.8210	78.9278	595	13.1	16	369	VR	F	95
POT48		39.0700	78.9575	39.0436	78.9278	391	11.4	13	712	VR	F	92
POT49		39.1374	78.7717	39.1385	78.8125	651	11.7	27	481	VR	F	101
POT50		38.8895	79.4031	38.9115	79.4140	1150	19	20	754	VR	F	132
POT51		39.2373	79.4490	39.2320	79.4714	868	9.2	14	251	AP	F	131
POT52		39.3484	79.2851	39.3621	79.3090	844	6.1	20	272	AP	F	123
POT53		39.3986	79.1334	39.3709	79.1249	720	11.1	22	497	AP	F	110
POT54		39.4552	78.8041	39.4412	78.7895	324	15.6	5	312	VR	F	92
POT55		39.4578	79.2281	39.4464	79.2536	804	8.5	17	282	AP	F	118
POT56		39.5134	79.1549	39.5280	79.1998	716	13.3	30	385	AP	F	113
POT57		39.6034	79.0791	39.6246	79.0900	740	12.7	6	291	AP	F	110
POT58		39.5657	78.9799	39.5436	78.9634	704	10.2	10	410	AP	F	105
POT59		39.8191	78.9376	39.7944	78.9178	734	9	17	190	AP	F	107
POT60		39.9059	78.8355	39.9119	78.8502	707	10.9	6	314	AP	A	108
POT61		39.8933	78.6019	39.8905	78.6265	602	13.9	9	410	VR	F	101
POT62		39.6870	78.5858	39.6955	78.6093	367	13.1	29	332	VR	F	95
POT63		39.4712	78.4380	39.4651	78.4584	424	10.7	18	419	VR	F	96
POT64		39.7955	78.2547	39.7878	78.2925	341	8.7	21	356	VR	F	96
POT65		39.8615	78.3017	39.8874	78.2867	430	9	12	258	VR	F	98
POT66		40.0180	78.0401	40.0377	78.0259	309	7.5	10	94	VR	F	99
POT67		40.1773	77.6630	40.2034	77.6386	438	12.1	25	408	VR	F	105
POT68		39.8671	77.2227	39.8900	77.2197	171	2.4	12	69	P	A	104
POT69		39.8794	77.2936	39.9043	77.3101	237	4.9	11	312	BR	A	105
POT70		39.9163	77.7482	39.9271	77.7767	196	3.3	13	113	VR	A	101
POT71		39.9505	77.4445	39.9720	77.4291	558	8.7	12	214	BR	F	114
POT72		39.5675	77.0598	39.5648	77.0250	205	4.8	23	127	P	A	107
POT73		39.6610	76.9482	39.6687	76.9185	247	5.7	15	146	P	A	108

[a] $^{10}Be_m$ and ^{9}Be were measured from all samples; $^{10}Be_i$ was measured for samples in bold; $^{9}Be_{min}$ was measured for samples in italics.

[b] Basin metrics used as input for calculating erosion rates using the CRONUS erosion rate calculator (Balco et al., 2008), following methods presented in Portenga and Bierman (2011).

[c] Physiographical provinces. AP - Appalachian Plateau; BR - Blue Ridge; C - Coastal Plain; P - Piedmont; VR - Valley and Ridge.

[d] Predominant land-use for each catchment. A - Agriculture; F - Forest; T - Trunk stream (mostly forested); U - Urban.

Table DR2 - Sample Preparation Data and AMS Measurement Ratios

Sample ID	$^{10}Be_i$ Quartz Mass (g)	$^{9}Be_{carr}$ Mass (μg)	Blank Corrected $^{10}Be_i/^{9}Be_{carr}$ Measured Ratio x10^{-13} (± 1SD)	$^{10}Be_m$ Sample Mass (g)	$^{9}Be_{spex}$ Mass (μg)	Blank Corrected $^{10}Be_i/^{9}Be_{spex}$ Measured Ratio x10^{-12} (± 1SD)
Potomac River data from this study						
POT01	20.2835	249.1	3.44 ± 0.070	0.551	300.4	5.31 ± 0.116
POT02	21.3027	248.8	2.36 ± 0.060	0.519	300.40	2.08 ± 0.030
POT04	20.4721	248.8	2.84 ± 16.312	0.581	301.38	3.31 ± 0.056
POT05	20.3331	248.1	3.11 ± 12.293	0.575	300.40	4.07 ± 0.059
POT06	20.3349	251.0	3.41 ± 11.542	0.456	325.10	5.31 ± 0.058
POT06x				0.512	300.40	6.41 ± 0.059
POT09	20.1183	249.2	5.24 ± 0.015	0.517	299.41	4.17 ± 0.060
POT10	20.2061	250.6	8.15 ± 0.016	0.574	300.40	10.42 ± 0.147
POT11	20.6843	248.3	4.83 ± 0.011	0.459	326.09	8.55 ± 0.086
POT12	20.4943	248.1	6.18 ± 0.012	0.486	325.10	11.82 ± 0.149
POT13	20.4158	248.7	3.66 ± 0.007	0.495	325.10	6.55 ± 0.066
POT14	20.5500	249.2	3.65 ± 0.009	0.475	327.1	18.19 ± 0.225
POT15	22.2406	247.9	4.83 ± 0.011	0.577	300.4	7.55 ± 0.068
POT16	12.4930	248.7	2.45 ± 0.006	0.463	299.4	8.78 ± 0.120
POT17	22.4892	249.5	3.35 ± 0.008	0.474	299.4	9.18 ± 0.109
POT18	19.2144	249.0	3.15 ± 0.008	0.471	300.4	12.20 ± 0.100
POT19	22.4617	249.5	4.08 ± 0.008	0.481	300.4	4.65 ± 0.042
POT20	23.0535	249.8	1.37 ± 0.004	0.462	295.5	0.82 ± 0.011
POT21	22.3728	248.6	5.19 ± 0.123	0.443	304.3	0.76 ± 0.011
POT22	22.5192	247.7	9.86 ± 0.194	0.479	298.4	2.12 ± 0.023
POT23	22.7368	250.5	6.68 ± 0.131	0.479	301.4	1.21 ± 0.018
POT24	20.6337	248.6	8.51 ± 0.145	0.459	301.4	1.68 ± 0.019
POT25	20.7810	248.6	7.50 ± 0.128	0.526	301.4	1.64 ± 0.028
POT26	21.0315	249.7	6.04 ± 0.142	0.491	300.4	1.24 ± 0.019
POT27	22.4813	247.9	11.10 ± 0.194	0.497	298.4	2.52 ± 0.027
POT28	22.3990	247.4	4.04 ± 0.007	0.510	300.4	2.84 ± 0.039
POT29	22.2244	241.1	6.87 ± 0.161	0.474	299.4	17.82 ± 0.272
POT30	20.5498	249.0	3.82 ± 0.009	0.542	300.4	25.48 ± 0.148
POT31	13.1799	249.1	5.05 ± 0.117	0.498	299.4	38.00 ± 0.500
POT32	20.6290	248.3	12.18 ± 0.203	0.545	298.4	1.99 ± 0.022
POT33	22.7229	248.4	9.41 ± 0.144	0.536	300.4	10.50 ± 0.073
POT34	22.7791	251.1	4.11 ± 0.010	0.532	298.4	4.23 ± 0.033
POT35	20.0630	249.3	4.05 ± 0.009	0.533	299.4	17.29 ± 0.120
POT36	18.9722	251.1	5.12 ± 0.009	0.546	300.4	5.02 ± 0.054
POT37	18.4223	249.1	3.03 ± 0.007	0.522	299.4	4.88 ± 0.046
POT38	18.5186	248.3	3.12 ± 0.007	0.514	297.4	23.15 ± 0.230
POT39	20.1190	248.2	6.72 ± 0.156	0.581	299.4	11.55 ± 0.074
POT40	18.2155	250.0	10.26 ± 0.168	0.511	298.4	9.30 ± 0.086
POT41	18.6707	251.3	4.11 ± 0.010	0.524	300.4	10.80 ± 0.058
POT42	18.5351	247.8	12.38 ± 0.205	0.513	300.4	43.45 ± 0.446
POT43	20.4871	250.6	6.73 ± 0.162	0.575	299.4	7.54 ± 0.112
POT44	18.6002	248.4	4.93 ± 0.008	0.546	299.4	9.58 ± 0.092
POT45	17.1618	249.1	2.46 ± 0.006	0.507	299.4	5.52 ± 0.036
POT46	17.2141	250.2	4.07 ± 0.010	0.549	299.4	8.40 ± 0.076
POT47				0.554	298.4	14.41 ± 0.152
POT48	18.6625	251.8	9.68 ± 0.183	0.530	302.4	15.95 ± 0.123

POT49	21.6322	248.5	6.59 ± 0.126	0.539	298.4	11.61 ± 0.129
POT50	21.6409	249.1	6.44 ± 0.142	0.506	300.4	7.28 ± 0.120
POT51	21.4089	249.0	4.88 ± 0.009	0.594	299.4	3.98 ± 0.035
POT52	21.8922	249.2	7.54 ± 0.125	0.551	301.4	17.07 ± 0.262
POT53	14.5076	249.6	4.98 ± 0.008	0.509	300.4	17.94 ± 0.196
POT54				0.539	297.4	9.26 ± 0.072
POT55	8.9300	250.9	2.68 ± 0.006	0.506	300.4	10.45 ± 0.081
POT56				0.555	299.4	7.10 ± 0.055
POT57				0.518	290.5	9.34 ± 0.111
POT58	21.6532	248.7	3.98 ± 0.009	0.544	299.4	8.92 ± 0.082
POT59				0.523	299.4	11.20 ± 0.186
POT60				0.545	300.4	8.26 ± 0.064
POT61	21.6659	249.1	8.27 ± 0.137	0.533	299.4	9.51 ± 0.121
POT62	9.8105	248.3	1.82 ± 0.004	0.539	298.4	10.56 ± 0.143
POT63	21.7010	248.0	8.99 ± 0.148	0.518	300.4	5.45 ± 0.091
POT64	20.0599	249.3	4.22 ± 0.010	0.511	301.4	7.53 ± 0.050
POT65	20.1525	248.7	4.39 ± 0.113	0.508	299.4	5.82 ± 0.032
POT66				0.530	299.4	18.92 ± 0.103
POT67	22.1607	248.0	6.42 ± 0.107	0.519	300.4	2.70 ± 0.018
POT68	21.5883	249.0	3.82 ± 0.009	0.523	299.4	20.36 ± 0.126
POT69	21.9931	249.1	5.43 ± 0.103	0.533	300.4	6.27 ± 0.043
POT70				0.510	306.3	13.32 ± 0.145
POT71	21.9866	248.6	4.61 ± 0.009	0.516	300.4	1.26 ± 0.011
POT72	22.1316	249.8	3.26 ± 0.008	0.530	301.4	9.68 ± 0.110
POT73	22.7059	248.6	3.52 ± 0.008	0.525	300.4	9.24 ± 0.063
Paleo-Potomac River data from the Hybla Valley Core						
R2C45				0.520	298.4	8.25 ± 0.056
R3C55				0.531	301.4	10.78 ± 0.073
R7C10				0.508	299.4	16.16 ± 0.148
R11C30				0.508	301.4	14.84 ± 0.072
R13(AL)20				0.524	299.4	1.00 ± 0.016
R18C55				0.507	301.4	31.28 ± 0.696
R23C25				0.534	305.3	17.76 ± 0.295
R25C45				0.522	299.4	17.05 ± 0.432
R28C35				0.521	300.4	15.60 ± 0.245
R32C65				0.514	300.4	19.80 ± 0.31
R35(AL)(L)30				0.525	299.4	18.25 ± 0.233
R41C10				0.523	299.4	17.72 ± 0.278
R45C10				0.537	302.4	0.84 ± 0.022

Table DR3 - Beryllium Isotope Data

Sample ID[a]	$^{9}Be_{reac}$ (atoms kg^{-1} x10^{19})	$^{9}Be_{min}$ (atoms kg^{-1} x10^{19})	$^{9}Be_{diss}$ (atoms kg^{-1} x10^{19})[b]	$^{10}Be_i$ LLNL #	$^{10}Be_i$ ± 1SD (atoms g^{-1} x10^{5})	$^{10}Be_i$ Prod. Rate (atoms g^{-1} yr^{-1})[c]	$^{10}Be_m$ LLNL #	$^{10}Be_m$ ± 1SD (atoms g^{-1} x10^{8})[d]	$^{10}Be_m$ Deposition Rate (atoms cm^{-2} yr^{-1} x10^{6})[e]
Potomac River data from this study									
POT01	2.77	4.91	9.03	BE29062	2.83 ± 0.055	5.72	BE27095	1.93 ± 0.042	1.89
POT02	1.48	1.99	13.24	BE29063	1.84 ± 0.045	4.49	BE27096	0.81 ± 0.012	2.02
POT04	2.05	5.36	9.30	BE29064	2.31 ± 0.059	4.55	BE27097	1.15 ± 0.020	1.98
POT05	2.18	3.74	10.79	BE29066	2.54 ± 0.062	4.53	BE27098	1.42 ± 0.021	2.00
POT06	3.09	6.71	7.04	BE29067	2.81 ± 0.068	6.03	BE27778	2.53 ± 0.028	1.89
POT06x							BE27099	2.51 ± 0.023	1.89
POT09	2.24	4.75	9.72	BE29068	4.34 ± 0.123	4.37	BE27100	1.61 ± 0.023	1.93
POT10	3.15	3.43	10.13	BE29069	6.76 ± 0.133	6.19	BE27101	3.65 ± 0.051	1.90
POT11	13.01			BE29070	3.88 ± 0.091	7.22	BE27779	4.06 ± 0.041	2.05
POT12	6.93	8.06	1.72	BE29071	5.00 ± 0.096	5.16	BE27780	5.28 ± 0.067	1.95
POT13	7.24	10.81	0.00	BE29072	2.98 ± 0.058	4.8	BE27781	2.88 ± 0.029	2.01
POT14	3.39	3.30	10.02	BE29073	2.96 ± 0.07	6.18	BE27782	8.37 ± 0.103	2.11
POT15	2.74	3.55	10.42	BE29074	3.60 ± 0.085	4.65	BE27762	2.63 ± 0.024	1.89
POT16	2.62	4.16	9.93	BE29086	3.26 ± 0.079	5.59	BE27763	3.79 ± 0.052	2.08
POT17	3.64	7.40	5.67	BE29075	2.48 ± 0.059	4.58	BE27764	3.88 ± 0.046	1.92
POT18	3.46	16.26	0.00	BE29077	2.72 ± 0.065	4.67	BE27765	5.20 ± 0.043	1.93
POT19	2.13	6.97	7.61	BE29078	3.03 ± 0.059	4.59	BE27766	1.94 ± 0.018	1.98
POT20	0.78	0.00	15.93	BE29079	0.99 ± 0.025	4.15	BE27767	0.35 ± 0.005	2.03
POT21	0.55	0.00	16.16	BE29080	3.85 ± 0.091	4.28	BE27768	0.35 ± 0.005	1.97
POT22	0.83	0.00	15.88	BE29081	7.25 ± 0.142	4.25	BE27769	0.88 ± 0.010	1.97
POT23	0.62	0.46	15.63	BE29088	4.92 ± 0.097	4.26	BE27770	0.51 ± 0.008	1.97
POT24	0.39	0.57	15.75	BE29089	6.85 ± 0.117	4.2	BE27771	0.74 ± 0.008	1.96
POT25	0.58	0.83	15.31	BE29090	6.00 ± 0.103	4.16	BE27105	0.63 ± 0.011	1.94
POT26	0.49	0.39	15.83	BE29091	4.79 ± 0.113	4.06	BE27772	0.51 ± 0.008	1.88
POT27	1.16	0.53	15.02	BE29082	8.18 ± 0.143	4.11	BE27773	1.01 ± 0.011	1.92
POT28	0.90	1.39	14.43	BE29083	2.98 ± 0.05	4.33	BE27774	1.12 ± 0.015	1.94
POT29	9.25	10.97	0.00	BE29092	4.98 ± 0.117	4.34	BE27775	7.52 ± 0.115	1.94
POT30	5.29	1.71	9.71	BE29093	3.09 ± 0.074	4.47	BE27776	9.44 ± 0.055	1.96
POT31	15.12			BE29094	6.38 ± 0.148	4.21	BE28973	15.27 ± 0.201	1.87
POT32	1.33	2.48	12.90	BE29095	9.80 ± 0.163	4.35	BE28974	0.73 ± 0.008	1.89
POT33	3.88	7.95	4.88	BE29084	6.88 ± 0.105	4.38	BE28975	3.93 ± 0.027	1.89
POT34	2.17	5.62	8.92	BE29085	3.03 ± 0.072	4.41	BE28976	1.58 ± 0.012	1.91
POT35	6.15	9.51	1.05	BE29096	3.36 ± 0.079	4.37	BE28977	6.49 ± 0.045	1.90
POT36	2.37	5.13	9.21	BE29097	4.53 ± 0.083	4.7	BE29391	1.85 ± 0.020	1.96
POT37	2.50	5.30	8.91	BE29099	2.74 ± 0.065	4.83	BE29392	1.87 ± 0.018	1.92
POT38	11.40	3.64	1.67	BE29100	2.80 ± 0.066	4.86	BE29393	8.95 ± 0.089	1.81
POT39	11.40	11.67	0.00	BE29101	5.54 ± 0.128	5.65	BE29394	3.98 ± 0.026	1.94
POT40	4.81	3.32	8.58	BE29102	9.41 ± 0.154	6.86	BE29395	3.63 ± 0.034	1.93
POT41	4.57	12.28	0.00	BE29103	3.70 ± 0.086	6.5	BE29396	4.14 ± 0.022	2.04
POT42	14.00			BE29104	11.11 ± 0.183	5.49	BE29397	17.00 ± 0.175	1.82
POT43	2.92	2.67	11.12	BE29105	5.50 ± 0.133	6.55	BE27106	2.62 ± 0.039	2.05
POT44	2.93	4.49	9.29	BE29106	4.40 ± 0.075	7.12	BE29398	3.51 ± 0.034	2.15
POT45	4.20	7.30	5.21	BE29107	2.39 ± 0.055	9.19	BE29399	2.18 ± 0.014	2.11
POT46	2.87			BE29108	3.96 ± 0.093	10.82	BE29401	3.06 ± 0.028	2.48
POT47	9.62						BE29402	5.19 ± 0.055	1.78
POT48	13.57	15.76	0.00	BE29109	3.73 ± 0.165	5.64	BE29403	6.08 ± 0.047	1.73
POT49	5.42	7.09	4.20	BE29110	5.06 ± 0.096	7.06	BE29404	4.30 ± 0.048	1.91
POT50	6.39	11.36	0.00	BE29111	4.95 ± 0.109	10.6	BE27107	2.89 ± 0.047	2.48
POT51	7.04	2.34	7.33	BE29112	3.79 ± 0.073		BE29405	1.34 ± 0.012	2.48
POT52	7.97	4.28	4.46	BE29113	5.74 ± 0.095		BE29406	6.24 ± 0.096	2.33
POT53	16.60			BE29114	5.72 ± 0.096		BE29407	7.08 ± 0.077	2.09
POT54	9.25						BE29408	3.42 ± 0.026	1.75
POT55	5.07	3.48	8.16	BE29115	5.03 ± 0.12		BE29409	4.15 ± 0.032	2.24
POT56	5.95						BE29410	2.56 ± 0.020	2.15
POT57	7.79						BE29411	3.50 ± 0.042	2.10
POT58	18.18	3.92	0.00	BE29116	3.06 ± 0.072		BE27108	3.28 ± 0.030	2.00
POT59	6.64						BE29412	4.28 ± 0.071	2.04
POT60	4.48						BE29413	3.04 ± 0.024	2.07
POT61	2.42	3.60	10.69	BE29117	6.35 ± 0.105		BE29414	3.57 ± 0.045	1.93
POT62	6.72	21.30	0.00	BE29118	3.07 ± 0.076		BE29416	3.91 ± 0.053	1.81
POT63	3.76	3.48	9.47	BE29119	6.86 ± 0.113		BE27109	2.11 ± 0.035	1.82
POT64	3.57	3.62	9.52	BE29120	3.50 ± 0.082		BE29417	2.97 ± 0.020	1.83
POT65	2.94	3.37	10.40	BE29122	3.62 ± 0.093		BE29418	2.29 ± 0.012	1.88
POT66	9.51						BE29419	7.14 ± 0.039	1.90
POT67	1.87	0.00	14.84	BE29123	4.80 ± 0.08		BE29420	1.05 ± 0.007	2.02
POT68	10.25	12.53	0.00	BE29124	2.94 ± 0.069		BE29421	7.79 ± 0.048	1.99
POT69	3.02	3.39	10.30	BE29125	4.11 ± 0.078		BE29422	2.36 ± 0.016	2.01
POT70	9.96						BE29423	5.35 ± 0.058	1.93
POT71	0.42	0.53	15.76	BE29126	3.48 ± 0.066		BE29424	0.49 ± 0.004	2.18
POT72	2.88	14.88	0.00	BE29127	2.46 ± 0.058		BE29425	3.68 ± 0.042	2.04
POT73	2.60	17.64	0.00	BE29128	2.58 ± 0.061		BE29426	3.53 ± 0.024	2.06
Potomac River data from Brown et al. (1988)									
01638500								3.81	1.89
01643000								7.69	1.98
01610200								4.14	1.84

[a] Sample IDs for Brown et al.'s (1988) samples are USGS gauging station identification numbers.

[b] $^{9}Be_{diss}$ was estimated by subtracting measured $^{9}Be_{reac}$ and $^{9}Be_{min}$ concentrations from an assumed crustal $^{9}Be_{parent}$ concentration of 2.5 ppm (von Blanckenburg et al., 2012).

[c] $^{10}Be_i$ production rate calculated using the CRONUS calculator (main calculator version 2.1, wrapper script 2.2, objective function 2.0, constants 2.2.1, muons 1.1; Balco et al., 2008), a global ^{10}Be production rate scaled from high latitude and sea level using Lal's (1991) and Stone's (2000) scaling factors.

[d] $^{10}Be_m$ concentrations from Brown et al. (1988) were recalculated from originally-reported $^{10}Be_m/^{9}Be_{carr}$ AMS ratios to account for recent constraints of the ^{10}Be half-life (see Supplementary Information).

[e] $^{10}Be_m$ deposition rates derived from Graly et al.'s (2011) equations, using the mean annual precipitation rate (Table 1) and mean latitude for each catchment.

Table DR4 - Hybla Valley Core Data

Sample ID	Core Depth (m)	$^{10}Be_m$ LLNL #	Core Age (ka)[a]	$^{10}Be_m$ ± 1SD (atoms g^{-1}) x10^5	Erosion Index
R2C45	0	BE29438	17	0.38 ± 0.006	0.06
R3C55	1	BE29431	17	5.88 ± 0.029	0.97
R7C10	5	BE29439	32	12.43 ± 0.277	2.04
R11C30	9	BE29441	49	6.54 ± 0.165	1.07
R13(AL)20	9	BE29443	51	7.73 ± 0.121	1.27
R18C55	14	BE29427	70	3.17 ± 0.022	0.52
R23C25	17	BE29428	84	4.09 ± 0.028	0.67
R25C45	19	BE29440	90	6.79 ± 0.113	1.12
R28C35	21	BE29429	100	6.37 ± 0.059	1.05
R32C65	24	BE29444	113	6.96 ± 0.089	1.14
R35(AL)(L)30	26	BE29442	123	6.01 ± 0.094	0.99
R41C10	31	BE29446	140	6.78 ± 0.106	1.11
R45C10	34	BE29447	156	0.31 ± 0.008	0.05

[a] Core ages derived from age-depth relationships presented in Litwin et al. (2013).