Lake Lacawac, Bruce R. Hargreaves, Lehigh University (brh0@lehigh.edu, http://www.lehigh.edu/~brh0) 41° 22.5'N 75° 17.3'W elevation 428m

18 May 2013, 4:30-6:43pm EDT: platform moved to lake center 16Nov 2013: platform move to dock 11:45-13:00 EDT

The water level sensor (referenced to dock) settles for several days after moving platform to lake center and thus underestimates water level during this period.

Dec11: Tw12 appears to be failing (drifting upward); need to check or replace when possible

H310 sensor depth & Lake level are based on differential pressure
sensor with ca 0.1mm resolution & vertical position referenced to bottom of lake.
Sensor PSIG converted to depth using density of water at 4oC (1.43321 psi/m)
Lake level is referenced also to lower frame of dock at SE corner (2003-May2005)
(Actual water level at dock varies seasonally with density of water column and hourly from
precip, runoff, evaporation, seepage & outflow. Outflow also varies with status of beaver dam).

						5280	ft/mile																				
						1609.3	m/mile																				
		Tair avg F	Tair max F	Tair min F		Rain-in	WS-mph	WS max mph					Tw 0.1m F	Tw 0.5m F	Tw 1m F	Tw 2m F	Tw 3m F	Tw 4m F	Tw 5m F	Tw 6m F	Tw 8m F	Tw 10m F	Tw 12m F					
		28.8	61.8	1.9		2.65	3.1	23					34.6	36.7	36.9	37.2	37.4	38.3	37.6	37.5	37.9	37.8	39.2					
Month summary	avg Tw	Tair avg-C	Tair Hi-C	Tair Min-C	RHair-%	Rain-mm	WS-m/s	WS Max-m/s	WDIR-deg	Barom-mb	Sum Rad W/m2	Sum PAR uM/m2/s	Tw 0.1m	Tw 0.5m	Tw 1m	Tw 2m	Tw 3m	Tw 4m	Tw 5m	Tw 6m	Tw 8m	Tw01.7m	Tw02.2m	H310_z (m)	Lakelevel-mm (4oC)	cumul. rain-mm	Batt min-V	RH% CR10 enc	RH% MUX enc
	3.1	-1.8	16.6	-16.7	77.8	67.4	1.4	10.3	221.6	964.0	119337688	237	1.5	2.6	2.7	2.9	3.0	3.5	3.1	3.0	3.3	3.2	4.0	1.8	-36.9	67.4	12.4	20.6	17.9

Std pressure at sea level =1 atm=760 mm Hg=29.92" Hg=1013.2 mbars
Std pressure at 428m elevation =724 mm Hg, 29.61 in. Hg, (965.2 mbars)

month (All)

PAR & PYR Integration period=15min instead of 60min after 11am on 9/11/2013

Data

Location	% records	Date	Day of Yr	Tair avg-C	Tair Hi-C	Tair Min-C	RHair-%	Rain-mm	WS-m/s	WS Max m/s	WDIR-deg	Barom-mb	Sum Rad J/m2	Sum PAR Mol/m2	Tw 0.1m	Tw 0.5m	Tw 1m	Tw 2m	TW3m	TW4m	TW5m	TW6m	TW8m	TW H310-C	TW12m	H310 depth-m (4oC)	Lakelevel-mm (4oC)	cumul. rain-mm	Batt min-V	RH% CR10 enc	RH% MUX enc
ND	100%	12/1/2013	335	-0.9	3.6	-4.1	86.7	0.0	0.3	2.7	124	967.6	3831429	8.3	1.76	2.70	2.74	2.85	2.92	3.46	3.67	3.09	2.95	3.46	3.2	4.31	1.7	-95.0	0.000	12.6	17.1	15.3
ND	100%	12/2/2013	336	1.4	6.2	-1.5	87.2	0.7	0.1	2.2	106	960.5	4238282	8.4	1.76	2.82	2.84	2.93	3.14	3.76	3.24	3.11	3.67	3.3	4.54	1.7	-94.2	0.700	12.5	19.7	16.0
ND	100%	12/3/2013	337	1.5	8.3	-1.9	85.8	0.0	0.4	5.0	199	960.5	7103527	13.7	2.16	2.92	2.94	3.04	3.26	3.83	3.36	3.24	3.73	3.4	4.58	1.7	-91.9	0.700	12.5	21.7	15.8
ND	100%	12/4/2013	338	2.2	7.6	-1.3	90.9	0.1	0.4	2.8	170	965.1	6002811	11.8	2.39	3.04	3.07	3.17	3.39	3.96	3.50	3.41	3.83	3.5	4.70	1.7	-90.7	0.800	12.6	21.7	15.9
ND	100%	12/5/2013	339	7.7	10.2	4.8	96.0	3.4	0.5	4.0	169	963.9	1401785	3.1	2.27	3.10	3.14	3.26	3.45	4.04	3.58	3.47	3.84	3.6	4.71	1.7	-89.0	4.200	12.5	24.7	18.9
ND	100%	12/6/2013	340	3.6	11.9	-1.5	88.3	14.6	1.9	7.1	264	964.4	2800961	5.9	3.23	3.13	3.14	3.24	3.27	3.71	3.24	3.31	3.25	3.6	4.02	1.7	-78.1	18.800	12.5	24.7	29.7
ND	100%	12/7/2013	341	-3.0	-1.7	-6.2	84.8	0.1	2.1	7.2	300	972.6	4219630	8.0	2.68	2.66	2.71	2.77	2.80	3.22	2.77	2.86	2.74	3.1	3.43	1.7	-60.3	18.900	12.5	18.9	19.9
ND	100%	12/8/2013	342	-6.4	-4.3	-9.2	79.7	0.0	1.0	4.7	161	978.2	2572662	5.4	1.74	2.50	2.75	2.97	3.08	3.62	3.28	3.15	3.43	3.3	4.09	1.7	-60.5	18.900	12.4	16.2	16.1
ND	100%	12/9/2013	343	-1.9	0.9	-5.6	96.5	0.6	1.1	6.0	101	965.6	1586612	3.4	1.42	2.60	2.78	2.98	3.15	3.70	3.31	3.13	3.47	3.3	4.25	1.8	-57.4	19.500	12.4	18.3	16.4
ND	100%	12/10/2013	344	-3.1	-0.5	-6.6	82.3	0.0	1.6	7.5	288	960.9	2168726	4.3	1.24	2.61	2.78	2.99	3.15	3.70	3.29	3.12	3.50	3.3	4.26	1.8	-55.2	19.500	12.4	18.1	16.2
ND	100%	12/11/2013	345	-6.2	-3.2	-8.1	59.9	0.0	1.9	8.2	272	967.7	6180021	10.9	1.11	2.66	2.80	3.04	3.14	3.66	3.23	3.18	3.46	3.4	4.20	1.8	-54.5	19.500	12.4	17.3	16.0
ND	100%	12/12/2013	346	-9.1	-6.9	-11.5	57.2	0.1	2.0	7.7	279	968.5	6940822	12.7	1.06	2.68	2.81	3.04	3.16	3.66	3.29	3.18	3.52	3.3	4.20	1.8	-55.0	19.600	12.7	17.1	16.5
ND	100%	12/13/2013	347	-6.7	-3.6	-10.4	57.0	0.0	2.2	8.1	252	964.2	7662228	14.2	1.12	2.75	2.87	3.07	3.13	3.57	3.24	3.19	3.45	3.4	4.17	1.8	-54.5	19.600	12.6	17.6	16.1
ND	100%	12/14/2013	348	-9.1	-6.7	-11.1	88.0	0.0	2.3	7.3	82	969.6	2190488	4.7	0.84	2.82	2.91	3.10	3.25	3.74	3.37	3.23	3.52	3.4	4.20	1.8	-50.4	19.600	12.6	16.3	15.8
ND	100%	12/15/2013	349	-5.2	-1.8	-10.2	87.3	0.0	2.1	8.3	265	951.0	2048397	4.5	1.12	2.83	2.94	3.10	3.22	3.69	3.32	3.24	3.54	3.4	4.22	1.8	-27.9	19.600	12.5	16.9	15.2
ND	100%	12/16/2013	350	-8.2	-3.9	-14.1	61.3	0.0	2.2	8.7	277	961.4	5759163	10.8	0.99	2.82	2.94	3.13	3.22	3.66	3.32	3.27	3.52	3.4	4.21	1.8	-28.1	19.600	12.4	17.3	15.3
ND	100%	12/17/2013	351	-11.9	-8.7	-16.6	89.1	0.0	0.6	4.0	99	960.9	863374	2.2	0.73	2.80	2.93	3.15	3.32	3.78	3.42	3.29	3.63	3.5	4.25	1.8	-27.4	19.600	12.4	16.5	15.3
ND	100%	12/18/2013	352	-7.2	-2.1	-16.7	80.3	0.0	1.3	6.9	255	957.7	4759968	10.0	0.73	2.77	2.95	3.16	3.29	3.77	3.45	3.31	3.64	3.5	4.25	1.8	-24.7	19.600	12.4	17.6	15.1
ND	100%	12/19/2013	353	-0.8	6.4	-7.5	66.7	4.0	0.9	8.3	250	961.8	6540326	12.7	0.69	2.75	2.97	3.18	3.31	3.78	3.47	3.33	3.67	3.5	4.26	1.8	-24.5	23.600	12.5	21.6	15.3
ND	100%	12/20/2013	354	4.7	10.9	-1.8	65.1	13.8	0.6	6.3	198	958.5	2408723	5.4	0.66	2.72	2.97	3.19	3.33	3.81	3.51	3.36	3.66	3.5	4.26	1.8	-25.4	37.400	12.6	23.5	16.5
ND	100%	12/21/2013	355	9.6	15.7	5.4	75.7	0.3	0.9	5.7	225	956.1	3612666	7.9	0.74	2.72	2.98	3.20	3.30	3.79	3.48	3.37	3.69	3.5	4.30	1.8	-24.4	37.700	12.5	29.6	20.9
ND	100%	12/22/2013	356	14.4	16.6	10.6	85.5	0.4	1.5	9.5	245	958.7	2153332	4.7	0.87	2.68	2.98	3.23	3.31	3.74	3.49	3.38	3.66	3.5	4.34	1.8	-17.0	38.100	12.5	33.1	27.2
ND	100%	12/23/2013	357	7.8	13.2	-0.2	91.6	8.9	1.5	9.1	267	963.8	833130	2.0	1.19	2.46	2.71	2.98	3.10	3.63	3.32	3.14	3.31	3.3	4.09	1.8	-4.3	47.000	12.5	31.4	30.3
ND	100%	12/24/2013	358	-3.8	-0.3	-9.0	70.3	0.0	2.5	8.7	316	968.3	3601062	7.2	2.16	2.39	2.47	2.57	2.65	3.04	2.74	2.70	2.63	3.0	3.34	1.8	3.0	47.000	12.5	20.0	19.6
ND	100%	12/25/2013	359	-9.3	-6.3	-12.8	64.3	0.0	1.6	9.0	226	974.3	5576387	10.5	1.68	1.90	2.02	2.23	2.39	2.79	2.55	2.47	2.50	2.6	3.14	1.8	2.2	47.000	12.4	17.8	16.6
ND	100%	12/26/2013	360	-4.7	-1.6	-7.3	75.9	0.2	1.2	7.9	248	968.0	3379119	6.7	1.61	2.01	2.11	2.25	2.33	2.81	2.54	2.38	2.57	2.6	3.24	1.8	0.7	47.200	12.7	18.3	16.3
ND	100%	12/27/2013	361	-3.2	-0.6	-7.1	70.1	0.0	1.2	8.4	272	969.7	3512600	7.0	1.33	1.93	2.06	2.21	2.36	2.79	2.56	2.41	2.63	2.6	3.30	1.8	-1.1	47.200	12.6	18.6	16.3
ND	100%	12/28/2013	362	2.0	7.4	-4.0	60.3	0.0	1.2	8.5	262	965.1	7257525	14.3	1.28	2.09	2.16	2.27	2.38	2.85	2.60	2.44	2.73	2.6	3.44	1.8	-2.9	47.200	12.5	25.1	17.0
ND	100%	12/29/2013	363	2.0	4.5	0.7	81.5	20.2	1.1	7.6	207	955.0	810470	1.9	1.31	2.19	2.27	2.40	2.51	2.91	2.70	2.56	2.75	2.8	3.48	1.8	3.8	67.400	12.5	23.0	17.1
ND	100%	12/30/2013	364	-2.6	2.7	-9.4	75.5	0.0	2.9	9.4	284	958.9	3807839	7.5	2.00	2.14	2.21	2.34	2.41	2.75	2.51	2.46	2.46	2.7	3.12	1.8	21.5	67.400	12.5	22.8	17.9
ND	100%	12/31/2013	365	-8.0	-3.9	-10.8	70.1	0.0	2.0	10.3	206	964.5	3513621	6.9	1.66	2.14	2.23	2.35	2.43	2.75	2.55	2.46	2.64	2.7	3.27	1.8	20.9	67.400	12.4	17.6	16.4

Lake water & energy budget daily summary from hourly data (negative values: loss from lake; runoff & seepage term is residual after adjusting lake level change for all others)

Ratio of lake watershed to lake area: 2.6176758 Runoff & seepage as % of watershed area precip: 54%

																												1.000	<=SCALE ADJ (1.0=no adjustment)
																												4.184	joule/calorie (= joule/degree for 1cm3)
Grand sum/avg	-1.75	1.47	2.59	2.72	2.88	3.01	3.49	1.2	119336210	-15973	115.3	67.4	95.4	-21.7	0.0	0.0	Nominal diffuse %R from water=7%	-13335.2	94381.3	13%	3	3.0	-0.7	-0.5	-4.4

SumTerrevap2=AirVPD,mbar*WS,m/s*s

																					4.184	<=CONVERT HEAT TO DEGREES				4.184	slope
																	7%	0.9			6000000	cm3/m2 (for 0-4m integrated depth)			6000000	intercept
																												r2
		Data																											
DATE	DOY	AvgTair C	AvgTw 0.1m	AvgTw0.5 m	Avg Tw1m	Avg Tw2m	Avg Tw3m	Avg Tw4m	AvgWS m/s	CSI	SumRad J/m2	SumH Evap (*0.9=KJ/m2)	Sum Lk_lvl chg (mm)	SumRain mm	Sum Runoff & seepage, mm	SumLake evap (mm)	Sum Terrevap2	Solar Heat input (absorbed from solar rad), KJ/m2)	Sum H evap (KJ/m^2)	solar heat absorbed - evap loss (kJ/m^2)	% of absorbed solar heat lost via evap	Solar Heat input (absorbed from solar rad), Tw 0-6m)	starting Tw (0-6m)	ending Tw (0-6m)	actual dTw, 0-6m	RESID1: NON-SOLAR FLUX (Heat flux to offset absorbed solar to match dTw)	evap loss (degC 0-6m)	RESID2: NON-SOLAR FLUX to offset absorbed solar to match dTw LESS EVAP (degC 0-6m)
12/1/2013	335	-0.96	1.77	2.70	2.74	2.85	2.91	3.66	0.2	3831032	-199	-0.089	0.0	1.0	-0.3	0.0	3563	-179	3384	5.0%	0.14	2.98	3.09	0.11	(0.03)	-0.01	(0.02)
12/2/2013	336	1.44	1.76	2.82	2.83	2.93	3.14	3.75	0.1	4238187	-73	1.306	0.7	1.5	-0.1	0.0	3942	-65	3876	1.7%	0.16	3.09	3.20	0.10	(0.05)	0.00	(0.05)
12/3/2013	337	1.49	2.14	2.91	2.94	3.04	3.26	3.83	0.4	7103368	-144	2.774	0.0	3.8	-0.2	0.0	6606	-130	6476	2.0%	0.26	3.20	3.29	0.09	(0.17)	-0.01	(0.17)
12/4/2013	338	2.03	2.38	3.04	3.06	3.17	3.38	3.95	0.3	6003064	-79	0.305	0.1	1.2	-0.1	0.0	5583	-71	5511	1.3%	0.22	3.29	3.43	0.14	(0.08)	0.00	(0.08)
12/5/2013	339	7.62	2.25	3.09	3.13	3.25	3.45	4.04	0.3	1401470	164	4.490	3.4	1.7	0.2	0.0	1303	147	1451	-11.3%	0.05	3.43	3.52	0.10	0.04	0.01	0.04
12/6/2013	340	3.92	3.24	3.14	3.16	3.25	3.29	3.73	1.7	2801734	-210	22.356	14.6	8.9	-0.3	0.0	2606	-189	2417	7.3%	0.10	3.52	2.93	(0.59)	(0.69)	-0.01	(0.69)
12/7/2013	341	-2.83	2.70	2.68	2.72	2.77	2.80	3.22	2.1	4218869	-830	3.257	0.1	5.1	-1.1	0.0	3924	-747	3177	19.0%	0.16	2.93	2.84	(0.09)	(0.25)	-0.03	(0.22)
12/8/2013	342	-6.41	1.75	2.49	2.74	2.97	3.07	3.61	0.9	2573159	-684	-0.030	0.0	1.7	-0.9	0.0	2393	-616	1777	25.7%	0.10	2.84	3.11	0.27	0.18	-0.02	0.20
12/9/2013	343	-2.05	1.42	2.60	2.79	2.98	3.15	3.70	1.0	1586245	-319	4.351	0.6	5.0	-0.4	0.0	1475	-287	1188	19.4%	0.06	3.11	3.15	0.03	(0.03)	-0.01	(0.01)
12/10/2013	344	-2.88	1.25	2.61	2.78	2.99	3.15	3.70	1.4	2167345	-510	1.947	0.0	3.5	-0.7	0.0	2016	-459	1557	22.8%	0.08	3.15	3.14	(0.01)	(0.09)	-0.02	(0.07)
12/11/2013	345	-6.19	1.11	2.66	2.81	3.04	3.14	3.66	1.7	6181281	-1055	-0.567	0.0	1.7	-1.4	0.0	5749	-949	4799	16.5%	0.23	3.14	3.16	0.02	(0.21)	-0.04	(0.17)
12/12/2013	346	-9.04	1.06	2.68	2.80	3.04	3.16	3.67	1.7	6939230	-1242	-0.310	0.1	2.1	-1.7	0.0	6453	-1118	5336	17.3%	0.26	3.16	3.12	(0.04)	(0.30)	-0.04	(0.25)
12/13/2013	347	-6.78	1.12	2.75	2.87	3.07	3.13	3.56	2.0	7663956	-1279	1.341	0.0	3.9	-1.7	0.0	7127	-1151	5976	16.1%	0.28	3.12	3.25	0.13	(0.15)	-0.05	(0.10)
12/14/2013	348	-8.93	0.85	2.82	2.91	3.10	3.25	3.75	2.2	2190596	-1071	14.212	0.0	16.5	-1.5	0.0	2037	-964	1073	47.3%	0.08	3.25	3.17	(0.08)	(0.16)	-0.04	(0.12)
12/15/2013	349	-5.43	1.12	2.83	2.94	3.10	3.22	3.68	1.9	2047563	-736	12.365	0.0	14.2	-1.0	0.0	1904	-663	1241	34.8%	0.08	3.17	3.20	0.03	(0.04)	-0.03	(0.02)
12/16/2013	350	-7.86	1.00	2.82	2.94	3.12	3.22	3.66	2.0	5759525	-1149	-1.598	0.0	0.8	-1.6	0.0	5356	-1034	4322	19.3%	0.21	3.20	3.25	0.05	(0.16)	-0.04	(0.12)
12/17/2013	351	-11.83	0.73	2.80	2.93	3.15	3.32	3.78	0.5	864301	-712	2.933	0.0	4.7	-1.0	0.0	804	-641	163	79.8%	0.03	3.25	3.29	0.04	0.00	-0.03	0.03
12/18/2013	352	-7.53	0.73	2.77	2.95	3.16	3.29	3.77	1.1	4759536	-721	1.949	0.0	3.8	-1.0	0.0	4426	-649	3778	14.7%	0.18	3.29	3.29	0.00	(0.17)	-0.03	(0.15)
12/19/2013	353	-1.01	0.69	2.75	2.97	3.18	3.31	3.78	0.7	6540464	-392	-1.076	4.0	-3.7	-0.5	0.0	6083	-352	5730	5.8%	0.24	3.29	3.31	0.02	(0.22)	-0.01	(0.21)
12/20/2013	354	4.45	0.66	2.72	2.97	3.19	3.33	3.81	0.4	2408764	-84	-0.363	13.8	-13.2	-0.1	0.0	2240	-75	2165	3.4%	0.09	3.31	3.31	0.00	(0.09)	0.00	(0.08)
12/21/2013	355	9.51	0.74	2.72	2.98	3.20	3.30	3.79	0.6	3611964	221	3.078	0.3	3.3	0.3	0.0	3359	199	3558	-5.9%	0.13	3.31	3.30	(0.02)	(0.15)	0.01	(0.16)
12/22/2013	356	14.35	0.86	2.68	2.98	3.23	3.31	3.74	1.0	2153924	1217	9.617	0.4	8.4	1.7	0.0	2003	1096	3099	-54.7%	0.08	3.30	3.35	0.05	(0.03)	0.04	(0.07)
12/23/2013	357	8.16	1.15	2.47	2.73	3.00	3.13	3.66	1.2	833050	210	15.019	8.9	6.7	0.3	0.0	775	189	964	-24.4%	0.03	3.35	2.61	(0.74)	(0.77)	0.01	(0.78)
12/24/2013	358	-3.58	2.15	2.39	2.47	2.57	2.65	3.04	2.3	3600087	-1136	1.330	0.0	3.7	-1.5	0.0	3348	-1022	2326	30.5%	0.13	2.61	2.50	(0.11)	(0.24)	-0.04	(0.20)
12/25/2013	359	-9.36	1.70	1.90	2.02	2.22	2.38	2.78	1.5	5577543	-1189	-2.172	0.0	0.3	-1.6	0.0	5187	-1070	4117	20.6%	0.21	2.50	2.68	0.19	(0.02)	-0.04	0.02
12/26/2013	360	-4.80	1.62	2.02	2.13	2.27	2.35	2.83	0.9	3378341	-639	-1.474	0.2	0.0	-0.9	0.0	3142	-575	2567	18.3%	0.13	2.68	2.18	(0.50)	(0.63)	-0.02	(0.60)
12/27/2013	361	-3.27	1.35	1.93	2.06	2.21	2.35	2.78	1.1	3514017	-612	-1.927	0.0	-0.3	-0.8	0.0	3268	-551	2717	16.9%	0.13	2.18	2.41	0.22	0.09	-0.02	0.11
12/28/2013	362	1.85	1.25	2.08	2.16	2.27	2.38	2.85	1.1	7256833	-405	-1.678	0.0	-0.3	-0.6	0.0	6749	-365	6384	5.4%	0.27	2.41	2.51	0.11	(0.16)	-0.01	(0.15)
12/29/2013	363	1.99	1.32	2.20	2.28	2.40	2.50	2.91	0.9	810257	-64	23.750	20.2	4.5	-0.1	0.0	754	-58	696	7.6%	0.03	2.51	2.55	0.04	0.01	0.00	0.01
12/30/2013	364	-2.30	1.98	2.14	2.21	2.34	2.42	2.76	2.8	3808407	-1097	1.522	0.0	3.9	-1.5	0.0	3542	-987	2555	27.9%	0.14	2.55	2.30	(0.25)	(0.39)	-0.04	(0.35)
12/31/2013	365	-7.97	1.68	2.14	2.23	2.34	2.42	2.74	1.7	3512096	-1156	-1.322	0.0	0.9	-1.6	0.0											