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

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)

	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					
	36.1	64.9	9.0		2.65	5.2	31					44.2	44.2	44.2	44.0	43.9	44.3	43.8	43.9	43.4	42.1	42.3					
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	Tw11.1m	Tw12.4m	H310_z (m)	Lakelevel-mm (4oC)	cumul. rain-mm	Batt min-V	RH% CR10 enc	RH% MUX enc
6.5	2.3	18.3	-12.8	66.9	67.4	2.3	14.0	253.9	968.1	209318506	407	6.8	6.8	6.8	6.7	6.6	6.8	6.6	6.6	6.3	5.6	5.7	7.1	-126.2	67.4	12.4	19.1	17.4

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
LC	100%	11/1/2013	305	14.9	18.3	8.2	71.0	8.2	3.6	14.0	235	951.0	8914082	18.2	11.19	11.16	11.13	11.04	10.84	10.72	10.55	10.46	9.37	6.5	6.47	11.1	-122.6	8.200	12.5	25.6	23.9
LC	100%	11/2/2013	306	9.0	13.5	5.4	71.9	0.0	1.4	7.8	265	954.2	6189813	12.5	11.14	11.16	11.13	11.06	10.92	10.98	10.81	10.62	9.33	6.6	6.47	11.1	-120.5	8.200	12.6	19.8	14.9
LC	100%	11/3/2013	307	2.1	8.1	-2.3	68.3	0.0	3.5	8.9	322	968.1	9625284	18.7	10.73	10.75	10.74	10.69	10.57	10.64	10.59	10.62	9.41	6.6	6.48	11.1	-123.3	8.200	12.6	17.6	14.2
LC	100%	11/4/2013	308	-0.3	4.7	-5.3	53.8	0.0	1.4	6.0	166	981.4	13488502	25.1	10.08	10.11	10.08	10.01	9.85	9.88	9.80	9.82	9.35	6.6	6.47	11.1	-125.9	8.200	12.6	18.0	14.4
LC	100%	11/5/2013	309	4.4	8.8	0.0	65.6	0.0	1.3	6.5	166	981.8	8022646	16.0	9.74	9.77	9.75	9.68	9.53	9.55	9.47	9.53	9.11	6.6	6.49	11.1	-128.0	8.200	12.6	17.3	13.8
LC	100%	11/6/2013	310	9.2	11.9	6.2	79.0	0.0	2.2	9.3	202	973.0	5716045	11.8	9.62	9.66	9.66	9.59	9.42	9.46	9.35	9.39	9.05	6.6	6.49	11.1	-129.8	8.200	12.6	19.8	14.1
LC	100%	11/7/2013	311	8.3	12.5	2.8	81.6	7.3	2.8	10.1	272	960.6	1993728	4.4	9.66	9.67	9.66	9.60	9.47	9.50	9.41	9.46	9.07	6.6	6.52	11.1	-125.4	15.500	12.5	20.8	30.9
LC	100%	11/8/2013	312	2.3	4.7	-0.3	64.0	0.0	3.1	11.2	292	964.7	6578091	12.7	9.11	9.15	9.15	9.10	8.98	9.04	8.97	9.06	8.80	6.6	6.58	11.1	-122.7	15.500	12.5	17.1	35.0
LC	100%	11/9/2013	313	2.7	6.5	-1.3	62.3	0.0	2.2	6.7	236	968.2	8554869	16.9	8.59	8.63	8.62	8.57	8.42	8.46	8.37	8.45	8.14	7.1	7.34	11.1	-125.8	15.500	12.6	17.6	16.7
LC	100%	11/10/2013	314	5.7	9.3	3.9	59.7	1.3	3.3	11.5	257	960.7	4092674	8.1	8.22	8.26	8.26	8.22	8.09	8.13	8.05	8.16	7.94	7.4	7.52	11.1	-126.6	16.800	12.6	18.4	22.3
LC	100%	11/11/2013	315	4.5	7.5	1.0	54.6	0.0	3.0	10.3	258	965.9	5592323	11.1	7.78	7.81	7.80	7.76	7.63	7.68	7.59	7.70	7.49	7.3	7.36	11.1	-127.9	16.800	12.5	17.9	19.0
LC	100%	11/12/2013	316	-1.6	7.6	-4.7	70.5	0.1	3.7	10.8	316	967.5	6751044	13.0	7.35	7.39	7.38	7.35	7.22	7.28	7.18	7.30	7.11	7.2	7.08	11.1	-128.5	16.900	12.5	17.1	15.6
LC	100%	11/13/2013	317	-3.7	-0.7	-6.5	64.9	0.0	3.1	8.6	294	972.7	11836191	21.9	6.58	6.64	6.64	6.61	6.48	6.54	6.42	6.54	6.35	6.7	6.42	11.1	-130.4	16.900	12.5	17.1	15.0
LC	100%	11/14/2013	318	2.4	7.1	-1.6	40.2	0.0	3.0	8.6	253	968.7	11003498	20.5	6.05	6.11	6.11	6.07	5.93	5.99	5.86	5.99	5.78	6.2	5.89	11.1	-133.1	16.900	12.6	18.6	14.5
LC	100%	11/15/2013	319	5.9	12.3	1.0	37.4	0.0	1.0	6.2	246	969.2	9222725	17.6	5.87	5.95	5.93	5.86	5.70	5.74	5.61	5.73	5.50	5.9	5.55	11.1	-134.8	16.900	12.6	20.2	14.4
LC	100%	11/16/2013	320	8.1	14.6	1.9	61.0	0.0	0.8	6.4	246	971.9	10967488	21.6	6.40	6.01	5.91	5.81	5.72	5.85	5.69	5.83	5.53	5.7	5.80	6.3	-136.2	16.900	12.6	23.7	14.8
LC	100%	11/17/2013	321	10.1	13.1	7.6	94.0	0.3	1.0	7.1	217	966.1	1283914	3.0	6.74	6.16	6.04	5.90	5.85	6.06	5.86	6.06	5.69	5.8	6.11	1.7	-136.5	17.200	12.5	22.0	16.9
LC	100%	11/18/2013	322	10.5	13.9	5.8	61.0	5.6	2.6	12.3	274	953.1	10552871	20.5	7.00	6.84	6.74	6.58	6.47	6.68	6.43	6.54	6.32	6.4	6.57	1.7	-129.5	22.800	12.5	27.8	18.9
LC	100%	11/19/2013	323	1.4	5.8	-1.9	58.7	0.0	4.3	12.1	326	965.4	2981379	6.1	6.37	6.37	6.33	6.19	6.09	6.41	6.06	6.17	6.03	6.0	6.29	1.7	-131.6	22.800	12.5	18.0	14.9
LC	100%	11/20/2013	324	-1.7	4.2	-5.9	56.2	0.0	0.9	4.1	197	978.7	10429675	19.3	5.87	5.93	5.86	5.69	5.59	5.99	5.57	5.67	5.28	5.5	5.68	1.7	-134.0	22.800	12.4	19.4	15.1
LC	100%	11/21/2013	325	-0.4	4.7	-7.1	72.9	0.0	0.4	4.9	200	979.7	5783178	11.8	5.68	5.64	5.59	5.46	5.37	5.84	5.35	5.45	5.14	5.3	5.49	1.7	-137.3	22.800	12.5	17.0	14.8
LC	100%	11/22/2013	326	7.2	9.3	4.0	90.6	2.2	1.2	6.4	265	967.8	2932700	6.2	5.87	5.84	5.82	5.70	5.63	6.01	5.61	5.72	5.50	5.5	5.83	1.7	-136.7	25.000	12.5	21.3	16.4
LC	100%	11/23/2013	327	0.0	7.5	-5.8	65.0	0.0	3.4	10.7	308	963.4	9122062	17.1	5.62	5.63	5.61	5.48	5.38	5.70	5.33	5.45	5.28	5.3	5.61	1.7	-136.3	25.000	12.5	21.2	15.5
LC	100%	11/24/2013	328	-8.4	-6.3	-10.0	57.3	0.0	4.5	12.1	312	968.2	5909232	11.1	4.54	4.53	4.46	4.26	4.18	4.58	4.15	4.27	4.16	4.1	4.53	1.7	-139.9	25.000	12.6	15.7	15.7
LC	100%	11/25/2013	329	-5.6	0.3	-10.0	56.6	0.0	1.9	6.7	277	973.7	9577046	18.3	3.67	3.75	3.70	3.64	3.56	4.07	3.59	3.67	3.57	3.4	4.01	1.7	-143.4	25.000	12.5	17.8	15.4
LC	100%	11/26/2013	330	-1.7	0.9	-4.2	84.6	15.6	1.0	5.3	175	968.7	1100131	2.7	3.38	3.56	3.61	3.63	3.62	4.25	3.76	3.82	3.79	3.4	4.24	1.7	-139.6	40.600	12.4	16.2	14.7
LC	100%	11/27/2013	331	0.5	4.2	-3.6	92.4	26.8	3.4	10.0	267	948.8	943440	2.2	3.42	3.43	3.43	3.32	3.23	3.68	3.18	3.29	3.14	3.2	3.52	1.7	-98.7	67.400	12.4	18.1	20.5
LC	100%	11/28/2013	332	-5.4	-3.6	-7.0	62.1	0.0	3.6	12.2	298	967.9	9023454	16.8	2.68	2.79	2.77	2.64	2.58	2.99	2.51	2.65	2.55	2.5	2.86	1.7	-93.0	67.400	12.4	17.9	16.2
LC	100%	11/29/2013	333	-5.1	-3.2	-7.8	75.0	0.0	1.1	5.4	272	980.6	3797620	7.4	2.33	2.61	2.67	2.65	2.66	3.35	2.75	2.76	2.92	2.5	3.29	1.7	-94.3	67.400	12.6	15.9	15.6
LC	75%	11/30/2013	334	-6.7	-2.2	-12.8	75.5	0.0	0.8	5.2	202	981.3	7332800	13.9	1.87	2.62	2.70	2.68	2.67	3.42	2.84	2.77	3.17	2.5	3.48	1.7	-94.7	67.400	12.5	16.7	15.9
	0%																														

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: 28%

Grand sum/avg	2.31	6.78	6.81	6.78	6.70	6.60	6.82	2.1	209318506	-41929	33.8	67.4	48.8	-57.3	0.0	0.0

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

Data

DATE	DOY	AvgTair C	AvgTw 0.1m	AvgTw0.5m	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
11/1/2013	305	15.13	11.18	11.15	11.11	11.02	10.82	10.70	3.4		8912832	-71	8.445	8.2	1.2	-0.1	0.0
11/2/2013	306	8.98	11.15	11.16	11.13	11.06	10.93	10.98	1.2		6189466	-942	-1.037	0.0	1.1	-1.3	0.0
11/3/2013	307	2.37	10.75	10.77	10.76	10.71	10.59	10.67	3.4		9624930	-3165	-3.500	0.0	1.7	-4.3	0.0
11/4/2013	308	-0.44	10.09	10.12	10.09	10.03	9.86	9.90	1.2		13491457	-1955	-2.398	0.0	1.1	-2.7	0.0
11/5/2013	309	4.23	9.74	9.77	9.75	9.68	9.53	9.56	1.1		8021853	-1215	-1.203	0.0	1.3	-1.7	0.0
11/6/2013	310	9.01	9.62	9.67	9.66	9.59	9.42	9.46	2.0		5715722	-656	-2.272	0.0	-0.5	-0.9	0.0
11/7/2013	311	8.58	9.67	9.68	9.66	9.61	9.47	9.50	2.7		1993051	-888	8.919	7.3	3.7	-1.2	0.0
11/8/2013	312	2.33	9.13	9.17	9.17	9.13	9.00	9.06	2.9		6577215	-2508	-2.306	0.0	2.0	-3.4	0.0
11/9/2013	313	2.59	8.60	8.64	8.63	8.58	8.43	8.48	2.0		8556461	-1762	-4.824	0.0	-1.6	-2.4	0.0
11/10/2013	314	5.78	8.23	8.27	8.28	8.23	8.10	8.15	3.0		4092298	-1901	2.524	1.3	4.7	-2.6	0.0
11/11/2013	315	4.42	7.79	7.82	7.81	7.77	7.64	7.69	2.9		5592268	-2066	-2.554	0.0	1.1	-2.8	0.0
11/12/2013	316	-1.25	7.37	7.41	7.40	7.37	7.24	7.30	3.5		6749589	-2686	-0.375	0.1	4.0	-3.7	0.0
11/13/2013	317	-3.78	6.60	6.66	6.66	6.62	6.49	6.55	3.0		11837224	-2478	-2.023	0.0	2.2	-3.4	0.0
11/14/2013	318	2.25	6.07	6.12	6.12	6.08	5.95	6.00	2.9		11003783	-2209	-3.125	0.0	0.7	-3.0	0.0
11/15/2013	319	5.93	5.87	5.95	5.93	5.86	5.70	5.75	1.0		9223403	-916	-0.952	0.0	1.1	-1.2	0.0
11/16/2013	320	8.07	6.38	6.01	5.91	5.81	5.72	5.84	0.6		10966245	-281	-1.834	0.0	-0.6	-0.4	0.0
11/17/2013	321	9.89	6.73	6.14	6.04	5.90	5.85	6.05	0.4		1285112	192	1.824	0.3	2.1	0.3	0.0
11/18/2013	322	10.76	7.00	6.84	6.72	6.56	6.45	6.65	2.0		10551989	-618	5.843	5.6	1.9	-0.8	0.0
11/19/2013	323	1.63	6.40	6.40	6.36	6.23	6.13	6.44	4.0		2981117	-2631	-4.063	0.0	0.4	-3.6	0.0
11/20/2013	324	-1.64	5.87	5.93	5.86	5.68	5.58	5.98	0.9		10430532	-1082	-1.187	0.0	1.1	-1.5	0.0
11/21/2013	325	-0.60	5.69	5.65	5.60	5.47	5.38	5.85	0.3		5783361	-657	-3.371	0.0	-1.6	-0.9	0.0
11/22/2013	326	7.06	5.86	5.83	5.80	5.68	5.62	6.01	1.0		2932724	19	2.880	2.0	1.7	0.0	0.0
11/23/2013	327	0.39	5.65	5.66	5.64	5.51	5.42	5.73	3.0		9121477	-1795	-2.186	0.2	0.9	-2.4	0.0
11/24/2013	328	-8.31	4.58	4.57	4.50	4.30	4.22	4.62	4.3		5908477	-3371	-4.327	0.0	1.1	-4.6	0.0
11/25/2013	329	-5.77	3.68	3.75	3.71	3.63	3.55	4.06	1.7		9578143	-1448	-1.277	0.0	1.5	-2.0	0.0
11/26/2013	330	-1.81	3.38	3.56	3.61	3.65	3.64	4.27	0.8		1100278	-503	16.519	12.4	5.6	-0.7	0.0
11/27/2013	331	0.62	3.44	3.44	3.44	3.33	3.24	3.70	3.1		943135	-762	34.874	30.0	6.8	-1.0	0.0
11/28/2013	332	-5.35	2.71	2.80	2.78	2.65	2.59	2.99	3.5		9023497	-2097	-2.513	0.0	1.2	-2.9	0.0
11/29/2013	333	-5.04	2.34	2.64	2.69	2.67	2.68	3.35	1.0		3795722	-756	-0.531	0.0	1.3	-1.0	0.0
11/30/2013	334	-6.67	1.87	2.60	2.68	2.66	2.66	3.41	0.5		7335145	-723	-0.196	0.0	1.6	-1.0	0.0
#N/A																	

<=SCALE ADJ (1.0=no adjustment): 1.000

joule/calorie (= joule/degree for 1cm3): 4.184

Nominal diffuse %R from water=7%	#N/A	#N/A	#N/A		7	6.7	-8.2		#N/A	-14.2

slope

intercept

r2

				4.184	<=CONVERT HEAT TO DEGREES				4.184	
7%	0.9			6000000	cm3/m2 (for 0-4m integrated depth)				6000000	
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)
8289	-64	8225	0.8%	0.33	10.52	11.05	0.53	0.20	0.00	0.20
5756	-848	4908	14.7%	0.23	11.05	10.94	(0.11)	(0.34)	-0.03	(0.31)
8951	-2849	6103	31.8%	0.36	10.94	10.27	(0.67)	(1.02)	-0.11	(0.91)
12547	-1760	10787	14.0%	0.50	10.27	9.76	(0.51)	(1.01)	-0.07	(0.94)
7460	-1093	6367	14.7%	0.30	9.76	9.57	(0.19)	(0.49)	-0.04	(0.44)
5316	-591	4725	11.1%	0.21	9.57	9.53	(0.04)	(0.25)	-0.02	(0.22)
1854	-799	1055	43.1%	0.07	9.53	9.45	(0.09)	(0.16)	-0.03	(0.13)
6117	-2257	3860	36.9%	0.24	9.45	8.74	(0.71)	(0.95)	-0.09	(0.86)
7958	-1585	6372	19.9%	0.32	8.74	8.38	(0.36)	(0.67)	-0.06	(0.61)
3806	-1711	2095	45.0%	0.15	8.38	7.95	(0.43)	(0.58)	-0.07	(0.52)
5201	-1859	3342	35.7%	0.21	7.95	7.58	(0.37)	(0.57)	-0.07	(0.50)
6277	-2417	3860	38.5%	0.25	7.58	6.92	(0.66)	(0.91)	-0.10	(0.82)
11009	-2230	8778	20.3%	0.44	6.92	6.32	(0.60)	(1.04)	-0.09	(0.95)
10234	-1988	8246	19.4%	0.41	6.32	5.85	(0.47)	(0.88)	-0.08	(0.80)
8578	-824	7754	9.6%	0.34	5.85	5.80	(0.05)	(0.39)	-0.03	(0.36)
10199	-253	9945	2.5%	0.41	5.80	5.93	0.13	(0.28)	-0.01	(0.27)
1195	173	1368	-14.5%	0.05	5.93	6.06	0.14	0.09	0.01	0.08
9813	-556	9257	5.7%	0.39	6.06	6.74	0.68	0.29	-0.02	0.31
2772	-2368	405	85.4%	0.11	6.74	5.62	(1.12)	(1.23)	-0.09	(1.14)
9700	-974	8727	10.0%	0.39	5.62	5.82	0.20	(0.19)	-0.04	(0.15)
5379	-591	4787	11.0%	0.21	5.82	5.61	(0.21)	(0.42)	-0.02	(0.40)
2727	17	2745	-0.6%	0.11	5.61	5.94	0.33	0.22	0.00	0.22
8483	-1615	6868	19.0%	0.34	5.94	4.98	(0.96)	(1.30)	-0.06	(1.24)
5495	-3034	2461	55.2%	0.22	4.98	3.74	(1.24)	(1.46)	-0.12	(1.33)
8908	-1303	7605	14.6%	0.35	3.74	4.01	0.27	(0.09)	-0.05	(0.04)
1023	-452	571	44.2%	0.04	4.01	3.49	(0.52)	(0.56)	-0.02	(0.54)
877	-686	191	78.2%	0.03	3.49	3.03	(0.46)	(0.49)	-0.03	(0.47)
8392	-1888	6504	22.5%	0.33	3.03	2.81	(0.22)	(0.56)	-0.08	(0.48)
3530	-680	2850	19.3%	0.14	2.81	2.33	(0.47)	(0.62)	-0.03	(0.59)
6822	#N/A	#N/A	#N/A	#N/A				#N/A	#N/A	