Lake Lacawac, Bruce R. Hargreaves, Lehigh University (brh0@lehigh.edu, http://www.lehigh.edu/~brh0)

13Apr09: Station moved from dock from 2:30-3:30pm (problems with ice-shift anchors result in wind direction error until corrected on 10Jun09)

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.

Adjusted Tw sensors 13Nov07 based on comparison of depths and vs PUV & YSI sonde profiles (note that Tw at 11.3m matches PUV Tw at 12.5, probably within sediment boundary layer)

Tw12 adjusted to match others on bottom after moved to dock

5280 ft/mile
1609.3 m/mile

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).

	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						
	66.0	73.6	58.2		4.70	3.7	25					74.3	74.3	74.3	73.4	70.1	61.1	53.6	49.4	45.7	45.0	45.0						
Month summary	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	Tw10.2m	Tw11.5m	H310_z (m)	Lakelevel-mm (4oC)	cumul. rain-mm	Batt min-V	RH% CR10 enc	RH% MUX enc
	18.9	**23.1**	**14.5**	**83.9**	**119.4**	**1.7**	**11.1**	**220.8**	**963.5**	**624890655**	**1302**	**23.5**	**23.5**	**23.5**	**23.0**	**21.2**	**16.2**	**12.0**	**9.7**	**7.6**	**7.2**	**7.2**	**10.2**	**-9.6**	**119.4**	**12.6**	**37.5**	**15.2**

month (All)

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%	7/1/2009	182	18.0	22.2	14.3	94.1	1.0	1.4	5.4	122	956.2	17235950	36	23	23	22.9	22.3	19.3	15.1	11.5	9.3	7.5	7.2	7.2	10.2	33.4	1.000	12.6	45.3	12.1
LC	100%	7/2/2009	183	18.6	23.2	16.3	92.8	12.6	1.5	6.6	160	957.7	15579286	33	23	23	23.1	22.4	19.4	15.2	11.5	9.4	7.5	7.2	7.2	10.3	38.4	13.600	12.7	47.3	13.9
LC	100%	7/3/2009	184	17.5	21.2	15.0	91.9	1.4	1.9	7.0	270	960.5	20651989	44	23	23	23.1	22.5	19.5	15.3	11.5	9.4	7.5	7.2	7.2	10.3	39.7	15.000	12.6	47.4	14.1
LC	100%	7/4/2009	185	17.8	21.4	14.8	75.6	0.0	2.8	11.1	282	961.4	27011955	56	23	23	23.0	22.9	19.7	15.3	11.5	9.4	7.5	7.2	7.2	10.2	31.3	15.000	12.7	47.3	12.8
LC	100%	7/5/2009	186	17.0	22.4	12.1	69.5	0.0	1.8	6.3	285	961.5	30940610	63	23	23	23.0	22.4	20.1	15.3	11.5	9.4	7.5	7.2	7.2	10.2	21.4	15.000	12.7	46.5	12.3
LC	100%	7/6/2009	187	18.0	23.9	10.3	75.5	0.0	1.3	6.6	259	958.4	25332866	52	23	23	23.3	22.6	20.3	15.4	11.6	9.4	7.5	7.2	7.2	10.2	13.7	15.000	12.7	46.2	12.3
LC	100%	7/7/2009	188	16.8	22.0	12.2	85.1	5.8	1.3	9.3	238	957.4	16796086	35	23	23	23.3	22.8	20.4	15.4	11.6	9.5	7.5	7.2	7.2	10.2	10.0	20.800	12.6	48.0	13.0
LC	100%	7/8/2009	189	15.2	19.6	10.6	85.6	0.2	1.7	5.9	291	962.4	19802736	41	23	23	22.8	22.5	20.4	15.5	11.6	9.5	7.5	7.2	7.2	10.2	8.1	21.000	12.6	48.6	13.1
LC	100%	7/9/2009	190	16.5	22.0	10.2	80.8	0.0	1.4	5.0	161	970.5	25864980	53	23	23	22.7	22.2	20.5	15.5	11.7	9.5	7.6	7.2	7.2	10.2	2.2	21.000	12.6	48.2	13.4
LC	100%	7/10/2009	191	18.3	22.7	12.7	82.9	0.0	1.3	5.5	193	974.1	21992315	45	24	23	22.9	22.3	20.6	15.6	11.7	9.5	7.5	7.2	7.2	10.2	-3.2	21.000	12.6	49.1	13.4
LC	100%	7/11/2009	192	19.4	22.9	16.0	89.6	15.7	2.4	8.5	197	968.4	15811157	33	23	23	23.1	22.5	20.6	15.7	11.7	9.5	7.6	7.2	7.2	10.2	-6.3	36.700	12.6	49.2	14.5
LC	100%	7/12/2009	193	18.2	22.0	12.9	70.5	0.1	2.2	8.4	274	963.7	30456614	62	23	23	23.1	22.8	20.8	15.8	11.8	9.6	7.6	7.2	7.2	10.2	2.9	36.800	12.6	50.6	15.6
LC	100%	7/13/2009	194	16.1	21.3	10.0	69.2	0.0	2.0	9.0	276	963.0	27315554	56	23	23	23.0	22.9	21.1	15.8	11.8	9.6	7.6	7.2	7.2	10.2	-4.3	36.800	12.7	49.9	13.0
LC	100%	7/14/2009	195	16.4	21.4	9.9	69.7	0.0	2.3	8.9	285	966.8	28703526	59	23	23	22.9	22.7	21.4	16.0	11.8	9.6	7.6	7.2	7.2	10.2	-11.4	36.800	12.6	49.7	12.7
LC	100%	7/15/2009	196	17.8	24.7	9.7	71.3	0.0	1.6	6.5	261	968.1	28411024	58	23	23	23.0	22.5	21.6	16.0	11.9	9.6	7.6	7.2	7.2	10.2	-17.9	36.800	12.6	49.2	13.0
LC	100%	7/16/2009	197	22.3	27.2	18.5	80.1	1.4	1.7	7.4	234	960.0	23116732	49	24	24	23.5	22.7	21.6	16.1	11.9	9.6	7.6	7.2	7.2	10.2	-22.0	38.200	12.6	50.5	14.5
LC	100%	7/17/2009	198	19.5	24.8	15.1	91.0	6.5	1.0	5.7	179	959.0	11834027	25	24	24	24.0	23.0	21.5	16.3	12.0	9.6	7.6	7.2	7.2	10.2	-22.7	44.700	12.6	51.8	17.2
LC	100%	7/18/2009	199	18.6	22.0	14.5	86.4	1.9	1.9	7.2	260	959.1	21821815	45	24	24	23.9	23.2	21.5	16.4	12.0	9.7	7.6	7.2	7.2	10.2	-20.3	46.600	12.6	53.0	18.4
LC	100%	7/19/2009	200	17.6	22.4	12.5	83.0	0.1	1.4	5.8	262	967.6	22889394	47	24	24	23.7	23.3	21.7	16.5	12.1	9.7	7.6	7.2	7.2	10.2	-24.0	46.700	12.6	52.4	15.5
LC	100%	7/20/2009	201	19.0	23.5	13.1	84.1	0.0	0.9	5.1	151	970.8	18900195	39	24	24	23.7	23.3	21.8	16.6	12.2	9.7	7.6	7.2	7.2	10.2	-27.9	46.700	12.6	52.6	15.8
LC	100%	7/21/2009	202	17.1	18.1	16.6	96.8	3.9	1.4	5.5	98	970.0	5219993	12	23	23	23.5	23.3	21.7	16.6	12.2	9.7	7.6	7.2	7.2	10.2	-29.1	50.600	12.6	54.3	14.5
LC	100%	7/22/2009	203	19.9	24.1	16.2	90.1	0.0	1.2	6.0	208	969.6	20286071	42	23	23	23.1	22.8	21.8	16.7	12.3	9.8	7.6	7.2	7.2	10.2	-29.2	50.600	12.6	39.3	17.5
LC	100%	7/23/2009	204	20.4	22.8	17.7	88.9	0.0	2.2	7.5	127	965.3	12456469	26	24	24	23.7	23.0	21.8	16.8	12.3	9.8	7.6	7.3	7.2	10.2	-32.5	50.600	12.6	10.2	17.0
LC	100%	7/24/2009	205	19.5	24.9	15.9	86.1	0.2	1.5	7.9	223	961.7	19020295	40	23	23	23.5	23.1	21.8	16.8	12.3	9.8	7.6	7.2	7.2	10.2	-36.0	50.800	12.6	9.7	17.0
LC	100%	7/25/2009	206	20.3	25.5	13.6	82.4	3.8	1.8	8.1	215	962.8	22375466	47	24	24	23.7	23.2	21.9	16.9	12.3	9.8	7.7	7.2	7.2	10.2	-39.7	54.600	12.6	9.6	17.5
LC	100%	7/26/2009	207	21.5	24.9	19.4	88.6	0.3	1.8	6.9	201	961.9	13937923	30	24	24	23.9	23.5	21.9	17.0	12.4	9.8	7.6	7.2	7.2	10.2	-39.8	54.900	12.6	9.4	20.0
LC	100%	7/27/2009	208	22.0	26.0	17.9	80.8	0.0	1.8	7.8	240	963.5	24658587	52	24	24	24.2	23.7	22.0	17.0	12.5	9.9	7.7	7.3	7.2	10.2	-43.2	54.900	12.6	9.4	18.4
LC	100%	7/28/2009	209	22.1	26.5	16.4	83.8	0.0	1.1	5.4	196	964.0	19049454	40	25	25	24.5	24.0	22.1	17.1	12.5	9.9	7.7	7.3	7.2	10.2	-47.1	54.900	12.6	9.5	18.4
LC	100%	7/29/2009	210	22.0	24.1	20.2	93.8	15.2	1.4	6.4	183	960.4	8880355	20	25	25	24.8	24.1	22.1	17.2	12.6	9.9	7.7	7.3	7.2	10.2	-46.7	70.100	12.6	9.6	20.3
LC	100%	7/30/2009	211	21.6	25.3	19.3	85.4	31.5	1.7	8.2	273	961.6	22790172	48	25	25	24.8	24.3	22.4	17.5	12.8	10.1	7.7	7.3	7.2	10.2	-2.8	101.600	12.6	9.8	25.2
LC	100%	7/31/2009	212	20.3	22.1	17.0	95.6	17.8	1.4	7.5	244	962.2	5747059	13	25	25	24.7	24.4	22.5	17.6	12.9	10.1	7.7	7.3	7.3	10.2	6.7	119.400	12.6	9.8	23.8

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: **3.88** Runoff & seepage as % of watershed area precip: **14.7%**

1.000 <=SCALE ADJ (1.0=no adjustment)

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

Grand sum/avg	**18.88**	**23.48**	**23.52**	**23.50**	**23.01**	**21.15**	**16.19**	**1.5**	**624890655**	**-73492**	**-18.9**	**119.4**	**68.1**	**-108.6**	**-18.0**	**-80.3**		
															SumTerrevap2=AirVPD,mbar*WS,m/s*sc			

Nominal diffuse %R from water=7%: 7.0% | -66142.6 | 515005.7 | 12% | 19 | #N/A | #N/A | -2.6 | #N/A

4.184 <=CONVERT HEAT TO DEGREES | 4.184 slope

6000000 cm3/m2 (for 0-4m integrated depth) | 6000000 r2

0.9

Data

DATE	DayOfYr	AvgTair C	AvgTw 0.1m	AvgTw0.5m	Avg Tw1m	Avg Tw2m	Avg Tw3m	Avg Tw4m	AvgWS CSI m/s	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	Sum Out flow (lake mm)
7/1/2009	182	18.02	22.96	22.90	22.86	22.31	19.28	15.10	1.3	17235950	-1666	-2.250	1.0	1.8	-2.5	-0.1	-2.6
7/2/2009	183	18.62	23.08	22.95	23.08	22.37	19.40	15.18	1.4	15579286	-1715	10.054	12.6	2.2	-2.5	-0.2	-2.0
7/3/2009	184	17.47	23.02	23.04	23.10	22.50	19.52	15.25	1.7	20651989	-2316	-5.976	1.4	-1.7	-3.4	-0.3	-1.9
7/4/2009	185	17.85	22.86	22.91	23.00	22.86	19.69	15.29	2.6	27011955	-4255	-11.003	0.0	-0.9	-6.3	-1.3	-2.5
7/5/2009	186	16.99	23.00	23.03	23.01	22.43	20.14	15.32	1.6	30940610	-3552	-8.472	0.0	0.3	-5.2	-0.9	-2.6
7/6/2009	187	17.95	23.44	23.44	23.27	22.59	20.34	15.38	1.2	25332866	-2716	-6.750	0.0	0.6	-4.0	-0.7	-2.6
7/7/2009	188	16.78	23.18	23.25	23.26	22.76	20.37	15.43	1.2	16796086	-2496	0.809	5.8	1.7	-3.7	-0.4	-2.6
7/8/2009	189	15.20	22.65	22.73	22.81	22.55	20.41	15.49	1.6	19802736	-2983	-6.328	0.2	1.0	-4.4	-0.4	-2.6
7/9/2009	190	16.48	23.02	23.00	22.68	22.21	20.50	15.54	1.2	25864980	-2674	-5.343	0.0	1.8	-3.9	-0.5	-2.6
7/10/2009	191	18.33	23.54	23.16	22.91	22.33	20.57	15.61	1.1	21992315	-2166	-5.273	0.0	1.0	-3.2	-0.4	-2.6
7/11/2009	192	19.39	22.92	23.04	23.10	22.45	20.57	15.70	2.1	15811157	-2086	11.601	15.7	2.1	-3.1	-0.5	-2.6
7/12/2009	193	18.23	22.88	23.01	23.08	22.79	20.79	15.80	2.0	30456614	-3970	-6.820	0.1	3.0	-5.9	-1.4	-2.6
7/13/2009	194	16.13	22.84	22.93	23.02	22.85	21.11	15.85	1.9	27315554	-4200	-6.961	0.0	3.1	-6.2	-1.3	-2.6
7/14/2009	195	16.37	22.74	22.79	22.85	22.71	21.38	15.96	2.1	28703526	-4305	-7.066	0.0	3.2	-6.4	-1.3	-2.6
7/15/2009	196	17.82	23.00	23.01	23.01	22.45	21.61	16.03	1.4	28411024	-3092	-5.273	0.0	2.9	-4.6	-1.0	-2.6
7/16/2009	197	22.30	23.85	23.86	23.51	22.74	21.58	16.11	1.6	23116732	-1718	-2.496	1.4	2.1	-2.5	-0.9	-2.6
7/17/2009	198	19.48	24.11	24.10	24.04	23.04	21.50	16.32	0.9	11834027	-1518	4.254	6.5	2.8	-2.2	-0.2	-2.6
7/18/2009	199	18.61	23.74	23.88	23.91	23.24	21.52	16.40	1.7	21821815	-2713	-2.812	1.9	2.5	-4.0	-0.6	-2.6
7/19/2009	200	17.58	23.65	23.78	23.71	23.27	21.68	16.49	1.2	22889394	-2567	-4.711	0.1	2.1	-3.8	-0.5	-2.6
7/20/2009	201	19.04	23.89	23.97	23.72	23.33	21.83	16.57	0.8	18900195	-1792	-3.480	0.0	2.1	-2.6	-0.3	-2.6
7/21/2009	202	17.12	23.27	23.45	23.53	23.31	21.74	16.63	1.3	5219993	-1909	1.933	3.9	3.6	-2.8	-0.1	-2.6
7/22/2009	203	19.85	23.31	23.29	23.13	22.84	21.79	16.69	1.1	20286071	-1320	-2.672	0.0	2.2	-1.9	-0.3	-2.6
7/23/2009	204	20.40	23.55	23.67	23.70	23.03	21.80	16.79	2.0	12456469	-2074	-3.937	0.0	2.2	-3.1	-0.5	-2.6
7/24/2009	205	19.46	23.40	23.48	23.45	23.11	21.83	16.79	1.3	19020295	-1858	-3.551	0.2	2.1	-2.7	-0.5	-2.6
7/25/2009	206	20.34	23.65	23.68	23.66	23.22	21.85	16.88	1.7	22375466	-2227	-0.422	3.8	2.6	-3.3	-0.9	-2.6
7/26/2009	207	21.53	23.73	23.82	23.89	23.48	21.90	16.98	1.7	13937923	-1464	-2.988	0.3	2.0	-2.2	-0.4	-2.6
7/27/2009	208	21.97	24.08	24.18	24.22	23.65	21.97	17.03	1.7	24658587	-2022	-4.008	0.0	2.6	-3.0	-0.9	-2.6
7/28/2009	209	22.14	24.77	24.66	24.52	24.04	22.07	17.13	1.0	19049454	-1483	-3.304	0.0	2.0	-2.2	-0.5	-2.6
7/29/2009	210	22.03	24.57	24.72	24.76	24.14	22.07	17.18	1.3	8880355	-1073	14.273	15.2	3.5	-1.6	-0.2	-2.6
7/30/2009	211	21.63	24.72	24.84	24.82	24.26	22.36	17.47	1.6	22790172	-2029	33.467	31.5	8.2	-3.0	-0.6	-2.6
7/31/2009	212	20.26	24.53	24.65	24.74	24.41	22.53	17.61	1.3	5747059	-1533	16.593	17.8	3.6	-2.3	-0.1	-2.6

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)
16029	-1499	14530	9.4%	0.64	17.86	17.92	0.06	(0.58)	-0.06	(0.52)
14489	-1543	12945	10.7%	0.58	17.92	17.96	0.03	(0.54)	-0.06	(0.48)
19206	-2084	17122	10.9%	0.77	17.96	18.05	0.09	(0.67)	-0.08	(0.59)
25121	-3829	21292	15.2%	1.00	18.05	18.07	0.02	(0.98)	-0.15	(0.83)
28775	-3197	25578	11.1%	1.15	18.07	18.21	0.15	(1.00)	-0.13	(0.87)
23560	-2445	21115	10.4%	0.94	18.21	18.31	0.09	(0.84)	-0.10	(0.75)
15620	-2247	13374	14.4%	0.62	18.31	18.26	(0.05)	(0.67)	-0.09	(0.58)
18417	-2685	15732	14.6%	0.73	18.26	18.10	(0.16)	(0.89)	-0.11	(0.79)
24054	-2407	21648	10.0%	0.96	18.10	18.17	0.07	(0.88)	-0.10	(0.79)
20453	-1949	18504	9.5%	0.81	18.17	18.27	0.10	(0.72)	-0.08	(0.64)
14704	-1877	12827	12.8%	0.59	18.27	18.17	(0.09)	(0.68)	-0.07	(0.61)
28325	-3573	24752	12.6%	1.13	18.17	18.46	0.28	(0.85)	-0.14	(0.70)
25403	-3780	21624	14.9%	1.01	18.46	18.48	0.02	(0.99)	-0.15	(0.84)
26694	-3874	22820	14.5%	1.06	18.48	18.46	(0.01)	(1.08)	-0.15	(0.92)
26422	-2783	23639	10.5%	1.05	18.46	18.54	0.08	(0.97)	-0.11	(0.86)
21499	-1546	19952	7.2%	0.86	18.54	18.88	0.34	(0.52)	-0.06	(0.45)
11006	-1367	9639	12.4%	0.44	18.88	18.86	(0.02)	(0.46)	-0.05	(0.41)
20294	-2441	17853	12.0%	0.81	18.86	18.96	0.10	(0.71)	-0.10	(0.61)
21287	-2310	18977	10.9%	0.85	18.96	19.07	0.11	(0.74)	-0.09	(0.65)
17577	-1613	15964	9.2%	0.70	19.07	19.10	0.03	(0.67)	-0.06	(0.60)
4855	-1718	3136	35.4%	0.19	19.10	18.79	(0.32)	(0.51)	-0.07	(0.44)
18866	-1188	17678	6.3%	0.75	18.79	18.96	0.18	(0.57)	-0.05	(0.53)
11585	-1867	9718	16.1%	0.46	18.96	18.89	(0.08)	(0.54)	-0.07	(0.47)
17689	-1672	16016	9.5%	0.70	18.89	19.06	0.18	(0.53)	-0.07	(0.46)
20809	-2004	18805	9.6%	0.83	19.06	19.17	0.11	(0.72)	-0.08	(0.64)
12962	-1318	11645	10.2%	0.52	19.17	19.18	0.01	(0.51)	-0.05	(0.46)
22932	-1820	21113	7.9%	0.91	19.18	19.52	0.35	(0.57)	-0.07	(0.49)
17716	-1335	16381	7.5%	0.71	19.52	19.58	0.06	(0.65)	-0.05	(0.59)
8259	-966	7293	11.7%	0.33	19.58	19.60	0.02	(0.31)	-0.04	(0.27)
21195	-1826	19369	8.6%	0.84	19.60	19.99	0.38	(0.46)	-0.07	(0.39)
5345	-1380	3965	25.8%	0.21	19.99	#N/A	#N/A	#N/A	-0.05	#N/A