GSA DATA REPOSITORY 2011084 Anderson

Data Repository Table DR1: Bison Lake Geochronological Data

Core Depth (cm)	Material Lab	number	Measured age (^{14}C yr B.P.)	Calibrated 1-sigma age ranges & (relative area of distribution)	Median intercept of 1-sigma range (Cal yr B.P.)
0				-58	
43	Vascular plant & insect tissue	NSRL-16821	1000 ± 15	910-957 (1)	927 ± 6
68	Wood	NSRL-16822	1310 ± 15	1198-1189 (0.169) 1285-1261 (0.831)	1240 ± 44
114.5	Seed & insect wing	NSRL-16823	2485 ± 15	2494-2599 (.75)	2550 ± 53
152.5	Wood	NSRL-16824	3640 ± 15	3925-3953 (0.554) 3956-3980 (0.446)	3950 ± 28
182	Conifer needle & unidentified organic fragments	NSRL-16825	4415 ± 20	4877-4942 (0.222) 4950-5047 (0.762), 5203-5211 (0.016)	5000 ± 41
193	Charcoal & vascular plant tissue	NSRL-16826	4625 ± 15	5315-5322 (0.228) 5419-5439 (0.772)	5375 ± 62
219.5	Seeds & vascular plant tissue	NSRL-16827	5755 ± 15	6499-6565 (.89) 6591-6600 (.11)	6550 ± 50
302	Wood	WW6772	9114 ± 62 (a)	10209-10299 (0.764) 10321-10343 (0.108) 10352-10374 (0.127)	10290 ± 83
307	Wood	WW6327	11845 ± 40 (b)	13767-13673 (1)	13720 ± 47

Table DR1: Bison Lake core B/C geochronological data. NSRL lab numbers refer to the INSTAAR Laboratory for AMS Radiocarbon Preparation and Research and W.M. Keck Carbon Cycle AMS Facility. WW numbers refer to the USGS Eastern Earth Surface Processes Team ^{14}C Laboratory and (a) NSF-Arizona AMS Facility, or (b) Lawrence Livermore CAMS Facility. Calibrated age ranges were determined using CALIB 5.02.

Data Repository Table DR2: Bison Lake and White River Plateau Water Isotope Data

Sample	#	$\delta^{18}O$ Range (‰)	Avg. $\delta^{18}O$ (‰)	$\delta^{2}H$ Range (‰)	Avg. $\delta^{2}H$ (‰)	Avg. d-excess	Slope
Bison Lake	8	-13.5 to -16.7	-15.1	-104 to -123	-113	7.6	6.06
Bison Springs	7	-16.9 to -17.5	-17.3	-120 to -128	-125	13.1	
Annual Snowpack[1]	7	-18.3 to -19.7	-19.1	-132 to -153	-141	11.7	
WRP Lakes	17	-7.5 to -16.3	-13.3	-79 to -121	-103	3.9	5.83
Annual Precip		-11.7 to -22.2	-16.7	-88 to -167	-123	10.3	7.17

[1]Sunlight Peak (39.4211, -107.3750, 3200 m a.s.l. 1993-2000 and courtesy of the USGS Rocky Mountain Snowpack Chemistry Monitoring Study and L. Benson)

Table DR2: Surface water $\delta^{18}O$, $\delta^{2}H$ ranges, averages and slopes, and d-excess from Bison Lake, springs, lakes, and precipitation samples collected between June and August 2005 and 2009. Six of eight Bison Lake samples were collected from the surface, and two were from 7-m water depth. White River Plateau Lakes are all located above 3000 m a.s.l.

Data Repository Figure DR1: Bison Lake SNOTEL Climate Data

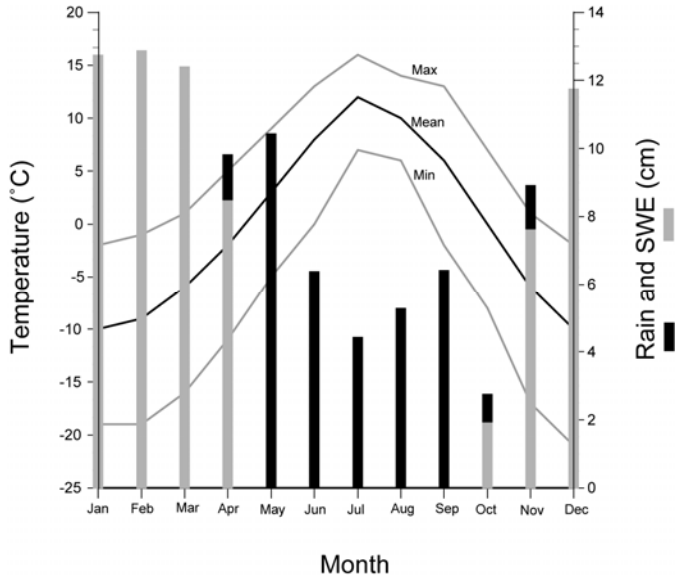

Figure DR1: Bison Lake average monthly temperature (min, mean, max) and precipitation with snow as monthly snow water equivalent (SWE, gray) and rain (black). The Natural Resource Conservation Service SNOTEL station is located within 1 km of Bison Lake (station #345, 39.4211˚N, 107.3750, 3200 m a.s.l) and has operated since 1986. Recorded mean annual temperature is -1˚C. Mean annual precipitation is 91.03 cm with ~70% as snow water equivalent (SWE). Data and description of instrumentation is available at http://www.wcc.nrcs.usda.gov/snow/.

Data Repository Figure DR2: Bathymetry and Coring Locations

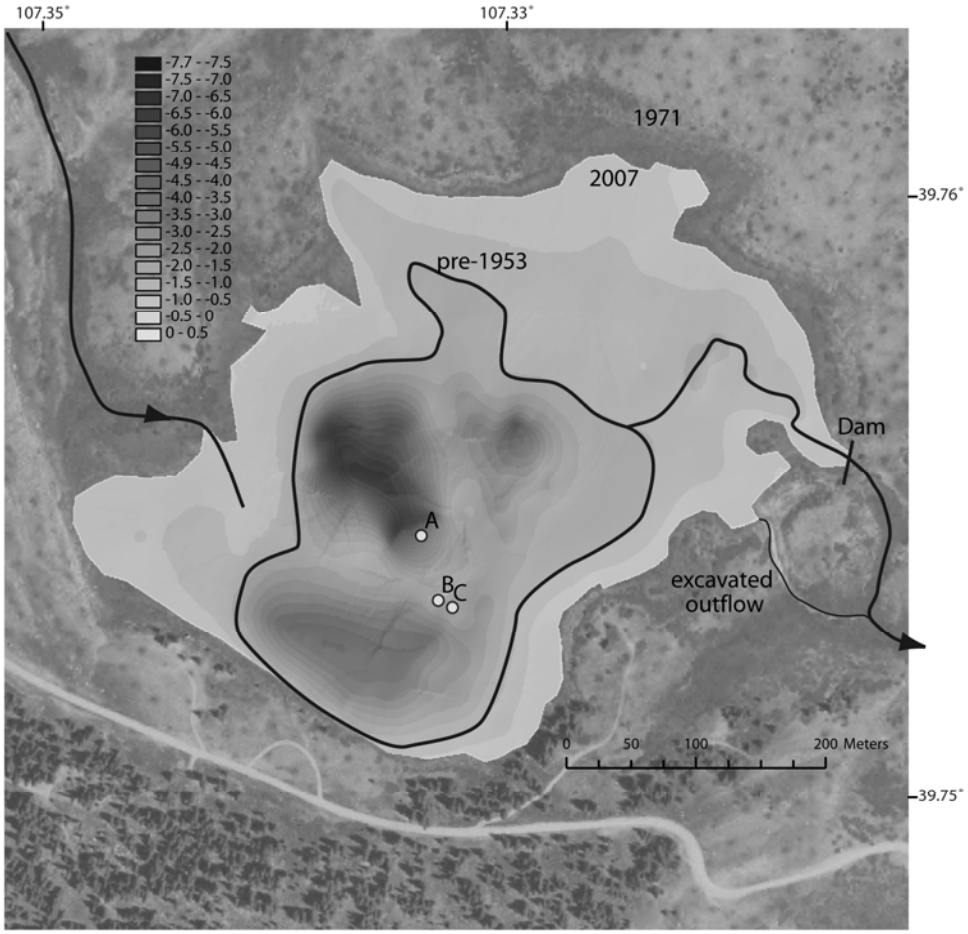

Figure DR2: Bison Lake bathymetry and core B/C location shown on a geo-rectified USDA 1991 air photo. The highest post-impoundment shoreline is visible by the darker vegetation and labeled '1971', the lowest shoreline is approximate and labeled pre-1953. The bathymetric surface was developed from a 2007 survey of longitude (x), latitude (y), and respective depth values (-z) below the lake surface (n = 730), including the lake perimeter. Using the average 2007 lake elevation of 3276 m a.s.l., the depth data generated altitude values below the lake surface from which a kriging interpolation method within ArcGIS 3D Analyst software generated a 0.5-m bathymetric surface raster.

Data Repository Figure DR3: Sediment Core Images

Figure DR3: Bison Lake core B images with indication of surface core (Core C) overlap. Images were obtained by GeoTek MSCL-S sensor at the Limnological Research Center, University of Minnesota and variably adjusted. Xray imagery for D3 was obtained by Cox Analytical Itrax XRF Core Scanning at the Large Lakes Observatory, University of Minnesota Duluth.

Data Repository Figure DR4: Bulk Sedimentary Properties and Age Model

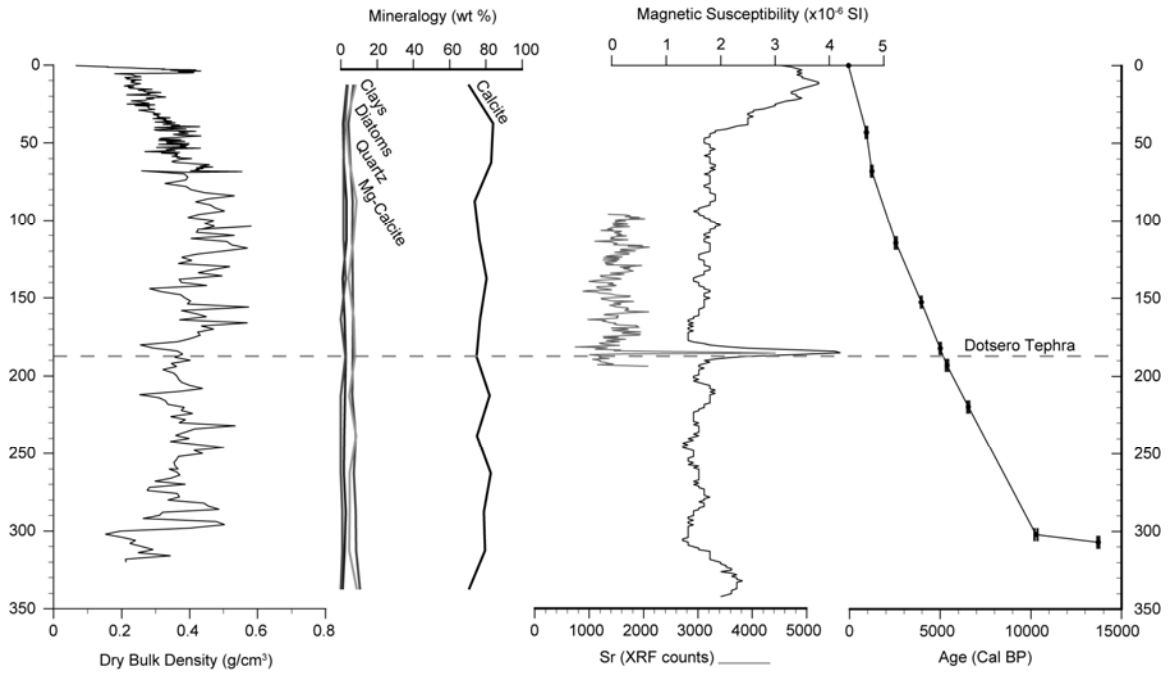

Figure DR4: Bison Lake core B/C stratigraphic data on a composite core depth scale. Linear age model and calibrated AMS ^{14}C ages are shown with 1-sigma error bars. Whole core magnetic susceptibility measurements were made with a Geotek MSCL-S sensor. Mineralogy was determined by x-ray diffraction (XRD, Siemens D5000 X-Ray Diffractometer, and by RockJock software). Elemental Strontium counts were determined by high-resolution scanning x-ray fluorescence spectroscopy (XRF, Cox Analytical Itrax XRF Core Scanner, Cr tube, 0.5 cm, 60 seconds) and identifies the Dotsero Tephra.

Data Repository Figure DR5: Carbon and Isotope Data by Depth

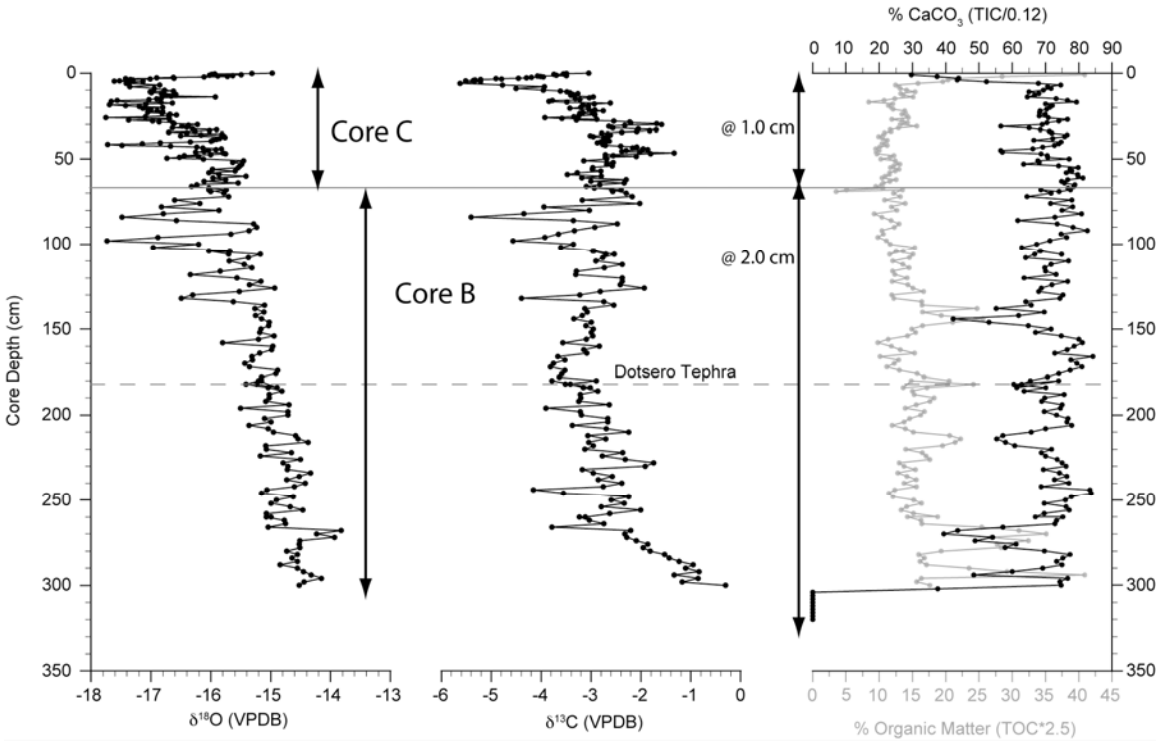

Figure DR5: Bison Lake core B/C calcite $\delta^{18}O$ and $\delta^{13}C$ on a core depth scale shown with bulk organic and inorganic carbon content measured by a UIC^{TM} coulometric carbon analyzer. The accuracy and precision for both TC and TIC is 0.10 wt %. Percent organic carbon (%OC) was calculated as the difference TC and TIC. Percent organic matter (%OM) was calculated as 2.5*(%OC). Percent calcium carbonate (%$CaCO_3$) was calculated as TIC/0.12. Samples for TC and TIC were analyzed every 1 cm from 0 to 69 cm depth (Core C) and every 2 cm for the remainder of the core (Core B).

Data Repository Figure DR6: Bison Lake Calcite Isotope Equilibria

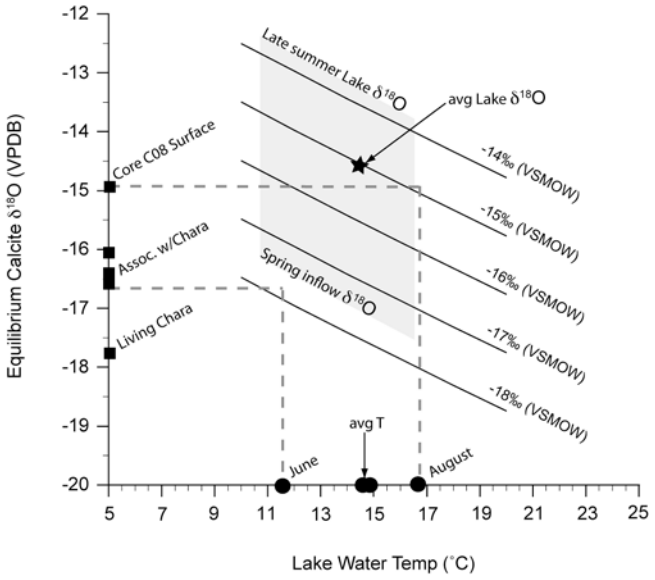

Figure DR6: Equilibrium calcite $\delta^{18}O$ is shown versus lake water temperature as a function of lake water $\delta^{18}O$ using equations from Tarutani et al. (1969, Geochimica et Cosmochimica Acta 33, 987-996), Epstein et al. (1953 Bulletin of the Geological Society of America 64, 1315-1326), both of which were traced from Friedman and O'Neil (1977, U.S. Geological Survey Professional Paper Vol. 440-KK, Data of Geochemistry). Black circles on the horizontal axis are measured lake water temperatures and squares on the vertical axis are measured calcite $\delta^{18}O$ from core CO8 surface sample (0-0.25 cm, <32µm, labeled "C08") and from living *Chara* encrustations and associated bulk sediment size fractions (labeled "Assoc. W/Chara", 125, 63, 32, <32 µm) from a grab sample near the coring site. Horizontal dotted lines outline these measured ranges and the gray area reflects the range of measured lake-water $\delta^{18}O$ within the measured temperature range (n=8, Table DR1). Calcite equilibrium of fine-grained calcite is supported by 1) similarity between predicted equilibrium lake water temperatures and the measured temperature range, and 2) calculations of an equilibrium calcite $\delta^{18}O$ value of -14.7‰ for the C08 surface sample based on the averaged growing season temperature of -14.7˚C, and lake-water $\delta^{18}O$ of -15.13‰, that is within analytical error of the measured calcite value of -14.9‰.