**Supplemental Information**

**Multi-proxy record of Holocene Paleohydrology from alpine lake sediment on the Wasatch Plateau of central Utah, USA**

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Table S1: Utah High Plateau surface water d18O, d2H, and *d-excess*

Figure S1: Emerald Lake core D07 macrofossils

Figure S2: Emerald Lake core A/C LOI and age model

Figure S3: Emerald Lake core D07 ternary plot of mineralogy

Figure S4: Emerald Lake core D07 normalized mineral abundances and carbonate isotopes

Table S1: Utah High Plateau surface water d18O, d2H, and *d-excess*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Site\* | Date | Latitude  ˚N | Longitude  ˚W | Elevation (m a.s.l.) | d18O  (‰VSMOW) | d2H  (‰VSMOW) | *d-excess*  (‰VSMOW) |
|  |  |  |  |  |  |  |  |
| Blue Lake North (WP) | 8/08/2006 | 39.33539 | 111.33680 | 2800 | -15.9 | -116 | 10.8 |
| Blue Lake North Inflow (WP) | 8/08/2006 | 39.05388 | 111.50542 | 2800 | -16.6 | -122 | 11.30 |
| Independence (Mary's) Pond (WP) | 8/08/2006 | 39.27404 | 111.30779 | 2670 | -13.6 | -107 | 1.9 |
| Emerald Lake (WP) | 8/10/2006 | 39.07447 | 111.49684 | 3050 | -12.1 | -98 | -1.5 |
| Blue Lake South (WP) | 8/11/2006 | 39.05536 | 111.50451 | 3065 | -15.2 | -113 | 8.8 |
| Blue Lake South Inflow (WP) | 8/11/2006 | 39.05388 | 111.50542 | 3107 | -16.8 | -120 | 14.41 |
| Upper Deep Creek Spring (TLM) | 8/08/2007 | 38.43893 | 111.46294 | 3183 | -15.1 | -108 | 12.92 |
| Upper Deep Creek Lake (TLM) | 8/08/2007 | 38.43515 | 111.46554 | 3209 | -14.0 | -102 | 9.7 |
| Deep Creek Lake (TLM) | 8/08/2007 | 38.43297 | 111.46429 | 3214 | -12.0 | -94 | 1.9 |
| Snow Lake (TLM) | 8/09/2007 | 38.42583 | 111.45959 | 3191 | 2.3 | -21 | -39.1 |
| Purple Lake (A) | 8/10/07 | 38.07837 | 111.57275 | 3188 | -6.2 | -64 | -13.9 |
| Purple Lake Spring (A) | 8/10/2007 | 38.07687 | 111.56995 | 3195 | -13.7 | -100 | 9.66 |
| Blue Lake (A) | 8/10/2007 | 38.08324 | 111.57014 | 3194 | -9.2 | -81 | -7.5 |
| Banana Lake (A) | 8/11/2007 | 38.06646 | 111.58663 | 3101 | -5.4 | -62 | -19.3 |
| Emerald Lake (WP) | 8/12/2007 | 39.07447 | 111.49684 | 3050 | -11.1 | -94 | -5.2 |
| Morris Pond (M) | 8/10/2009 | 37.67374 | 112.78045 | 3124 | -5.9 | -69 | -22.4 |
| Lowder Creek Meadow Lake (M) | 8/11/2009 | 37.67020 | 112.78809 | 3127 | -15.3 | -108 | 13.7 |
| Lowder Creek Meadow Spring (M) | 8/11/2009 | 37.67055 | 112.78974 | 3137 | -14.9 | -107 | 12.05 |
| Lowder Creek Moraine Lake (M) | 8/11/2009 | 37.67247 | 112.78368 | 3127 | -8.8 | -81 | -10.3 |
| Puffer Lake (T) | 8/12/2009 | 38.31421 | 112.36643 | 2958 | -14.1 | -104 | 9.0 |
| Mirror Lake (T) | 8/12/2009 | 38.31042 | 112.36813 | 2928 | -14.0 | -104 | 7.6 |
| Mirror-Otter Spring (T) | 08/12/2009 | 38.30961 | 112.36886 | 2923 | -14.3 | -106 | 7.79 |
| Otter Lake (T) | 8/12/2009 | 38.30869 | 112.36996 | 2915 | -14.1 | -107 | 6.1 |
| Blayney's Reservoir (T) | 8/13/2009 | 38.31069 | 112.36993 | 2917 | -14.0 | -106 | 5.8 |
| Lake Creek Spring from Otter L. (T) | 08/14/2009 | 38.30946 | 112.37139 | 2902 | -14.1 | -106 | 6.70 |
|  |  |  |  |  |  |  |  |

\*WP = Wasatch Plateau, TLM = Thousand Lakes Mountain, A = Aquarius Plateau, M = Markagunt Plateau, T = Tushar Mountains



Fig. S1: Emerald Lake core D07 terrestrial and aquatic macrofossil presence (colored symbols) for measured depths (black circles) on the age scale with lithologic units.



Fig. S2: Emerald Lake core A/C dry bulk density, percent inorganic carbon (%CaCO3) and organic matter (%OM) on a core depth (cm) scale and lithologic units. Age control points with 1-sigma error bars and the Bacon age-depth model are shown in black. Light gray outlines denote the 95% confidence limits of the age model.



Fig. S3: A ternary plot of Emerald Lake core D07 mineralogy shows the relative distribution of dolomite, quartz, and calcite for all core samples (gray triangles). Most of the core is composed primarily of calcite. The samples that span the period between ~5.7 and 5.0 ka (thousands of years BP), lower in calcite and elevated in dolomite and quartz, are interpreted to reflect the influence of the landslide event (red). The samples that span the period between 4.5 and 2.5 ka, low in calcite and dolomite and elevated in quartz, are interpreted to reflect reworking associated with declines in lake level (green).



Figure S4: Emerald Lake core D07 quartz, dolomite, and calcite abundances as raw values (gray) and TIC-normalized values (black) in the upper three panels. The lower two panels show d13C and d18O values as raw (gray) and dolomite-normalized values (black). The data gap in the isotope stratigraphy is due to the lack of calcite.