"Incision of paleolake outlet canyons on Mars from overflow flooding"

DOI: 10.1130/G45397.1.

ADDITIONAL DETAILS ON METHODS AND RESULTS

Additional Details on Datasets Used

The topography data analyzed for each of the 24 martian basins are listed in **Table DR3**. MOLA data were analyzed using the global gridded topography at ~463 m/pixel, as well as a masked version of the gridded topography that includes only pixels directly constrained by at least one overlapping point shot. CTX DEMs were produced with the NASA Ames Stereo Pipeline (ASP; Shean et al., 2016; Beyer et al., 2018), and were tied to MOLA point shot data using the pc_align function (Beyer et al., 2018) to reduce errors associated with long wavelength topography. We also employed the ASP hole filling algorithm with a maximum hole dimension of 1000 pixels (~6 km) to remove spatial data gaps in the CTX DEMs. The CTX DEMs were produced with a resolution (post-spacing) of 18 m/pixel. For consistency, the analyzed HRSC DEMs downloaded from the NASA Planetary Data System (PDS) were also tied to MOLA point shot data using the ASP.

For each basin we produced a mosaic of all the analyzed topography (**Table DR3**) using Esri's ArcMap geographic information system (GIS). The mosaic was produced at the maximum resolution amongst the different topographic data covering the basin, and lower resolution data were upsampled to the appropriate resolution using a bilinear interpolation algorithm.

Measurement of Outlet and Basin Morphometry.

Outlet canyon rims were mapped based on a DEM-derived slope map (**Fig. DR2**). Manual mapping of the outlet canyon centerline and rims was completed at a scale of: 1:10,000 to 1:20,000 for mapping on CTX DEMs; 1:50,000 for mapping on HRSC DEMs; and 1:100,000 for mapping on MOLA gridded topography.

Topographic profiles (e.g., **Figs. 1C,D**) were extracted from the DEM data at the following point spacings: 25 m for CTX DEMs (18 m/pixel resolution); 75 m for 50 m/pixel resolution HRSC DEMs; 100 m for 75 m/pixel resolution HRSC DEMs; 150 m for 100 m/pixel resolution HRSC DEMs; 175 m for 125 m/pixel resolution HRSC DEMs; 225 m for 150 m/pixel resolution HRSC DEMs; and 650 m for the MOLA point-shot-constrained gridded data (~463 m/pixel resolution). These length scales are all approximately a factor of $\sqrt{2}$ larger than the data resolution.

Breach depth was calculated as the difference between the pre-breach and post-breach water surface elevations. The outlet breach cross-sectional area was calculated as the area below the pre-breach water surface elevation in the breach profile. The outlet canyon volume was calculated using cross-sectional areas measured from multiple profiles across the canyon (see **Table DR3** for the number of profiles used) and the canyon length. We performed a linear interpolation between cross-sectional areas, starting with the breach cross-sectional area, and extrapolating the most downstream cross-sectional area to the end of the canyon length. For this calculation, we assumed a trapezoidal cross-sectional geometry with canyon sidewalls at a slope of 35°. Where the canyon was too narrow for this geometry to be realistic, we assumed a triangular cross-sectional geometry. The canyon depth was calculated as the elevation difference between the minimum elevation point in the canyon at that profile and the minimum elevation of the intersection points between the profile and the manually mapped canyon rims. The canyon width was calculated as the distance along the profile between the two canyon rim intersection points. Cross-sectional areas from profiles along the outlet canyon were calculated only where we were able to measure both the canyon depth and width.

The post-breach and pre-breach water surface elevations were used to calculate a pre-breach and post-breach lake contour, with the former artificially closed using the line of the manually mapped breach profile (**Figs. 1A,B**). The volume contained between these contours was used to estimate the volume of water drained from the lake during progressive breach incision.

The contour analysis and calculation of the pre-breach, post-breach and drained volume of the basin was completed using the mosaicked topography. All of the other geometric measurements were collected from the original (i.e., non-upsampled) topography data. In making geometric measurements, we only used the point-shot-constrained MOLA data, not the full global gridded dataset.

Power Law Fitting of Results

We fit the relationships between outlet geometry and both drained volume (**Fig. 2**) and potential energy released during the flood (**Fig. 3**) using power law relationships. We conducted this fitting using linear regression on log-transformed data, as opposed to using nonlinear regression. This decision was made based on analysis of the error structure of the data, and using Akaike's information criterion (AIC), following the methods of Xiao et al. (2011). In short, it is shown that linear regression in log-transformed space is more appropriate when the data have multiplicative errors that follow a lognormal distribution, for which there is a simple test using AIC (Xiao et al., 2011).

For all of the power law best-fits to the data shown in this paper (**Figs. 2, 3**), linear regression in log-transformed space was preferred over nonlinear regression using the test of Xiao et al. (2011). The one exception to this is for the power law best-fit to the outlet volume data versus drained potential energy for the catalog of breached basins on Earth, where both linear regression in log-transformed space and nonlinear regression performed equally well. For consistency, we used linear regression in log-transformed space for all of the power law best-fits. An important note from this approach is that the R^2 and p-values given in the paper were calculated in log-transformed space, and therefore cannot be directly compared to the R^2 and p-value of fits to the data in untransformed space. This is the reason why the linear best-fit for outlet volume versus drained volume for the breached martian basins (**Fig. 2C**) has a higher R^2 value than the power law best-fit.

GSA DATA REPOSITORY FIGURES

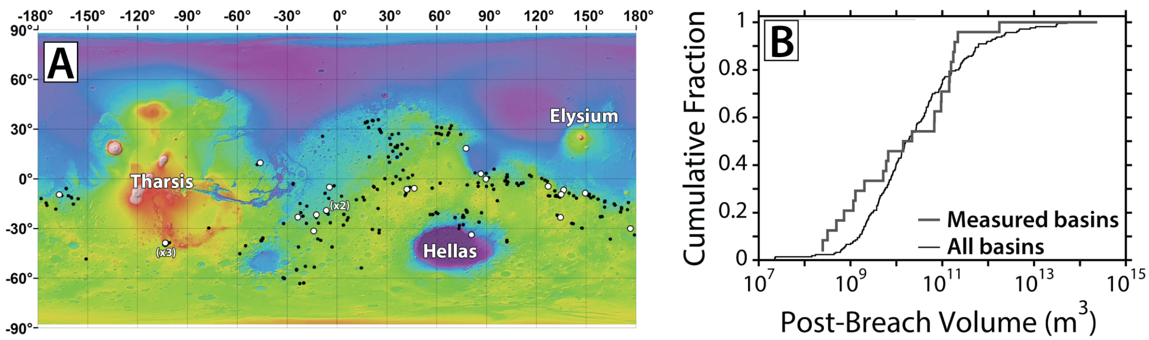

Figure DR1. (A) Spatial distribution of martian paleolake basins measured in this study (large white circles; n = 24; labels in brackets indicate locations where multiple circles overlap) compared with the full catalog of breached martian paleolake basins (small black circles; n = 220) from Fassett and Head (2008a) and Goudge et al. (2016). Mars Orbiter Laser Altimeter (MOLA) global gridded topography overlain on MOLA-derived hillshade. **(B)** Cumulative frequency distribution of post-breach volumes for martian paleolake basins measured in this study (thick gray line; n = 24) compared with breached martian paleolake basins (thin black line; n = 210) from the catalog of Fassett and Head (2008a). Note the similar shape of the two distributions. Post-breach volumes (as opposed to pre-breach or drained volumes) are plotted here, as those are the data available from the catalog of Fassett and Head (2008a). No volume measurements are available from Goudge et al. (2016).

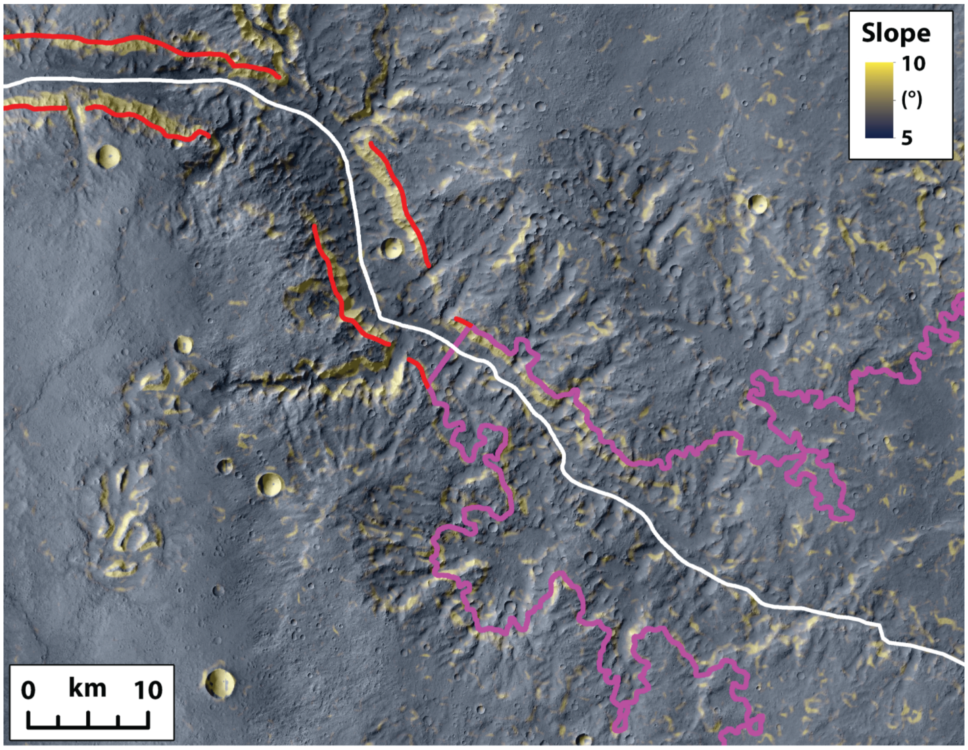

Figure DR2. Slope map for the Parana basin outlet breach (same locations as **Fig. 1B**). The break in slope going from the canyon sidewalls to the exterior terrain was used to identify and map the outlet canyon rims (red lines). White line indicates the outlet canyon centerline (connected to the lowest point in the basin) and magenta line indicates the pre-breach contour. Mosaic of slope maps derived from High Resolution Stereo Camera digital elevation models h4090_0000 and h4101_0000 overlain on Context Camera image G06_020653_1608. North is up.

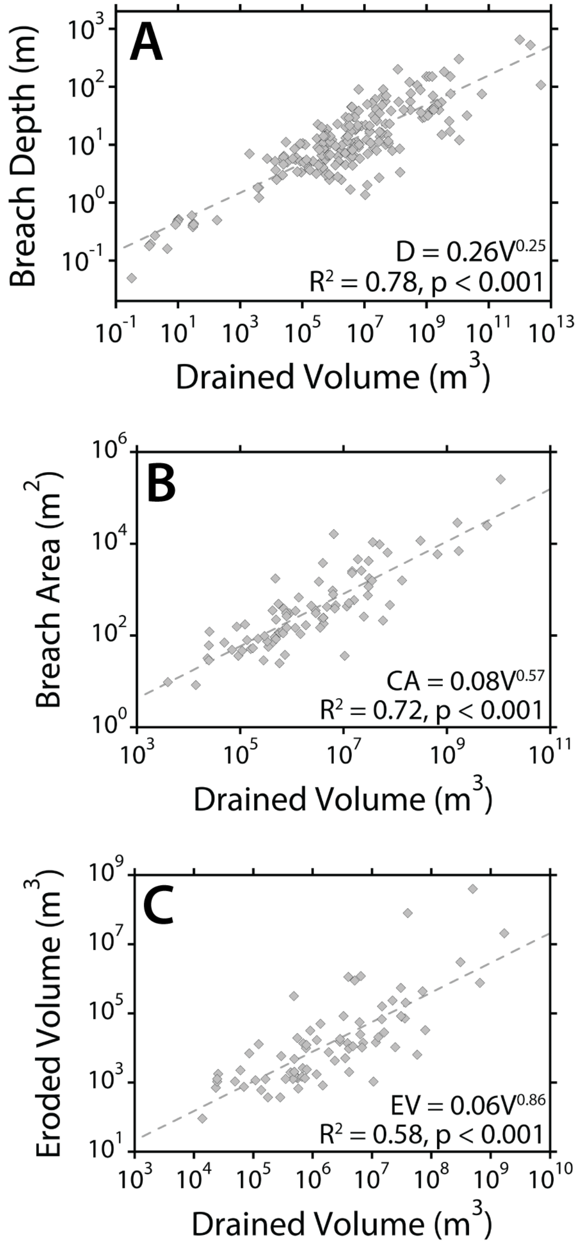

Figure DR3. Breach depth (A), cross-sectional area (B), and eroded embankment volume (C) versus drained volume for breached lake basins on Earth. Light dashed lines are best-fit power laws, with equation, R^2, and p-value shown.

GSA DATA REPOSITORY TABLES

TABLE DR1. FULL RESULTS OF BASIN AND OUTLET GEOMETRY FOR BREACHED MARTIAN PALEOLAKE BASINS.

Lat. (°N)*	**Lon. (°E)***	**Post-Breach Contour (m)**	**Post-Breach Volume (m^3)**	**Pre-Breach Contour (m)**	**Pre-Breach Volume (m^3)**	**Drained Volume (m^3)**	**Breach Depth (m)**	**Breach Cross-Sectional Area (m^2)**	**Outlet Volume (m^3)**	**Original Basin Identification Reference(s)**
-20.99	-14.56	-1060	1.77E+12	-889	5.02E+12	3.26E+12	171	9.15E+05	1.09E+12	Goldspiel and Squyres (1991); Fassett and Head (2008a)
-1.80	84.95	1354	1.88E+11	1504	5.98E+11	4.10E+11	150	1.73E+05	4.89E+10	Fassett and Head (2008a)
0.35	89.54	-246	9.65E+10	191	6.81E+11	5.85E+11	437	9.43E+05	5.19E+10	Cabrol and Grin (2001); Fassett and Head (2008a)
-22.68	-23.69	-922	6.78E+10	-907	8.57E+10	1.78E+10	15	2.42E+04	5.96E+08	Fassett and Head (2008a)
-6.07	42.07	1463	6.73E+10	1573	1.80E+11	1.13E+11	110	7.11E+04	2.76E+09	Cabrol and Grin (2001); Fassett and Head (2008a)
18.56	78.11	-2410	2.20E+11	-2289	3.90E+11	1.69E+11	121	2.13E+05	4.33E+09	Fassett and Head (2005); Fassett and Head (2008a)
-4.31	126.99	1249	9.44E+10	1332	1.63E+11	6.83E+10	83	8.53E+04	6.85E+10	Irwin et al. (2007); Fassett and Head (2008a)
-28.16	177.76	958	2.23E+14	1174	3.64E+14	1.41E+14	216	4.07E+06	8.39E+12	Irwin et al. (2002, 2004); Fassett and Head (2008a)
8.53	-47.94	-1713	1.16E+09	-1679	2.31E+09	1.16E+09	34	1.35E+03	2.52E+07	Fassett and Head (2008a)
-38.98	-103.02	3409	1.42E+10	3488	1.86E+10	4.49E+09	79	4.44E+04	3.93E+08	Fassett and Head (2008a)
-19.17	-6.35	-342	1.43E+11	-264	1.71E+11	2.79E+10	78	4.90E+04	1.54E+08	Fassett and Head (2008a)
-6.43	136.53	-689	5.20E+09	-457	5.63E+10	5.11E+10	232	2.88E+05	2.58E+10	Fassett and Head (2008a)
-9.12	135.08	626	1.74E+11	822	4.83E+11	3.09E+11	196	2.21E+05	3.87E+10	Cabrol and Grin (2001); Fassett and Head (2008a)
-9.42	-167.26	-1437	6.00E+09	-1335	2.55E+10	1.95E+10	102	1.21E+05	2.16E+09	Fassett and Head (2008a)
-23.06	134.14	1816	1.45E+11	1945	3.81E+11	2.36E+11	129	5.90E+04	8.89E+09	Fassett and Head (2008a)
-8.52	149.51	-503	7.29E+08	-475	3.98E+09	3.25E+09	28	2.40E+04	5.20E+09	Fassett and Head (2008a)
-33.84	80.58	-5415	2.20E+10	-5346	4.99E+10	2.79E+10	69	2.87E+04	9.40E+09	Cabrol and Grin (2001); Leverington and Maxwell (2004); Fassett and Head (2008a)
-39.27	-103.55	2740	1.57E+11	2804	1.79E+11	2.26E+10	64	2.69E+04	2.07E+09	Mangold and Ansan (2006); Fassett and Head (2008a)

-18.99	-6.40	-403	3.18E+08	-340	2.60E+09	2.28E+09	63	2.89E+04	7.67E+08	Irwin et al. (2005); Fassett and Head (2008a)
-31.78	-13.76	799	6.67E+09	809	1.01E+10	3.43E+09	10	2.25E+04	2.23E+09	Fassett and Head (2008a)
3.12	86.67	-3059	2.49E+08	-2850	1.31E+10	1.29E+10	209	2.50E+05	1.02E+09	Fassett and Head (2008a)
-5.64	46.40	1978	1.29E+09	2125	6.33E+10	6.20E+10	147	2.16E+05	5.39E+09	Fassett and Head (2008a)
-5.09	-4.47	-1434	4.94E+08	-1401	1.66E+09	1.17E+09	33	3.55E+04	7.66E+08	Fassett and Head (2008a)
-38.81	-103.27	3497	2.02E+09	3535	2.69E+09	6.69E+08	38	1.07E+04	5.34E+07	Goudge et al. (2012, 2016)

*Coordinates are locations where outlet breach geometry was measured for each basin.

TABLE DR2. COMPILATION OF FLOOD AND OUTLET DATA FOR BREACHED TERRESTRIAL LAKE BASINS.

Basin Name/Location	Drained Volume (m^3)	Breach Depth (m)	Breach Cross-Sectional Area (m^2)	Eroded Embankment Volume (m^3)	Reference(s)*
Oirase River; Towada, Japan	6.00E+09	76	2.49E+04	-	Kataoka (2011); Gomez et al. (2012); Manville (2015)
Volcano Creek; Chiginagak, Alaska	3.80E+06	45	-	-	Schaefer et al. (2008); Manville (2015)
Issyk River; Kirgizstan	1.26E+08	55	-	-	Schuster et al. (2002); O'Connor and Beebee (2009)
Schaeffer; USA, Colorado	4.44E+06	30.5	-	-	Costa (1988); O'Connor and Beebee (2009)
Mill River; USA, Massachusetts	2.50E+06	13.1	-	-	Costa (1988); O'Connor and Beebee (2009)
Fred Burr; USA, Montana	7.50E+05	10.2	-	-	Costa (1988); Froehlich (1995a); O'Connor and Beebee (2009)
Tegermach River; Kirgizstan	6.50E+06	90	1.64E+04	-	Glazyrin and Reyzvikh (1968); Costa and Schuster (1991); O'Connor and Beebee (2009)
Porter Hill; USA, Oregon	1.50E+04	2.5	-	-	Costa and O'Connor (1995); O'Connor and Beebee (2009)
North Branch Trib.; USA, Pennsylvania	2.20E+04	5.5	-	-	MacDonald and Langridge-Monopolis (1984); Costa (1988); O'Connor and Beebee (2009)
Naranjo River (Colima); Mexico	1.00E+09	150	-	-	Capra and Macias (2002); O'Connor and Beebee (2009)
Sandy Run ; USA, Pennsylvania	5.67E+04	8.5	-	-	MacDonald and Langridge-Monopolis (1984); O'Connor and Beebee (2009)
DMAD; USA, Utah	1.97E+07	8.8	-	-	Costa (1988); O'Connor and Beebee (2009)
Centralia, Res. No. 3; USA, Washington	1.33E+04	5.2	-	-	Costa (1994); O'Connor and Beebee (2009)
Poerua River; New Zealand	4.00E+06	45	3.83E+03	1.15E+06	Hancox et al. (2005); O'Connor and Beebee (2009)
Unnamed; USA, Washington	6.06E+04	5.5	-	2.27E+03	Carson (2001); O'Connor and Beebee (2009)
Malpasset; France	2.20E+07	61	-	-	Costa (1988); O'Connor and Beebee (2009)
St Francis; USA, California	4.71E+07	56.4	-	-	Costa (1988); Rogers and McMahon (1993); O'Connor and Beebee (2009)
Test 3; Austria	1.82E+00	0.27	-	-	Simmler and Samet (1982); O'Connor and Beebee (2009)

Test 9; Austria	1.32E+00	0.195	-	-	Simmler and Samet (1982); O'Connor and Beebee (2009)
Test 10; Austria	1.18E+00	0.18	-	-	Simmler and Samet (1982); O'Connor and Beebee (2009)
FAFUM; Germany	4.55E+00	0.16	-	-	Bechteler and Kulisch (1994); O'Connor and Beebee (2009)
IMPACT Lab. Trial; Test 5; Series 1; UK	1.80E+02	0.5	-	-	O'Connor and Beebee (2009)
Tunawaea Stream; New Zealand	6.30E+05	18.5	-	-	Jennings et al. (1993); Webby and Jennings (1994); O'Connor and Beebee (2009)
IMPACT Field test 2; Norway	3.30E+04	5	-	-	Vaskinn et al. (2004); O'Connor and Beebee (2009)
IMPACT Field test 3; Norway	6.50E+04	6	-	-	Vaskinn et al. (2004); O'Connor and Beebee (2009)
Laboratory Sim. 1; Peru	3.20E+01	0.44	-	-	Lee and Duncan (1975); O'Connor and Beebee (2009)
Laboratory Sim. 2; Peru	3.00E+01	0.41	-	-	Lee and Duncan (1975); O'Connor and Beebee (2009)
Laboratory Sim. 3; Peru	3.00E+01	0.38	-	-	Lee and Duncan (1975); O'Connor and Beebee (2009)
Laboratory Sim. 4; Peru	3.20E+01	0.42	-	-	Lee and Duncan (1975); O'Connor and Beebee (2009)
CEHIDRO Lab; Portugal	3.25E-01	0.05	-	-	Franca and Almeida (2002); O'Connor and Beebee (2009)
A-1; Thailand	2.80E+01	0.6	-	-	Chinnarasri et al. (2004); O'Connor and Beebee (2009)
A-2; Thailand	2.80E+01	0.6	-	-	Chinnarasri et al. (2004); O'Connor and Beebee (2009)
A-3; Thailand	2.80E+01	0.6	-	-	Chinnarasri et al. (2004); O'Connor and Beebee (2009)
Bairaman River; Papua New Guinea	4.00E+07	70	-	8.00E+07	King et al. (1989); O'Connor and Beebee (2009)
B-1; Thailand	2.80E+01	0.6	-	-	Chinnarasri et al. (2004); O'Connor and Beebee (2009)
B-2; Thailand	2.80E+01	0.6	-	-	Chinnarasri et al. (2004); O'Connor and Beebee (2009)
B-3; Thailand	2.80E+01	0.6	-	-	Chinnarasri et al. (2004); O'Connor and Beebee (2009)
C-1; Thailand	2.80E+01	0.6	-	-	Chinnarasri et al. (2004); O'Connor and Beebee (2009)
C-2; Thailand	2.80E+01	0.6	-	-	Chinnarasri et al. (2004); O'Connor and Beebee (2009)
C-3; Thailand	2.80E+01	0.6	-	-	Chinnarasri et al. (2004); O'Connor and Beebee (2009)
Run 1; Thailand	1.04E+01	0.52	-	-	Chinnarasri et al. (2003); O'Connor and Beebee (2009)
Run 2; Thailand	1.00E+01	0.5	-	-	Chinnarasri et al. (2003); O'Connor and Beebee (2009)
Run 3; Thailand	9.40E+00	0.47	-	-	Chinnarasri et al. (2003); O'Connor and Beebee (2009)
Run 5; Thailand	8.40E+00	0.42	-	-	Chinnarasri et al. (2003); O'Connor and Beebee (2009)

Indus River; Pakistan	1.20E+09	150	-	-	Hewitt (1968); Shroder et al. (1991); O'Connor and Beebee (2009)
ARS Embankment 1, Soil 1; USA, Oklahoma	4.00E+03	1.83	-	-	Hanson et al. (2003); O'Connor and Beebee (2009)
ARS Embankment 1, Soil 2; USA, Oklahoma	4.00E+03	1.83	-	-	Hanson et al. (2003); O'Connor and Beebee (2009)
ARS Embankment 2, Soil 1; USA, Oklahoma	4.00E+03	1.22	-	-	Hanson et al. (2003); O'Connor and Beebee (2009)
ARS Embankment 2, Soil 2; USA, Oklahoma	4.00E+03	1.22	-	-	Hanson et al. (2003); O'Connor and Beebee (2009)
ARS FS#1; USA, Oklahoma	4.00E+03	1.83	9.64E+00	-	Hahn et al. (2000); O'Connor and Beebee (2009)
Rio Mantaro; Peru 28	3.00E+08	55.8	-	-	Snow (1964); O'Connor and Beebee (2009)
Rio Mantaro; Peru	5.00E+08	107	-	4.00E+08	Lee and Duncan (1975); O'Connor and Beebee (2009)
Ching-Shui; Taiwan	1.20E+08	200	-	-	Chang (1984); Hung (2000); O'Connor and Beebee (2009)
Rio San Pedro; Chile	2.50E+09	40	-	-	Davis and Karzulovic (1963); Weischet (1963); Pena and Klohn (1989); O'Connor and Beebee (2009)
Ching-Shui; Taiwan	4.00E+07	90	-	-	Chang (1984); O'Connor and Beebee (2009)
Yigong River; Tibet	3.00E+09	54	-	-	Shang et al. (2003); O'Connor and Beebee (2009)
Trib. of Granite Creek; USA, Alaska	2.52E+07	26	-	-	Lamke (1972); Costa (1988); O'Connor and Beebee (2009)
Foreman Creek; USA, California	2.00E+03	7	-	-	Weber et al. (1986); O'Connor and Beebee (2009)
Navarro River; USA, California	5.43E+05	5.5	-	-	Sowma-Bawcom (1996); O'Connor and Beebee (2009)
Polallie Creek; USA, Oregon	1.05E+05	10.6	-	-	Gallino and Pierson (1985); O'Connor and Beebee (2009)
N. Fork Toutle River; USA, Washington	3.10E+05	9	-	-	Jennings et al. (1981); Costa and Schuster (1991); O'Connor and Beebee (2009)
N. Fork Toutle River; USA, Washington	2.47E+06	4.5	-	-	Costa and Schuster (1991); O'Connor and Beebee (2009)
Gros Ventre River; USA, Wyoming	5.40E+07	15	-	-	Malde (1968); O'Connor and Beebee (2009)

Lugge Tsho; Bhutan	4.80E+07	23	-	-	Richardson and Reynolds (2000); Watanabe and Rothacher (1996); Yamada et al. (2004); O'Connor and Beebee (2009)
Dadu River; China	5.00E+07	70	9.80E+03	-	Dai et al. (2005); O'Connor and Beebee (2009)
Lake Nostetuko; Canada, British Columbia	6.50E+06	38.4	-	1.20E+06	Blown and Church (1985); Evans (1987); Clague and Evans (1994); O'Connor and Beebee (2009)
Queen Bess Lake; Canada, British Columbia	6.50E+06	9	-	-	Kershaw et al. (2005); O'Connor and Beebee (2009)
Keppel Cove Tarn; UK	1.24E+05	10	1.75E+02	1.30E+04	Carling and Glaister (1987); O'Connor and Beebee (2009)
Moraine Lake No. 13; Almatinka River; Kazahkstan	8.64E+04	5.2	-	-	Yesenov and Degovets (1979); O'Connor and Beebee (2009)
Dig Tsho; Nepal	5.10E+06	18	-	9.00E+05	Galay (1985); Vuichard and Zimmermann (1987); Cenderelli and Wohl (2003); O'Connor and Beebee (2009)
Dudh Khosi Valley; Nepal	4.90E+06	30	-	-	Buchroithner et al. (1982); Fushimi et al. (1985); Cenderelli and Wohl (2003); O'Connor and Beebee (2009)
Tam Pokhari Glacier Lake; Nepal	1.77E+07	52	-	-	Dwivedi et al. (2000); O'Connor and Beebee (2009)
Laguna Jancaruish; Quebrada Los Cedros; Peru	8.00E+06	21	-	-	Lliboutry et al. (1977); O'Connor and Beebee (2009)
Midui; Lake Tibet	5.40E+06	19	-	-	Li and You (1992); Ding and Liu (1992); O'Connor and Beebee (2009)
Boqu River; Tibet	1.90E+07	32	4.64E+03	-	Xu (1988); Xu and Feng (1994); O'Connor and Beebee (2009)
Dong River; China	2.50E+06	20	-	-	Li et al. (1986); Costa and Schuster (1991); O'Connor and Beebee (2009)
Demenhai Lake; Tibet	3.70E+06	17	-	-	Lu and Li (1986); O'Connor and Beebee (2009)
Gelhapuco; Tibet	2.34E+07	41	-	-	Xu and Feng (1994); O'Connor and Beebee (2009)
Qunbixiama-Cho; Tibet	1.24E+07	50	-	-	Xu and Feng (1994); O'Connor and Beebee (2009)
Sangwang-Cho; Tibet	3.00E+08	40	-	-	Xu and Feng (1994); O'Connor and Beebee (2009)
Longda-Cho; Tibet	1.08E+07	22	-	-	Xu and Feng (1994); O'Connor and Beebee (2009)

Diller Glacier; Wychus Creek; USA, Oregon	3.20E+05	22.4	-	-	O'Connor et al. (2001); O'Connor and Beebee (2009)
Collier Glacier; White Branch; USA, Oregon	4.60E+05	5.4	-	-	O'Connor et al. (2001); O'Connor and Beebee (2009)
East Bend Glacier; Crater Creek; USA, Oregon	1.40E+05	4.4	-	-	O'Connor et al. (2001); O'Connor and Beebee (2009)
Chong Khumdan Glacier, Upper Shyok River; Pakistan	1.50E+09	150	-	-	Hewitt (1968, 1982); O'Connor and Beebee (2009)
Altai Mountains; River Ob; Russia	1.00E+12	650	-	-	Herget (2005); O'Connor and Beebee (2009)
Yalong River; China	6.40E+08	88	-	-	Li et al. (1986); Chen et al. (1992); O'Connor and Beebee (2009)
Lake George; USA, Alaska	2.20E+09	48.8	-	-	Hulsing (1981); Lipscomb (1989); O'Connor and Beebee (2009)
Lake George; USA, Alaska	1.10E+09	35.1	-	-	Hulsing (1981); Lipscomb (1989); O'Connor and Beebee (2009)
Lake George; USA, Alaska	1.50E+09	41.2	-	-	Hulsing (1981); Lipscomb (1989); O'Connor and Beebee (2009)
Lake George; USA, Alaska	1.70E+09	43.3	-	-	Hulsing (1981); Lipscomb (1989); O'Connor and Beebee (2009)
Lake George; USA, Alaska	7.40E+08	29.3	-	-	Hulsing (1981); Lipscomb (1989); O'Connor and Beebee (2009)
Lake George; USA, Alaska	8.60E+08	29.9	-	-	Hulsing (1981); Lipscomb (1989); O'Connor and Beebee (2009)
Lake George; USA, Alaska	1.10E+09	32	-	-	Hulsing (1981); Lipscomb (1989); O'Connor and Beebee (2009)
Russell Fiord; USA, Alaska	5.40E+09	25.5	-	-	Mayo (1989); Trabant et al. (2003); O'Connor and Beebee (2009)
Russell Fiord; USA, Alaska	3.10E+09	14.9	-	-	Trabant et al. (2003); O'Connor and Beebee (2009)
Missoula Flood; USA, Idaho	2.20E+12	525	-	-	O'Connor and Baker (1992); O'Connor and Beebee (2009)
Rio Toro; Costa Rica	4.50E+05	12	-	-	Mora et al. (1993); O'Connor and Beebee (2009)
Tadami River (Numazawako); Japan	1.60E+09	70	2.88E+04	-	Kataoka et al. (2008); O'Connor and Beebee (2009)
Magdalena River (El Chichon); Mexico	4.80E+07	10	-	-	Macias et al. (2004); O'Connor and Beebee (2009)
Tarawera River; New Zealand	1.70E+09	40	7.00E+03	2.10E+07	Hodgson and Nairn (2005); O'Connor and Beebee (2009)
Tarawera River; New Zealand	1.40E+08	3.35	-	-	Hodgson and Nairn (2005); O'Connor and Beebee (2009)

Marella River (Mapanuepe Lake); Philippines	3.60E+06	6	-	-	Umbal and Rodolfo (1996); O'Connor and Beebee (2009)
Marella River (Mapanuepe Lake); Philippines	4.70E+06	6.5	-	-	Umbal and Rodolfo (1996); O'Connor and Beebee (2009)
Marella River (Mapanuepe Lake); Philippines	1.80E+06	2.5	-	-	Umbal and Rodolfo (1996); O'Connor and Beebee (2009)
Colorado River; USA, Colorado	1.10E+10	302	2.55E+05	-	Fenton et al. (2006); O'Connor and Beebee (2009)
Williamson River (Mazama); USA, Oregon	5.70E+09	17	-	-	Conaway (1999); O'Connor and Beebee (2009)
Mhlanga; South Africa	7.50E+05	2.5	-	-	Parkinson and Stretch (2007); O'Connor and Beebee (2009)
Rio Paute; Ecuador	1.85E+08	40	-	-	Plaza-Nieto and Zevallos (1994); Canuti et al. (1994); O'Connor and Beebee (2009)
Wamberal; South Africa	1.38E+06	2.8	-	-	Parkinson and Stretch (2007); O'Connor and Beebee (2009)
Bot; South Africa	3.00E+07	2.7	-	-	Parkinson and Stretch (2007); O'Connor and Beebee (2009)
Lake Bonneville; USA, Idaho	4.75E+12	108	-	-	Jarrett and Malde (1987); O'Connor (1993); O'Connor and Beebee (2009)
Crooked Creek; USA, Oregon	1.13E+10	12	-	-	Carter et al. (2006); O'Connor and Beebee (2009)
Waikato River; Lake Taupo; New Zealand	1.99E+10	32	-	-	Manville et al. (1999); O'Connor and Beebee (2009)
Waikato River; Lake Taupo; New Zealand	6.00E+10	75	-	-	Manville and Wilson (2004); Manville et al. (2007); O'Connor and Beebee (2009)
Whangaehu River, Mount Ruapehu, Crater Lake; New Zealand	1.80E+06	7.9	-	-	Manville (2004); O'Connor and Beebee (2009)
Whangaehu River, Mount Ruapehu, Crater Lake; New Zealand	1.40E+06	6.3	-	-	Manville et al. (2007); Manville and Cronin (2007); O'Connor and Beebee (2009)
Pinatubo Caldera; Philippines	6.50E+07	23	-	-	Lagmay et al. (2007); Antonia et al. (2003); O'Connor and Beebee (2009)
Aniakchak River; USA, Alaska	3.70E+09	183	-	-	Waythomas et al. (1996); O'Connor and Beebee (2009)

Rio Pisque; Ecuador	2.50E+06	30	-	-	Plaza-Nieto et al. (1990); O'Connor and Beebee (2009)
Crater Creek, Okmok Caldera, Umnak Island; USA, Alaska	5.80E+09	150	-	-	Wolfe and Beget (2002); O'Connor and Beebee (2009)
Paulina Creek; Paulina Lake, Newberry Caldera; USA, Oregon	1.24E+07	2	-	-	Chitwood and Jensen (2000); O'Connor and Beebee (2009)
Lake Ha! Ha!; Canada, Quebec	6.00E+07	10.6	-	-	Capart et al. (2007); O'Connor and Beebee (2009)
Bradfield Dam; UK	3.20E+06	29	-	-	Costa (1988); Macchione and Sirangelo (1990); O'Connor and Beebee (2009)
Eigiau; UK	4.50E+06	10.5	-	-	Macchione and Sirangelo (1990); O'Connor and Beebee (2009)
Ashalim Dam; Israel	5.00E+05	8	-	-	Greenbaum (2007); O'Connor and Beebee (2009)
Birehi Ganga River; India	2.85E+08	120	-	-	Lubbock (1894); Strachey (1894); Malde (1968); Costa (1988); Costa and Schuster (1991); O'Connor and Beebee (2009)
Puddingstone; USA, California	6.17E+05	15.2	-	-	Ponce (1982); Froehlich (1995a); O'Connor and Beebee (2009)
Lily Lake; USA, Colorado	9.25E+04	3.35	3.62E+01	-	Froehlich (1995a); O'Connor and Beebee (2009)
Apishapa, Colorado	2.22E+07	28	2.60E+03	2.38E+05	MacDonald and Langridge-Monopolis (1984); Costa (1985); Singh and Scarlatos (1988); Froehlich (1987, 1995a, 1995b); Wahl (1998)
Statham Lake Dam, Georgia	5.64E+05	5.55	1.17E+02	1.35E+03	Wahl (1998)
Swift, Montana	3.70E+07	47.9	1.08E+04	2.06E+05	Singh and Snorrason (1982); MacDonald and Langridge-Monopolis (1984); Costa (1985); Wahl (1998)
Teton, Idaho	3.10E+08	77.4	1.17E+04	3.06E+06	MacDonald and Langridge-Monopolis (1984); Costa (1985); Singh and Scarlatos (1988); Froehlich (1987, 1995a, 1995b); Wahl (1998)
Trial Lake, Utah	1.48E+06	5.18	1.09E+02	8.29E+02	Froehlich (1995b); Wahl (1998)
Trout Lake, North Carolina	4.93E+05	8.53	2.23E+02	4.83E+03	Froehlich (1995b); Wahl (1998)
Upper Pond, Connecticut	2.22E+05	5.18	8.55E+01	-	Froehlich (1995b); Wahl (1998)
Wheatland No. 1, Wyoming	1.16E+07	12.2	4.32E+02	1.46E+04	MacDonald and Langridge-Monopolis (1984); Singh and Scarlatos (1988); Froehlich (1987, 1995b); Wahl (1998)
Wilkinson Lake Dam, Georgia	5.33E+05	3.57	1.04E+02	1.42E+03	Wahl (1998)

Winston, North Carolina	6.62E+05	6.4	1.27E+02	1.48E+03	Singh and Snorrason (1982); MacDonald and Langridge-Monopolis (1984); Froehlich (1987, 1995b); Wahl (1998)
Castlewood, Colorado	6.17E+06	21.6	9.55E+02	5.57E+04	MacDonald and Langridge-Monopolis (1984); Costa (1985); Froehlich (1987, 1995a, 1995b); Wahl (1998)
Caulk Lake, Kentucky	6.98E+05	11.1	3.90E+02	1.37E+04	Froehlich (1995b); Wahl (1998)
Clearwater Lake Dam, Georgia	4.66E+05	4.05	9.23E+01	1.29E+03	Wahl (1998)
Cougar Creek, Alberta	2.98E+04	11.1	-	-	Froehlich (1995b); Wahl (1998)
Davis Reservoir, California	5.80E+07	11.6	2.13E+02	6.47E+03	MacDonald and Langridge-Monopolis (1984); Costa (1985); Wahl (1998)
East Fork Pond River, Kentucky	1.87E+06	9.8	1.69E+02	7.63E+03	Froehlich (1995b); Wahl (1998)
Baldwin Hills, California	9.10E+05	12.2	3.05E+02	3.17E+04	Jansen (1983); MacDonald and Langridge-Monopolis (1984); Costa (1985); Singh and Scarlatos (1988); Froehlich (1987, 1995a, 1995b); Wahl (1998)
Elk City, Oklahoma	1.18E+06	9.44	3.46E+02	1.69E+04	Singh and Snorrason (1982); Singh and Scarlatos (1988); Froehlich (1987, 1995b); Wahl (1998)
Emery, California	4.25E+05	6.55	7.07E+01	1.97E+03	Froehlich (1995b); Wahl (1998)
Fogelman, Tennessee	4.93E+05	11.1	8.46E+01	2.05E+03	Froehlich (1995b); Wahl (1998)
Frankfurt, Germany	3.52E+05	8.23	5.68E+01	1.29E+03	MacDonald and Langridge-Monopolis (1984); Singh and Scarlatos (1988); Wahl (1998)
French Landing, Michigan	3.87E+06	8.53	2.34E+02	1.38E+04	MacDonald and Langridge-Monopolis (1984); Costa (1985); Singh and Scarlatos (1988); Froehlich (1987, 1995a, 1995b); Wahl (1998)
Frenchman Creek, Montana	1.60E+07	10.8	5.90E+02	2.84E+04	MacDonald and Langridge-Monopolis (1984); Costa (1985); Singh and Scarlatos (1988); Froehlich (1987, 1995a, 1995b); Wahl (1998)
Bearwallow Lake, North Carolina	4.93E+04	5.79	7.06E+01	1.09E+03	Froehlich (1987, 1995b); Wahl (1998)
Goose Creek, South Carolina	1.06E+07	1.37	3.62E+01	1.07E+03	MacDonald and Langridge-Monopolis (1984); Costa (1985); Singh and Scarlatos (1988); Wahl (1998)
Grand Rapids, USA	2.55E+04	6.4	1.22E+02	1.80E+03	Singh and Snorrason (1982); Singh and Scarlatos (1988); Froehlich (1995b); Wahl (1998)

Haas Pond, Connecticut	2.34E+04	2.99	3.20E+01	7.08E+02	Froehlich (1995b); Wahl (1998)
Hart, Michigan	6.35E+06	10.7	7.91E+02	2.48E+04	Froehlich (1987, 1995b); Wahl (1998)
Hatchtown, Utah	1.48E+07	16.8	2.54E+03	1.61E+05	Singh and Snorrason (1982); MacDonald and Langridge-Monopolis (1984); Costa (1985); Singh and Scarlatos (1988); Froehlich (1987, 1995a, 1995b); Wahl (1998)
Hell Hole, California	3.06E+07	35.1	4.25E+03	5.55E+05	MacDonald and Langridge-Monopolis (1984); Costa (1985); Froehlich (1987, 1995a, 1995b); Wahl (1998)
Horse Creek, Colorado	1.28E+07	7.01	5.12E+02	2.05E+04	Singh and Snorrason (1982); MacDonald and Langridge-Monopolis (1984); Froehlich (1987, 1995b); Wahl (1998)
Hutchinson Lake Dam, Georgia	1.17E+06	4.42	1.48E+02	1.75E+03	Wahl (1998)
Iowa Beef Processors, Washington	3.33E+05	4.42	7.43E+01	-	Froehlich (1995b); Wahl (1998)
Ireland No. 5, Colorado	1.60E+05	3.81	5.14E+01	1.26E+03	Froehlich (1987, 1995a, 1995b); Wahl (1998)
Jacobs Creek, Pennsylvania	4.23E+05	20.1	3.52E+02	-	Froehlich (1995b); Wahl (1998)
Johnston City, Illinois	5.75E+05	3.05	2.51E+01	6.73E+02	MacDonald and Langridge-Monopolis (1984); Singh and Scarlatos (1988); Froehlich (1987, 1995b); Wahl (1998)
Johnstown (South Fork Dam, Penn.)	1.46E+07	21.3	2.32E+03	6.88E+04	Singh and Snorrason (1982); MacDonald and Langridge-Monopolis (1984); Costa (1985); Froehlich (1987, 1995a, 1995b); Coleman (2018); Wahl (1998)
Kelly Barnes, Georgia	7.77E+05	11.3	3.08E+02	9.94E+03	MacDonald and Langridge-Monopolis (1984); Costa (1985); Singh and Scarlatos (1988); Froehlich (1987, 1995a, 1995b); Wahl (1998)
Kraftsmen's Lake Dam, Georgia	1.77E+05	3.66	5.31E+01	3.76E+02	Wahl (1998)
La Fruta, Texas	7.89E+07	7.9	4.65E+02	3.29E+04	Froehlich (1987, 1995b); Wahl (1998)
Lake Avalon, New Mexico	3.15E+07	13.7	1.78E+03	8.10E+04	Singh and Scarlatos (1988); Froehlich (1995b); Wahl (1998)
Lake Frances, California	7.89E+05	14	2.65E+02	1.24E+04	MacDonald and Langridge-Monopolis (1984); Singh and Scarlatos (1988); Froehlich (1987, 1995b); Wahl (1998)

Lake Genevieve, Kentucky	6.80E+05	6.71	1.13E+02	2.63E+03	Froehlich (1995b); Wahl (1998)
Lake Latonka, Pennsylvania	4.09E+06	6.25	2.45E+02	9.54E+03	Singh and Scarlatos (1988); Froehlich (1987, 1995b); Wahl (1998)
Lake Philema Dam, Georgia	4.78E+06	9	4.25E+02	1.13E+04	Wahl (1998)
Lambert Lake, Tennessee	2.96E+05	12.8	9.75E+01	5.87E+03	Froehlich (1995b); Wahl (1998)
Laurel Run, Pennsylvania	5.55E+05	14.1	4.95E+02	1.95E+04	MacDonald and Langridge-Monopolis (1984); Costa (1985); Singh and Scarlatos (1988); Froehlich (1987, 1995a, 1995b); Wahl (1998)
Buckhaven No. 2, Tennessee	2.47E+04	6.1	2.88E+01	1.07E+03	Froehlich (1995b); Wahl (1998)
Lawn Lake, Colorado	7.98E+05	6.71	1.49E+02	2.40E+03	Costa (1985); Froehlich (1987, 1995b); Wahl (1998)
Little Deer Creek, Utah	1.36E+06	22.9	6.78E+02	5.06E+04	MacDonald and Langridge-Monopolis (1984); Costa (1985); Singh and Scarlatos (1988); Froehlich (1987, 1995a, 1995b); Wahl (1998)
Long Branch Canyon, California	2.84E+05	3.17	2.90E+01	3.78E+02	Froehlich (1995b); Wahl (1998)
Lower Latham, Colorado	7.08E+06	5.79	4.59E+02	1.43E+04	Froehlich (1987, 1995a, 1995b); Wahl (1998)
Lower Two Medicine, Montana	2.96E+07	11.3	7.57E+02	-	MacDonald and Langridge-Monopolis (1984); Costa (1985); Singh and Scarlatos (1988); Froehlich (1987, 1995a, 1995b); Wahl (1998)
Lyman, Arizona	3.58E+07	16.2	1.57E+03	7.19E+04	MacDonald and Langridge-Monopolis (1984); Singh and Scarlatos (1988); Froehlich (1987); Wahl (1998)
Lynde Brook, Massachusetts	2.88E+06	11.6	3.54E+02	1.53E+04	MacDonald and Langridge-Monopolis (1984); Froehlich (1987, 1995b); Wahl (1998)
Buffalo Creek, West Virginia	4.84E+05	14	1.75E+03	3.19E+05	MacDonald and Langridge-Monopolis (1984); Costa (1985); Singh and Scarlatos (1988); Wahl (1998)
Martin Cooling Pond Dike, Florida	1.36E+08	8.53	1.59E+03	-	Wahl (1998)
Melville, Utah	2.47E+07	7.92	2.60E+02	1.06E+04	MacDonald and Langridge-Monopolis (1984); Singh and Scarlatos (1988); Froehlich (1987, 1995b); Wahl (1998)
Merimac (Upper) Lake Dam, Georgia	6.96E+04	3.44	4.88E+01	7.58E+02	Wahl (1998)

Mossy Lake Dam, Georgia	4.13E+06	4.41	1.83E+02	2.04E+03	Wahl (1998)
Bullock Draw Dike, Utah	7.40E+05	3.05	3.81E+01	1.35E+03	MacDonald and Langridge-Monopolis (1984); Singh and Scarlatos (1988); Froehlich (1987, 1995b); Wahl (1998)
Oros, Brazil	6.60E+08	35.8	5.91E+03	7.65E+05	MacDonald and Langridge-Monopolis (1984); Costa (1985); Singh and Scarlatos (1988); Froehlich (1987, 1995a, 1995b); Wahl (1998)
Otter Lake, Tennessee	1.09E+05	5	4.65E+01	1.17E+03	Froehlich (1995b); Wahl (1998)
Otto Run, USA	7.40E+03	5.79	-	-	MacDonald and Langridge-Monopolis (1984); Costa (1985); Singh and Scarlatos (1988); Wahl (1998)
Pierce Reservoir, Wyoming	4.07E+06	8.08	2.46E+02	-	Froehlich (1987, 1995b); Wahl (1998)
Prospect, Colorado	3.54E+06	1.68	1.49E+02	5.12E+03	Froehlich (1987, 1995a, 1995b); Wahl (1998)
Quail Creek, Utah	3.08E+07	16.7	1.17E+03	8.44E+04	Froehlich (1995a, 1995b); Wahl (1998)
Rainbow Lake, Michigan	6.78E+06	10	3.89E+02	1.05E+04	Froehlich (1987, 1995b); Wahl (1998)
Renegade Resort Lake, Tennessee	1.39E+04	3.66	8.38E+00	9.20E+01	Froehlich (1995b); Wahl (1998)
Butler, Arizona	2.38E+06	7.16	4.48E+02	4.31E+03	Froehlich (1995a, 1995b); Wahl (1998)
Rito Manzanares, New Mexico	2.47E+04	4.57	6.08E+01	1.29E+03	MacDonald and Langridge-Monopolis (1984); Singh and Scarlatos (1988); Froehlich (1987, 1995b); Wahl (1998)
Salles Oliveira, Brazil	7.15E+07	38.4	6.45E+03	4.40E+05	MacDonald and Langridge-Monopolis (1984); Singh and Scarlatos (1988); Wahl (1998)
Scott Farm Dam No. 2, Alberta	8.60E+04	10.4	1.56E+02	7.02E+03	Froehlich (1995b); Wahl (1998)
Sheep Creek, USA	2.91E+06	14	3.08E+02	1.83E+04	MacDonald and Langridge-Monopolis (1984); Singh and Scarlatos (1988); Wahl (1998)
Sinker Creek, USA	3.33E+06	21.3	1.51E+03	8.41E+04	MacDonald and Langridge-Monopolis (1984); Singh and Scarlatos (1988); Wahl (1998)
South Fork Tributary, Pennsylvania	3.70E+03	1.83	-	-	MacDonald and Langridge-Monopolis (1984); Costa (1985); Singh and Scarlatos (1988); Wahl (1998)
Spring Lake, Rhode Island	1.36E+05	5.49	7.96E+01	6.12E+02	MacDonald and Langridge-Monopolis (1984); Singh and Scarlatos (1988); Froehlich (1987); Wahl (1998)

[*]Dataset was compiled from three different previously published databases: Wahl (1998), O'Connor and Beebee (2009), and Manville (2015). Given references include the database the basin was pulled from listed last, preceded by any original published references given in that database.

TABLE DR3. DATA ANALYZED FOR MARTIAN BREACHED BASINS.

Lat. (°N)	Lon. (°E)	Topography Used	DEM(s) Used	Number of Outlet Profiles*
-20.99	-14.56	HRSC and MOLA	h4090_0000; h4101_0000	7
-1.80	84.95	HRSC	h2162_0002; h3285_0000	26
0.35	89.54	CTX and MOLA	P06_003402_1797-P06_003547_1797	11
-22.68	-23.69	CTX and MOLA	B16_016025_1563-B17_016170_1572	25
-6.07	42.07	HRSC and MOLA	h5202_0000	20
18.56	78.11	CTX	D17_033717_1987-D16_033651_1987; F02_036618_1985-F03_037119_2001; G15_024091_1987-G16_024592_1987; P02_001965_1988-D04_028970_1971; P17_007714_2001-G17_024948_2000; P18_007925_1987-P19_008650_1987	22
-4.31	126.99	CTX, HRSC and MOLA	P03_002082_1758-P05_002794_1759; h2037_0000; h2059_0000	20
-28.16	177.76	HRSC and MOLA	h0283_0000; h2238_0000; h4132_0000; h4154_0000; h4165_0000	18
8.53	-47.94	CTX	P15_006954_1871-B17_016250_1870	15
-38.98	-103.02	CTX	D17_034014_1406-D18_034159_1406	36
-19.17	-6.35	CTX	D14_032850_1607-D18_034261_1607	21
-6.43	136.53	CTX	B02_010494_1737-D02_027900_1745; B22_018142_1743-G04_019909_1746; D04_028889_1756-D02_027900_1745; G04_019843_1746-G05_020265_1746	20
-9.12	135.08	CTX, HRSC and MOLA	P21_009215_1706-F20_043803_1714; h1938_0000; h1960_0000	31
-9.42	-167.26	CTX and HRSC	G23_027344_1704-D17_034003_1704; h3185_0000	13
-23.06	134.14	HRSC and MOLA	h4279_0000	13
-8.52	149.51	CTX and MOLA	F01_036088_1737-F01_036233_1737	31
-33.84	80.58	CTX and MOLA	F12_040601_1460-F13_041036_1460	5
-39.27	-103.55	CTX, HRSC and MOLA	B18_016806_1405-B19_016872_1405; h0530_0000; h0068_0000	25
-18.99	-6.40	CTX and MOLA	D14_032850_1607-D18_034261_1607	9
-31.78	-13.76	CTX and HRSC	G13_023343_1485-G15_023989_1485; h4079_0000; h4090_0000	10
3.12	86.67	CTX	F17_042341_1829-F17_042631_1826	12
-5.64	46.40	HRSC	h5130_0000; h5112_0000	24
-5.09	-4.47	CTX and MOLA	F10_039694_1762-F10_039839_1762	31
-38.81	-103.27	CTX	D17_034014_1406-D18_034159_1406	19

*Value is number of profiles used for linear interpolation to calculate the outlet canyon volume.

ADDITIONAL REFRENCES CITED

Antonia, M., Bornas, V., and Newhall, C.G., 2003, The 10 July 2002 caldera-rim breach and breakout lahar from Mt. Pinatubo, Philippines: Results and lessons from attempting an artificial breach: Programme and Abstracts of the Volcanological Society of Japan, p. 91, doi:10.18940/vsj.2003.0_91.

Bechteler, W., and Kulisch, H., 1994, Physical 3D-simulations of erosion-caused dam-breaks: International Workshop of Floods and Inundations Related to Large Earth Movements, Trento, Italy, Abstracts.

Beyer, R.A., Alexandrov, O., and McMichael, S., 2018, The Ames Stereo Pipeline: NASA's open source software for deriving and processing terrain data: Earth and Space Science, v. 5, doi:10.1029/2018EA000409.

Blown, I., and Church, M., 1985, Catastrophic lake drainage within the Homathko River basin, British Columbia: Canadian Geotechnical Journal, v. 22, p. 551–563, doi:10.1139/t85-075.

Buchroithner, M.F., Jentsch, G., and Wanivenhaus, B., 1982, Monitoring of recent geological events in the Khumbu area (Himalaya, Nepal) by digital processing of Landsat MSS data: Rock Mechanics, v. 15, p. 181–197, doi:10.1007/BF01240589.

Cabrol, N.A., and Grin, E.A., 2001, The evolution of lacustrine environments on Mars: Is Mars only hydrologically dormant?: Icarus, v. 149, p. 291–328, doi:10.1006/icar.2000.6530.

Canuti, P., Frassoni, A., and Naatale, L., 1994, Failure of the Rio Paute landslide dam: Landslide News, v. 8, p. 6–7.

Capart, H., Spinewine, B., Young, D.L., Zech, Y., Brooks, G.R., Leclerc, M., and Secretan, Y., 2007, The 1996 Lake Ha! Ha! breakout flood, Québec: Test data for geomorphic flood routing methods: Journal of Hydraulic Research, v. 45, p. 97–109, doi:10.1080/00221686.2007.9521836.

Capra, L., and Macias, J.L., 2002, The cohesive Naranjo debris-flow deposit (10 km^3): A dam breakout flow derived from the Pleistocene debris-avalanche deposit of Nevado de Colima Volcano (México): Journal of Volcanology and Geothermal Research, v. 117, p. 213–235, doi:10.1016/S0377-0273(02)00245-7.

Carling, P.A., and Glaister, M.S., 1987, Reconstruction of a flood resulting from a moraine-dam failure using geomorphological evidence and dam-break modeling, *in* Mayer, L., and Nash, D., eds., Catastrophic Flooding: Boston, MA, Allen and Unwin, p. 181–200.

Carson, R.J., 2001, Dam failure in southeastern Washington: Geological Society of America Abstracts with Programs, v. 33, no. 6, p. 284.

Carter, D.T., Ely, L.L., O'Connor, J.E., and Fenton, C.R., 2006, Late Pleistocene outburst flooding from pluvial Lake Alvord into the Owyhee River, Oregon: Geomorphology, v. 75, p. 346–367, doi:10.1016/j.geomorph.2005.07.023.

Cenderelli, D.A., and Wohl, E.E., 2003, Flow hydraulics and geomorphic effects of glacial-lake outburst floods in the Mount Everest region, Nepal: Earth Surface Processes and Landforms, v. 28, p. 385–407, doi:10.1002/esp.448.

Chang, S.C., 1984, Tsao-Ling landslide and its effect on a reservoir project: 4th International Symposium on Landslides, Toronto, Canada, Abstracts, p. 469–473.

Chen, Y.J., Zhou, F., Feng, Y., and Xia, Y.C., 1992, Breach of a naturally embanked dam on Yalong River: Canadian Journal of Civil Engineering, v. 19, p. 811–818, doi:10.1139/l92-092.

Chinnarasri, C., Tingsanchali, T., Weesakul, S., and Wongwises, S., 2003, Flow patterns and damage of dike overtopping: International Journal of Sediment Research, v. 18, p. 301–309.

Chinnarasri, C., Jirakitlerd, S., and Wongwises, S., 2004, Embankment dam breach and its outflow characteristics: Civil Engineering and Environmental Systems, v. 21, p. 247–264, doi:10.1080/10286600412331328622.

Chitwood, L.A., Jensen, R.A., 2000, Large prehistoric flood along Paulina Creek, *in* Jensen, R.A., and Chitwood, L.A., eds., What's New at Newberry Volcano, Oregon: Bend, OR, U.S.D.A. Forest Service, p. 31–40.

Clague, J.J., and Evans, S.G., 1994, Formation and failure of natural dams in the Canadian Cordillera: Geological Survey of Canada, Bulletin 464, 35 p., doi:10.4095/194028.

Coleman, N.M., 2018, Johnstown's Flood of 1889 – Power Over Truth and the Science Behind the Disaster: New York, Springer, 256 p.

Conaway, J.S., 1999, Hydrogeology and paleohydrology of the Williamson River basin, Klamath County, Oregon [M.S. thesis]: Portland, OR, Portland State University, 117 p.

Costa, J.E., 1985, Floods from dam failures: U.S. Geological Survey Open-File Report 85-560, 54 p., https://pubs.usgs.gov/of/1985/0560/report.pdf.

Costa, J.E., 1988, Floods from dam failures, *in* Baker, V.R., Kochel, R.C., and Patton, P.C., eds., Flood Geomorphology: New York, NY, John Wiley and Sons, p. 439–469.

Costa, J.E., 1994, Multiple flow processes accompanying a dam-break flood in a small upland watershed, Centralia, Washington: U.S. Geological Survey Water-Resources Investigations Report 94-4026, 24 p., https://pubs.usgs.gov/wri/1994/4026/pdf/WRI-94-4026.pdf.

Costa, J.E., and O'Connor, J.E., 1995, Geomorphically effective floods, *in* Costa, J.E., Miller, A.J., Potter, K.W., and Wilcock, P.R., eds., Natural and Anthropogenic Influences in Fluvial Geomorphology: Washington, DC, American Geophysical Union, p. 45–56, doi:10.1029/GM089p0045.

Costa, J.E., and Schuster, R.L., 1991, Documented historical landslide dams from around the world: U.S. Geological Survey Open-File Report 91-239, 486 p., https://pubs.usgs.gov/of/1991/0239/report.pdf.

Dai, F.C., Lee, C.F., Deng, J.H., and Tham, L.G., 2005, The 1786 earthquake-triggered landslide dam and subsequent dam-break flood on the Dadu River, southwestern China: Geomorphology, v. 65, p. 205–221, doi:10.1016/j.geomorph.2004.08.011.

Davis, S.N., and Karzulovic, J., 1963, Landslides at Lago Riñihue, Chile: Bulletin of the Seismological Society of America, v. 53, p. 1403–1414.

Ding, Y., and Liu, J., 1992, Glacier lake outburst flood disasters in China: Annals of Glaciology, v. 16, p. 180–184.

Dwivedi, S.K., Archarya, M.D., and Simard, D., 2000, The Tam Pokhari Glacier Lake outburst flood of 3 September 1998: Journal of Nepal Geological Society, v. 22, p. 539–546.

Evans, S.G., 1987, The breaching of moraine-dammed lakes in the southern Canadian Cordillera: International Symposium on Engineering Geological Environment in Mountainous Areas, Beijing, China, Abstracts, v. 2, p. 141–150.

Fassett, C.I., and Head, J.W., 2005, Fluvial sedimentary deposits on Mars: Ancient deltas in a crater lake in the Nili Fossae region: Geophysical Research Letters, v. 32, p. L14201, doi:10.1029/2005GL023456.

Fenton, C.R., Webb, R.H., and Cerling, T.E., 2006, Peak discharge of a Pleistocene lava-dam outburst flood in Grand Canyon, Arizona, USA: Quaternary Research, v. 65, p. 324–335, doi:10.1016/j.yqres.2005.09.006.

Franca, M.J., and Almeida, A.B., 2002, Experimental tests on rockfill dam breaching process: International Symposium on Hydraulic and Hydrologic Aspects of Reliability and Safety Assessment of Hydraulic Structure, St. Petersburg, Russia, Abstracts.

Froehlich, D.C., 1987, Embankment-dam breach parameters: ASCE National Conference on Hydraulic Engineering, Williamsburg, VA, Abstracts, p. 570–575.

Froehlich, D.C., 1995a, Peak outflow from breached embankment dam: Journal of Water Resources Planning and Management, v. 121, p. 90–97, doi:10.1061/(ASCE)0733-9496(1995)121:1(90).

Froehlich, D.C., 1995b, Embankment dam breach parameters revisited: ASCE National Conference on Water Resources Engineering, San Antonio, TX, Abstracts, p. 887–891.

Fushimi, H., Ikegami, K., Higuchi, K., and Shankar, K., 1985, Nepal case study: Catastrophic floods, *in* Young, G.J., ed., Techniques for Prediction of Runoff from Glacierized Areas: Wallingford, UK, International Association of Hydrological Sciences, p. 125–130.

Galay, V.J., 1985, Hindu Kush-Himalayan erosion and sedimentation in relation to dams: International Workshop on Water Management in the Hindu Kush-Himalaya Region, Chengu, China, Abstracts.

Gallino, G.L., and Pierson, T.C., 1985, Polallie Creek debris flow and subsequent dam-break flood of 1980, East Fork Hood River Basin, Oregon: U.S. Geological Survey Water-Supply Paper 2273, 22 p., https://pubs.usgs.gov/wsp/2273/report.pdf.

Glazyrin, G.Y., and Reyzvikh, V.N., 1968, Computation of the flow hydrograph for the breach of landslide lakes: Soviet Hydrology, v. 5 p. 492–496.

Gomez, C., Kataoka, K.S., and Tanaka, K., 2012, Large-scale internal structure of the Sanbongi Fan-Towada Volcano, Japan: Putting the theory to the test, using GPR on volcaniclastic deposits: Journal of Volcanology and Geothermal Research, v. 229–230, p. 44–49, doi:10.1016/j.jvolgeores.2012.04.009.

Goudge, T.A., Head, J.W., Mustard, J.F., and Fassett, C.I., 2012, An analysis of open-basin lake deposits on Mars: Evidence for the nature of associated lacustrine deposits and post-lacustrine modification processes: Icarus, v. 219, p. 211–229, doi:10.1016/j.icar.2012.02.027.

Greenbaum, N., 2007, Assessment of dam failure flood and a natural, high-magnitude flood in a hyperarid region using paleoflood hydrology, Nahal Ashalim catchment, Dead Sea, Israel: Water Resources Research, v. 43, p. W02401, doi:10.1029/2006WR004956.

Hahn, W., Hanson, G.K., and Cook, K.R., 2000, Breach morphology observations of embankment overtopping test: Joint Conference on Water Resources Engineering and Water Resources Planning & Management National Conference on Hydraulic Engineering, Reston, VA, Abstracts.

Hancox, G.T., McSaveney, M.J., Manville, V.R., and Davies, T.R., 2005, The October 1999 Mt Adams rock avalanche and subsequent landslide dam-break flood and effects in Poerua river, Westland, New Zealand: New Zealand Journal of Geology and Geophysics, v. 48, p. 683–705, doi:10.1080/00288306.2005.9515141.

Hanson, G.J., Cook, K.R., and Britton, S.L., 2003, Observed erosion processes during embankment overtopping tests: American Society of Agricultural and Biological Engineers Annual Meeting, Abstracts, Paper 032066.

Herget, J., 2005, Reconstruction of Pleistocene ice-dammed lake outburst floods in the Altai Mountains, Siberia: Geological Society of America Special Paper 386, 118 p., doi:10.1130/0-8137-2386-8.1.

Hewitt, K., 1968, Record of natural damming and related floods in the Upper Indus Basin: Indus, v. 10, p. 11–19.

Hewitt, K., 1982, Natural dams and outburst floods of the Karakoram Himalaya, *in* Glen, J.W., ed., Hydrological Aspects of Alpine and High-Mountain Areas: Wallingford, UK, International Association of Hydrological Sciences, p. 259–269.

Hodgson, K.A., and Nairn, I.A., 2005, The c. AD 1315 syn-eruption and AD 1904 post-eruption breakout floods from Lake Tarawera, Haroharo caldera, North Island, New

Zealand: New Zealand Journal of Geology and Geophysics, v. 48, p. 491–506, doi:10.1080/00288306.2005.9515128.

Hulsing, H., 1981, The breakout of Alaska's Lake George: U.S. Geological Survey Popular Publications, 15 p.

Hung, J.-J., 2000, Chi-Chi earthquake induced landslides in Taiwan: Earthquake Engineering and Engineering Seismology, v. 2, p. 25–33.

Irwin, R.P., Maxwell, T.A., and Howard, A.D., 2007, Water budgets on early Mars: Empirical constraints from paleolake basin and watershed areas: Proceedings, Seventh International Conference on Mars, Lunar and Planetary Institute Contribution 1353, abs. 3400.

Jansen, R.B., 1983, Dams and public safety: U.S. Bureau of Reclamation Water Resources Technical Publication, 332 p., https://www.usbr.gov/tsc/techreferences/mands/mands-pdfs/AZ1130.pdf.

Jarrett, R.D., and Malde, H.E., 1987, Paleodischarge of the late Pleistocene Bonneville Flood, Snake River, Idaho, computed from new evidence: Geological Society of America Bulletin, v. 99, p. 127–134, doi:10.1130/0016-7606(1987)99<127:POTLPB>2.0.CO;2.

Jennings, M.E., Schneider, V.R., and Smith, P.E., 1981, Computer assessments of potential flood hazards from breaching of two debris dams, Toutle River and Cowlitz River systems, *in* Lipman, P.W., and Mullineaux, D.R., eds., The 1980 Eruptions of Mount St. Helens, Washington: Washington, DC, U.S. Geological Survey, p. 829–836.

Jennings, D.N., Webby, M.G., and Parkin, D.T., 1993, Tunawaea landslide dam, King Country, New Zealand: Landslide News, v. 7, p. 25–27.

Kataoka, K.S., 2011, Geomorphic and sedimentary evidence of a gigantic outburst flood from Towada caldera after the 15 ka Towada–Hachinohe ignimbrite eruption, northeast Japan: Geomorphology, v. 125, p. 11–26, doi:10.1016/j.geomorph.2010.08.006.

Kataoka, K.S., Urabe, A., Manville, V., and Kajiyama, A., 2008, Breakout flood from an ignimbrite-dammed valley after the 5 ka Numazawako eruption, northeast Japan: Geological Society of America Bulletin, v. 120, p. 1233–1247, doi:10.1130/B26159.1.

Kershaw, J.A., Clague, J.J., and Evans, S.G., 2005, Geomorphic and sedimentological signature of a two-phase outburst flood from moraine-dammed Queen Bess Lake, British Columbia, Canada: Earth Surface Processes and Landforms, v. 30, p. 1–25, doi:10.1002/esp.1122.

Lagmay, A.M.F., Rodolfo, K.S., Siringan, F.P., Uy, H., Remotigue, C., Samora, P., Lapus, M., Rodolfo, R., and Ong, J., 2007, Geology and hazard implications of the Maraunot notch in the Pinatubo Caldera, Philippines: Bulletin of Volcanology, v. 69, p. 797–809, doi:10.1007/s00445-006-0110-5.

Lamke, R.D., 1972, Floods of the summer of 1971 in south-central Alaska: U.S. Geological Survey Open-File Report 72-215, 88 p., http://dggs.alaska.gov/webpubs/usgs/of/text/of72-0215.pdf.

Lee, K.L., and Duncan, J.M., 1975, Landslide of April 25, 1974 on the Mantaro River, Peru: Washington, DC, The National Academies Press, 72 p., doi:10.17226/20646.

Leverington, D.W., and Maxwell, T.A., 2004, An igneous origin for features of a candidate crater-lake system in western Memnonia, Mars: Journal of Geophysical Research, v. 109, p. E06006, doi:10.1029/2004JE002237.

Li, D., and You, Y., 1992, Bursting of the Midui Moraine Lake in Bomi, Xizang: Journal of Mountain Research, v. 10, p. 219–224.

Li, T., Schuster, R.L., and Wu, J., 1986, Landslide dams in south-central China, *in* Schuster, R.L., ed., Landslide Dams: Process, Risk, and Mitigation: New York, NY, American Society of Civil Engineers, p. 146–162.

Lipscomb, S.W., 1989, Flow and hydraulic characteristics of the Knik-Matanuska River Estuary, Cook Inlet, southcentral Alaska: U.S. Geological Survey Water-Resources Investigations Report 89-4064, 52 p., https://pubs.usgs.gov/wri/1989/4064/report.pdf.

Lliboutry, L., Arnao, B.M., Pautre, A., and Schneider, B., 1977, Glaciological problems set by the control of dangerous lakes in Cordillera Blanca, Peru. I. Historical failures of morainic dams, their causes and prevention: Journal of Glaciology v. 18, p. 239–254, doi:10.3189/S002214300002133X.

Lu, R., and Li, D., 1986, Debris flow induced by ice lake burst in the Tangbulang Gully, Gonbujiangda, Xizang (Tibet): Journal of Glaciology and Geocryology, v. 8, p. 61–70.

Lubbock, G., 1894, The Gohna lake: Geographical Journal, v. 4, p. 457.

Macchione, F., and Sirangelo, B., 1990, Floods resulting from progressively breached dams: Lausanne Symposia, August 1990, Hydrology in Mountainous Regions, Lausanne, Switzerland, Abstracts, p. 325–332.

Macias, J.L., Capra, L., Scott, K.M., Espindola, J.M., Garcia-Palomo, A., and Costa, J.E., 2004, The 26 May 1982 breakout flows derived from failure of a volcanic dam at El Chichón, Chiapas, Mexico: Geological Society of America Bulletin, v. 116, p. 233–246, doi:10.1130/B25318.1.

Malde, H.E., 1968, The catastrophic Late Pleistocene Bonneville flood in the Snake River Plain, Idaho: U.S. Geological Survey Professional Paper 596, 52 p., https://pubs.usgs.gov/pp/0596/report.pdf.

Mangold, N., and Ansan, V., 2006, Detailed study of an hydrological system of valleys, a delta and lakes in the Southwest Thaumasia region, Mars: Icarus, v. 180, p. 75–87, doi:10.1016/j.icarus.2005.08.017.

Manville, V., 2004, Paleohydraulic analysis of the 1953 Tangiwai lahar: New Zealand's worst volcanic disaster: Acta Vulcanologica, v. 16, p. 137–152.

Manville, V., 2015, Volcano-hydrologic hazards from volcanic lakes, *in* Rouwet, D., Christenson, B., Tassi, F., and Vandemeulebrouck, J., eds., Volcanic Lakes: Berlin, Germany, Springer-Verlag, p. 21–71, doi:10.1007/978-3-642-36833-2_2.

Manville, V., and Cronin, S.J., 2007, Breakout lahar from New Zealand's Crater Lake: Eos, Transactions, American Geophysical Union, v. 88, p. 441–442, doi:10.1029/2007EO430001.

Manville, V., and Wilson, C.J.N., 2004, The 26.5 ka Oruanui eruption, New Zealand: A review of the roles of volcanism and climate in the post-eruptive sedimentary response: New Zealand Journal of Geology and Geophysics, v. 47, p. 525–547, doi:10.1080/00288306.2004.9515074.

Manville, V., White, J.D.L., Houghton, B.F., and Wilson, C.J.N., 1999, Paleohydrology and sedimentology of a post-1.8 ka breakout flood from intracaldera Lake Taupo, North Island, New Zealand: Geological Society of America Bulletin, v. 111, p. 1435–1447, doi:10.1130/0016-7606(1999)111<1435:PASOAP>2.3.CO;2.

Manville, V., Hodgson, K.A., and Nairn, I.A., 2007, A review of break-out floods from volcanogenic lakes in New Zealand: New Zealand Journal of Geology and Geophysics, v. 50, p. 131–150, doi:10.1080/00288300709509826.

Mayo, L.R., 1989, Advance of Hubbard Glacier and 1986 outburst of Russell Fiord, Alaska, U.S.A.: Annals of Glaciology, v. 13, p. 189–194, doi:10.3189/S0260305500007874.

Mora, S., Madrigal, C., Estrada, J., and Schuster, R.L., 1993, The 1992 Rio Toro landslide dam, Costa Rica: Landslide News, v. 7, p. 19–22.

O'Connor, J.E., 1993, Hydrology, hydraulics, and geomorphology of the Bonneville flood: Geological Society of America Special Paper 274, 83 p., doi:10.1130/SPE274-p1.

O'Connor, J.E., Hardison, J.H., and Costa, J.E., 2001, Debris flows from failures of neoglacial-age moraine dams in the Three Sisters and Mount Jefferson Wilderness Areas, Oregon: U.S. Geological Survey Professional Paper 1606, 93 p., https://pubs.usgs.gov/pp/1606/report.pdf.

Parkinson, M., and Stretch, D., 2007, Breaching timescales and peak outflows for perched, temporary open estuaries: Coastal Engineering Journal, v. 49, p. 267–290, doi:10.1142/S0578563407001605.

Pena, H., and Klohn, W., 1989, Non-meteorological flood disasters in Chile, *in* Starosolszky, O., and Melder, O.M., eds., Hydrology of Disasters: Proceedings of the Technical Conference in Geneva: New York, NY, James & James, p. 243–258.

Plaza-Nieto, G., and Zevallos, O., 1994, The 1993 La Josefina rockslide and Rio Paute landslide dam, Ecuador: Landslide News, v. 4, p. 4–6.

Plaza-Nieto, G., Yepes, H., and Schuster, R.L., 1990, Landslide dam on the Pisque River, northern Ecuador: Landslide News, v. 4, p. 2–4.

Ponce, V.M., 1982, Documented cases of Earth dam breaches: San Diego, CA, San Diego State University Civil Engineering Series No. 82149, Research Report, 44 p.

Richardson, S.D., and Reynolds, J.M., 2000, An overview of glacial hazards in the Himalayas: Quaternary International, v. 65–66, p. 31–47, doi:10.1016/S1040-6182(99)00035-X.

Rogers, J.D., and McMahon, D.J., 1993, Reassessment of the St. Francis Dam Failure: 10th Annual Association of State Dam Safety Officials Conference, Kansas City, MO, Abstracts, p. 333–339.

Schaefer, J.R., Scott, W.E., Evans, W.C., Jorgenson, J., McGimsey, R.G., and Wang, B., 2008, The 2005 catastrophic acid crater lake drainage, lahar, and acidic aerosol formation at Mount Chiginagak volcano, Alaska, USA: Field observations and preliminary water and vegetation chemistry results: Geochemistry, Geophysics, Geosystems, v. 9, p. Q07018, doi:10.1029/2007GC001900.

Schuster, R.L., Salcedo, D.A., and Valenzuela, L., 2002, Overview of catastrophic landslides of South America in the twentieth century, *in* Evans, S.G., and DeGraff, J.V., eds., Catastrophic Landslides: Effects, Occurrence, and Mechanisms: Boulder, CO, Geological Society of America, p. 1–34, doi:10.1130/REG15-p1.

Shang, Y., Yang, Z., Li, L., Liu, D., Liao, Q., and Wang, Y., 2003, A super-large landslide in Tibet in 2000: background, occurrence, disaster, and origin: Geomorphology, v. 54, p. 225–243, doi:10.1016/S0169-555X(02)00358-6.

Shean, D.E., Alexandrov, O., Moratto, Z.M., Smith, B.E., Joughin, I.R., Porter, C., and Morin, P., 2016, An automated, open-source pipeline for mass production of digital elevation models (DEMs) form very-high-resolution commercial stereo satellite imagery: ISPRS Journal of Photogrammetry and Remote Sensing, v. 116, p. 101–117, doi:10.1016/j.isprsjprs.2016.03.012.

Shroder, J.F., Cornwell, K., and Khan, M.S., 1991, Catastrophic breakout floods in the western Himalaya, Pakistan: Geological Society of America Abstracts with Programs, v. 23, no. 5, p. 87.

Simmler, H., and Samet, L., 1982, Dam failure from overtopping studied on a hydraulic model: Fourteenth International Congress on Large Dams, Rio de Janeiro, Brazil, Abstracts, p. 427–446.

Singh, K.P., and Snorrason, A., 1982, Sensitivity of outflow peaks and flood stages to the selection of dam breach parameters and simulation models: Illinois Department of Energy and Natural Resources, State Water Survey Division, SWS Contract Report 289, 179 p., http://www.isws.uiuc.edu/pubdoc/CR/ISWSCR-289.pdf.

Singh, V.P., and Scarlatos, P.D., 1988, Analysis of gradual Earth-dam failure: Journal of Hydraulic Engineering, v. 114, p. 21–42, doi:10.1061/(ASCE)0733-9429(1988)114:1(21).

Snow, D.T., 1964, Landslide of Cerro Condor-Sencca, Department of Ayacucho, Peru, *in* Kiersch, G.A., ed., Engineering Geology Case Histories, Number 5: New York, NY, Geological Society of America, p. 1–6, doi:10.1130/Eng-Case-5.1.

Sowma-Bawcom, J.A., 1996, Breached landslide dam on the Navarro River, Mendocino County, California: California Geology, v. Sep./Oct., p. 120–127.

Strachey, R., 1894, The landslip at Gohna, in British Garwhal: Geographical Journal, v. 4, p. 162–170.

Trabant, D.C., March, R.S., and Thomas, D.S., 2003, Hubbard Glacier, Alaska: Growing and advancing in spite of global climate change and the 1986 and 2002 Russell Lake outburst floods: U.S. Geological Survey Fact Sheet 001-03, 4 p., https://pubs.usgs.gov/fs/fs-001-03/fs-001.03.pdf.

Umbal, J.V., and Rodolfo, K.S., 1996, The 1991 lahars of southwestern Mount Pinatubo and evolution of the lahar-dammed Mapanuepe Lake, *in* Newhall, C.G., and Punongbayan, R.S., eds., Fire and Mud: Eruptions and Lahars of Mount Pinatubo: Seattle, WA, University of Washington Press, p. 951–970.

Vaskinn, K.A., Lovoll, A., Hoeg, K., Morris, M., Hanson, G., and Hassan, M.A.A.M., 2004, Physical modeling of breach formation – large scale field tests: Annual Association of State Dam Safety Officials Conference, Phoenix, AZ, Abstracts.

Vuichard, D., and Zimmermann, M., 1987, The 1985 catastrophic drainage of a moraine-dammed lake, Khumbu Himal, Nepal: Cause and consequences: Mountain Research and Development, v. 7, p. 91–110, doi:10.2307/3673305.

Wahl, T.L., 1998, Prediction of embankment dam breach parameters: A literature review and needs assessment: U.S. Bureau of Reclamation Dam Safety Office Dam Safety Research Report DSO-98-004, 60 p., https://www.usbr.gov/ssle/damsafety/TechDev/DSOTechDev/DSO-98-04.pdf.

Watanbe, T., and Rothacher, D., 1996, The 1994 Lugge Tsho glacial lake outburst flood, Bhutan Himalaya: Mountain Research and Development, v. 16, p. 77–81, doi:10.2307/3673897.

Waythomas, C.F., Walder, J.S., McGimsey, R.G., and Neal, C.A., 1996, A catastrophic flood caused by drainage of a caldera lake at Aniakchak Volcano, Alaska, and implications for volcanic hazards assessment: Geological Society of America Bulletin, v. 108, p. 861–871, doi:10.1130/0016-7606(1996)108<0861:ACFCBD>2.3.CO;2.

Webby, M.G., and Jennings, D.N., 1994, Analysis of dam-break flood caused by failure of Tunawaea landslide dam: 1994 International Conference on Hydraulics in Civil Engineering, Brisbane, Australia, Abstracts, p. 163–168.

Weber, G.E., Nielsen, H.P., and Kraeger, B.K., 1986, The Foreman Creek flood: Failure of a landslide formed debris dam during the 1-4-82 storm, Sand Cruz Co., CA: Geological Society of America Abstracts with Programs, v. 18, no. 2, p. 196.

Weischet, W., 1963, Further observations of geologic and geomorphic changes resulting from the catastrophic earthquake of May 1960, in Chile: Bulletin of the Seismological Society of America, v. 53, p. 1237–1257.

Wolfe, B.A., and Beget, J.E., 2002, Destruction of an Aleut village by a catastrophic flood release from Okmok Caldera, Umnak Island, Alaska: Geological Society of America Abstracts with Programs, v. 34, no. 6, p. 126.

Xiao, X., White, E.P., Hooten, M.B., and Durham, S.L., 2011, On the use of log-transformation vs. nonlinear regression for analyzing biological power laws: Ecology, v. 92, p. 1887–1894, doi:10.1890/11-0538.1.

Xu, D., 1988, Characteristics of debris flow caused by outburst of glacial lake in Boqu River, Xizang, China, 1981: GeoJournal, v. 17, p. 569–580.

Xu, D., and Feng, Q., 1994, Dangerous glacier lakes and their outburst features in the Tibetan Himalayas: Bulletin of Glacier Research, v. 12, p. 1–8.

Yamada, T., et al., 2004, Outline of 2002 research activities on glaciers and glacier lakes in Lunana region, Bhutan, Himalayas: Bulletin of Glaciological Research, v. 21, p. 79–90.

Yesenov, U.Y., and Degovets, A.S., 1979, Catastrophic mudflow on the Bol’shaya Almatinka River in 1977: Soviet Hydrology, v. 18, p. 158–160.