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

17 April 2011: platform moved to lake center, 1-2pm 13Nov 2011: platform move to dock 12-1pm

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); will check & replace in mid-Dec.

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)

rain sum (in.) Aug-Sep2011=> 13.89

	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						
	34.8	59.3	13.9		3.17	3.1	34					39.6	39.9	40.1	41.0	40.4	40.8	40.5	40.4	40.4	40.1	39.9						
Month summa 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	Tw01.6m	Tw02.1m	H310_z (m)	Lakelevel-mm (4oC)	cumul. rain-mm	Batt min-V	RH% CR10 enc	RH% MUX enc
4.6	1.6	15.1	-10.1	85.3	80.4	1.4	15.0	253.1	967.3	153779078	301	4.2	4.4	4.5	5.0	4.7	4.9	4.7	4.7	4.6	4.5	4.4	1.6	85.3	80.4	12.3	35.2	45.5

month (All)

0.0 mm delayed precip from rain gage from 29Oct 9" snow (16.2mm from lake level rise)

0.00 in. water equiv (0.32" reported at Hamlin on 29Oct; 0.64" from lake level rise)

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%	12/1/2011	335	1.5	6.3	-1.3	81.0	0.0	2.5	9.0	303	969.3	7682548	15	6.71	6.76	6.81	7.10	6.89	6.96	6.82	6.79	6.82	6.8	6.92	1.6	108.6	0.000	12.4	32.8	85.4
ND	100%	12/2/2011	336	1.7	6.5	-2.2	83.0	0.1	1.6	7.2	284	973.6	6516034	13	6.48	6.57	6.65	6.90	6.67	6.76	6.61	6.60	6.60	6.6	6.88	1.6	101.4	0.100	12.6	30.2	87.3
ND	100%	12/3/2011	337	0.6	6.3	-3.4	80.6	0.0	0.7	3.6	219	981.8	7279736	14	6.13	6.19	6.24	6.51	6.27	6.39	6.19	6.19	6.13	6.2	6.52	1.6	94.2	0.100	12.6	30.8	85.8
ND	100%	12/4/2011	338	4.7	9.7	0.3	86.6	0.0	0.8	5.3	249	977.9	7591863	15	5.99	6.10	6.20	6.47	6.22	6.37	6.19	6.18	6.15	6.2	6.81	1.6	88.4	0.100	12.6	33.5	91.7
ND	100%	12/5/2011	339	9.5	15.1	4.4	86.9	0.0	1.0	5.8	240	972.6	5030803	10	6.30	6.26	6.29	6.58	6.35	6.50	6.36	6.31	6.32	6.3	7.20	1.6	83.8	0.100	12.6	35.0	90.0
ND	100%	12/6/2011	340	12.2	14.2	8.1	99.7	4.2	0.7	4.5	245	964.5	1727976	4	7.14	6.56	6.65	6.90	6.66	6.83	6.73	6.65	6.72	6.6	7.51	1.6	83.1	4.300	12.5	38.9	81.0
ND	100%	12/7/2011	341	4.9	7.8	0.3	102.5	27.0	1.3	5.6	246	956.6	757524	2	6.90	7.01	7.12	7.31	7.07	7.22	7.14	7.06	7.12	7.1	7.49	1.6	94.0	31.300	12.4	37.5	79.0
ND	100%	12/8/2011	342	-0.6	2.6	-2.9	95.2	6.3	0.8	8.2	139	963.7	8127180	13	5.94	6.03	6.08	6.41	6.22	6.30	6.16	6.10	6.09	6.1	6.24	1.6	125.5	37.600	12.4	38.9	76.1
ND	100%	12/9/2011	343	-0.2	4.1	-3.0	95.0	2.8	0.6	5.4	236	970.9	7825251	15	5.72	5.83	5.90	6.26	5.95	6.16	5.99	5.93	5.88	5.9	6.02	1.6	118.7	40.400	12.6	37.7	71.1
ND	100%	12/10/2011	344	-1.8	-0.3	-5.7	82.5	0.1	1.9	7.9	301	972.3	6421478	12	5.25	5.35	5.39	5.72	5.42	5.59	5.41	5.38	5.37	5.3	5.38	1.6	110.7	40.500	12.6	34.4	69.5
ND	100%	12/11/2011	345	-3.9	1.5	-7.9	82.3	0.0	0.6	3.7	253	980.5	7398003	14	4.85	5.04	5.10	5.51	5.20	5.38	5.22	5.12	4.98	5.1	4.84	1.6	102.4	40.500	12.5	31.7	65.1
ND	100%	12/12/2011	346	-2.0	5.2	-6.5	74.7	0.0	0.5	3.5	242	979.0	6499465	12	4.53	4.74	4.79	5.20	4.87	5.06	4.88	4.83	4.69	4.7	4.54	1.6	95.1	40.500	12.5	31.8	63.5
ND	100%	12/13/2011	347	-0.8	4.6	-4.8	79.9	0.0	1.2	6.0	270	975.4	7054157	14	4.09	4.30	4.32	4.85	4.50	4.69	4.52	4.51	4.38	4.3	4.23	1.6	88.7	40.500	12.5	32.6	62.7
ND	100%	12/14/2011	348	2.5	8.3	-1.6	86.9	0.0	0.5	3.8	222	974.4	6202720	12	4.32	4.45	4.43	4.94	4.59	4.81	4.66	4.63	4.51	4.4	4.45	1.6	83.8	40.500	12.5	36.3	62.6
ND	100%	12/15/2011	349	6.6	9.5	3.9	88.7	1.5	1.4	6.3	259	962.4	1796424	4	4.33	4.41	4.54	4.99	4.67	4.86	4.72	4.69	4.68	4.6	4.53	1.6	81.4	42.000	12.5	37.4	47.7
ND	100%	12/16/2011	350	3.6	9.9	-0.5	69.7	0.1	3.2	15.0	301	963.8	6170965	12	4.31	4.39	4.50	4.80	4.52	4.70	4.57	4.55	4.62	4.5	4.10	1.6	79.8	42.100	12.5	39.1	18.1
ND	100%	12/17/2011	351	-1.7	0.3	-5.7	79.0	0.0	2.3	7.2	316	966.5	3619852	7	3.86	3.94	4.01	4.40	4.10	4.31	4.12	4.12	4.14	4.0	3.47	1.6	75.3	42.100	12.5	31.5	14.4
ND	100%	12/18/2011	352	-6.7	-3.3	-10.1	76.1	0.0	1.5	6.1	272	968.6	7408931	14	2.60	3.24	3.39	4.01	3.67	3.95	3.74	3.73	3.68	3.5	2.97	1.6	70.6	42.100	12.4	27.7	15.8
ND	100%	12/19/2011	353	1.3	6.8	-5.5	78.2	0.1	1.3	6.8	256	964.6	5863133	12	2.64	3.17	3.37	4.22	3.83	4.15	3.89	3.94	3.86	3.6	3.24	1.6	67.0	42.200	12.5	32.5	14.0
ND	100%	12/20/2011	354	2.4	4.8	0.6	86.9	0.4	1.5	7.9	241	966.0	3900828	8	3.39	3.51	3.62	4.09	3.76	4.02	3.85	3.84	3.83	3.7	3.10	1.6	64.2	42.600	12.5	36.4	13.4
ND	100%	12/21/2011	355	6.1	11.9	1.4	100.9	7.6	0.9	10.0	229	959.6	1110304	3	3.46	3.57	3.70	4.30	3.92	4.20	4.03	4.02	3.95	3.8	3.29	1.6	66.1	50.200	12.4	37.2	12.8
ND	100%	12/22/2011	356	7.2	9.0	4.6	90.5	0.0	1.0	6.8	251	963.2	2142240	5	3.75	3.83	3.96	4.45	4.08	4.33	4.21	4.15	4.16	4.1	3.39	1.6	69.7	50.200	12.4	41.0	12.7
ND	100%	12/23/2011	357	2.3	5.1	-3.3	93.2	10.7	2.3	7.7	253	963.7	1955429	4	3.66	3.77	3.94	4.38	4.04	4.25	4.09	4.09	4.09	4.0	3.30	1.6	78.3	60.900	12.4	39.0	13.6
ND	100%	12/24/2011	358	-4.7	-2.4	-7.0	81.3	0.0	2.1	6.9	279	973.5	6974024	13	2.92	3.17	3.25	3.71	3.36	3.60	3.43	3.46	3.46	3.2	2.64	1.6	75.4	60.900	12.3	34.4	15.2
ND	100%	12/25/2011	359	-0.6	4.3	-7.3	76.7	0.0	1.0	5.8	254	967.1	5283084	10	2.53	3.10	3.32	4.08	3.66	3.99	3.82	3.82	3.83	3.5	3.05	1.6	72.4	60.900	12.6	34.6	14.3
ND	100%	12/26/2011	360	1.0	2.8	-2.3	81.2	0.0	2.7	9.4	295	966.9	3329282	7	2.76	3.05	3.19	3.62	3.27	3.51	3.34	3.34	3.35	3.2	2.57	1.6	68.6	60.900	12.5	36.8	13.9
ND	100%	12/27/2011	361	2.2	7.1	-2.3	89.4	19.0	1.1	7.0	206	956.1	1761933	4	2.44	2.83	3.18	3.91	3.45	3.83	3.59	3.61	3.54	3.2	2.87	1.6	70.8	79.900	12.4	34.9	13.8
ND	100%	12/28/2011	362	-0.1	5.3	-5.3	83.0	0.5	3.6	13.0	294	948.8	1878671	4	2.65	2.73	2.92	3.26	2.91	3.12	2.94	2.97	2.97	2.9	2.19	1.6	87.3	80.400	12.3	37.8	14.1
ND	100%	12/29/2011	363	-5.4	-1.1	-9.4	77.7	0.0	1.7	8.3	288	960.7	5447815	10	1.34	1.79	1.95	2.83	2.41	2.76	2.47	2.49	2.39	2.1	1.73	1.6	82.4	80.400	12.3	31.3	15.3
ND	100%	12/30/2011	364	2.3	7.3	-1.1	84.2	0.0	0.5	4.2	190	961.6	4175243	8	1.38	2.07	2.30	3.47	3.07	3.44	3.17	3.15	2.99	2.5	2.39	1.6	79.2	80.400	12.5	37.8	13.7
ND	100%	12/31/2011	365	4.5	9.5	0.3	90.5	0.0	0.8	6.3	216	959.8	4846185	10	1.86	2.19	2.35	3.29	2.88	3.27	2.98	2.97	2.82	2.5	2.24	1.6	76.2	80.400	12.4	40.6	13.2

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: 2.61767578 Runoff & seepage as % of watershed area precip: 29.0%

1.000 <=SCALE ADJ (1.0=no adjustment)

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

Grand sum/avg		1.57	4.20	4.39	4.50	4.98	4.66	4.88	1.2	153779078	-15025	-37.4	80.4	60.9	-21.8	0.0	0.0	Nominal diffuse %R from water=7%	-13522.8	129491.8	9%	5	#N/A	#N/A	-0.5	#N/A

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

Data

DATE	DayOfYr	AvgTair C	AvgTw 0.1m	AvgTw0.5 m	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
12/1/2011	335	1.52	6.71	6.76	6.81	7.10	6.89	6.96	2.3	7682548	-1327	-7.523	0.0	3.9	-1.9	0.0
12/2/2011	336	1.69	6.48	6.57	6.65	6.90	6.67	6.76	1.5	6516034	-897	-7.382	0.1	1.7	-1.3	0.0
12/3/2011	337	0.60	6.13	6.19	6.24	6.51	6.27	6.39	0.6	7279736	-615	-6.644	0.0	0.3	-0.9	0.0
12/4/2011	338	4.73	5.99	6.10	6.20	6.47	6.22	6.37	0.5	7591863	-241	-5.132	0.0	0.0	-0.3	0.0
12/5/2011	339	9.47	6.30	6.26	6.29	6.58	6.35	6.50	0.7	5030803	122	-3.094	0.0	0.7	0.2	0.0
12/6/2011	340	12.18	7.14	6.56	6.65	6.90	6.66	6.83	0.5	1727976	278	1.547	4.2	0.8	0.4	0.0
12/7/2011	341	4.91	6.90	7.01	7.12	7.31	7.07	7.22	1.2	757524	-223	38.248	27.0	18.0	-0.3	0.0
12/8/2011	342	-0.61	5.94	6.03	6.08	6.41	6.22	6.30	0.7	8127180	-635	0.281	6.3	11.8	-0.9	0.0
12/9/2011	343	-0.23	5.72	5.83	5.90	6.26	5.95	6.16	0.5	7825251	-483	-7.945	2.8	3.9	-0.7	0.0
12/10/2011	344	-1.81	5.25	5.35	5.39	5.72	5.42	5.59	1.8	6421478	-1172	-8.472	0.1	4.0	-1.7	0.0
12/11/2011	345	-3.86	4.85	5.04	5.10	5.51	5.20	5.38	0.6	7398003	-761	-7.734	0.0	1.6	-1.1	0.0
12/12/2011	346	-1.97	4.53	4.74	4.79	5.20	4.87	5.06	0.4	6499465	-623	-6.679	0.0	0.5	-0.9	0.0
12/13/2011	347	-0.79	4.09	4.30	4.32	4.85	4.50	4.69	1.1	7054157	-644	-6.047	0.0	-0.2	-0.9	0.0
12/14/2011	348	2.51	4.32	4.45	4.43	4.94	4.59	4.81	0.4	6202720	-195	-3.129	0.0	1.1	-0.3	0.0
12/15/2011	349	6.64	4.33	4.41	4.54	4.99	4.67	4.86	1.0	1796424	70	-0.738	1.5	1.3	0.1	0.0
12/16/2011	350	3.62	4.31	4.39	4.50	4.80	4.52	4.70	2.9	6170965	-1001	-4.746	0.1	0.0	-1.5	0.0
12/17/2011	351	-1.65	3.86	3.94	4.01	4.40	4.10	4.31	2.2	3619852	-1037	-4.324	0.0	0.0	-1.5	0.0
12/18/2011	352	-6.69	2.60	3.24	3.39	4.01	3.67	3.95	1.4	7408931	-1040	-4.254	0.0	-0.3	-1.5	0.0
12/19/2011	353	1.28	2.64	3.17	3.37	4.22	3.83	4.15	1.0	5863133	-341	-3.304	0.1	-0.7	-0.5	0.0
12/20/2011	354	2.39	3.39	3.51	3.62	4.09	3.76	4.02	1.3	3900828	-241	-1.758	0.4	0.3	-0.3	0.0
12/21/2011	355	6.09	3.46	3.57	3.70	4.30	3.92	4.20	0.6	1110304	230	7.558	7.6	1.8	0.3	0.0
12/22/2011	356	7.21	3.75	3.83	3.96	4.45	4.08	4.33	0.9	2142240	163	-2.004	0.0	0.1	0.2	0.0
12/23/2011	357	2.35	3.66	3.77	3.94	4.38	4.04	4.25	2.2	1955429	-360	8.507	10.7	1.5	-0.5	0.0
12/24/2011	358	-4.66	2.92	3.17	3.25	3.71	3.36	3.60	1.9	6974024	-1080	-3.726	0.0	0.7	-1.6	0.0
12/25/2011	359	-0.56	2.53	3.10	3.32	4.08	3.66	3.99	0.7	5283084	-411	-3.058	0.0	0.1	-0.6	0.0
12/26/2011	360	0.99	2.76	3.05	3.19	3.62	3.27	3.51	2.5	3329282	-662	-3.867	0.0	-0.6	-1.0	0.0
12/27/2011	361	2.16	2.44	2.83	3.18	3.91	3.45	3.83	0.8	1761933	-88	20.143	19.0	3.9	-0.1	0.0
12/28/2011	362	-0.11	2.65	2.73	2.92	3.26	2.91	3.12	3.3	1878671	-1008	-2.074	0.5	3.5	-1.5	0.0
12/29/2011	363	-5.41	1.34	1.79	1.95	2.83	2.41	2.76	1.5	5447815	-822	-4.183	0.0	0.8	-1.2	0.0
12/30/2011	364	2.35	1.38	2.07	2.30	3.47	3.07	3.44	0.4	4175243	-56	-3.023	0.0	0.4	-0.1	0.0
12/31/2011	365	4.49	1.86	2.19	2.35	3.29	2.88	3.27	0.7	4846185	75	-2.847	0.0	-0.1	0.1	0.0

				4.184	<=CONVERT HEAT TO DEGREES				4.184	slope		
7%	0.9			6000000	cm3/m2 (for 0-4m integrated depth)				6000000	intercept		
										r2		
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)		
7145	-1194	5950	16.7%	0.28	7.21	6.78	(0.43)	(0.71)	-0.05	(0.67)		
6060	-807	5253	13.3%	0.24	6.78	6.32	(0.46)	(0.70)	-0.03	(0.67)		
6770	-553	6217	8.2%	0.27	6.32	6.06	(0.26)	(0.53)	-0.02	(0.51)		
7060	-217	6844	3.1%	0.28	6.06	6.29	0.23	(0.05)	-0.01	(0.04)		
4679	109	4788	-2.3%	0.19	6.29	6.62	0.33	0.15	0.00	0.14		
1607	250	1857	-15.6%	0.06	6.62	7.19	0.57	0.51	0.01	0.50		
704	-201	504	28.5%	0.03	7.19	6.28	(0.91)	(0.94)	-0.01	(0.93)		
7558	-571	6987	7.6%	0.30	6.28	6.17	(0.11)	(0.41)	-0.02	(0.39)		
7277	-435	6843	6.0%	0.29	6.17	5.76	(0.41)	(0.70)	-0.02	(0.68)		
5972	-1055	4917	17.7%	0.24	5.76	5.25	(0.51)	(0.75)	-0.04	(0.71)		
6880	-685	6195	10.0%	0.27	5.25	5.12	(0.13)	(0.40)	-0.03	(0.37)		
6045	-560	5484	9.3%	0.24	5.12	4.78	(0.34)	(0.58)	-0.02	(0.56)		
6560	-579	5981	8.8%	0.26	4.78	4.60	(0.19)	(0.45)	-0.02	(0.43)		
5769	-176	5593	3.0%	0.23	4.60	4.85	0.25	0.02	-0.01	0.03		
1671	63	1733	-3.8%	0.07	4.85	4.90	0.06	(0.01)	0.00	(0.01)		
5739	-901	4838	15.7%	0.23	4.90	4.46	(0.44)	(0.67)	-0.04	(0.63)		
3366	-934	2433	27.7%	0.13	4.46	3.91	(0.55)	(0.69)	-0.04	(0.65)		
6890	-936	5954	13.6%	0.27	3.91	4.00	0.09	(0.19)	-0.04	(0.15)		
5453	-307	5146	5.6%	0.22	4.00	3.73	(0.27)	(0.48)	-0.01	(0.47)		
3628	-217	3411	6.0%	0.14	3.73	4.19	0.46	0.31	-0.01	0.32		
1033	207	1239	-20.0%	0.04	4.19	4.13	(0.06)	(0.10)	0.01	(0.11)		
1992	146	2139	-7.4%	0.08	4.13	4.54	0.41	0.34	0.01	0.33		
1819	-324	1494	17.8%	0.07	4.54	3.61	(0.94)	(1.01)	-0.01	(1.00)		
6486	-972	5514	15.0%	0.26	3.61	3.89	0.29	0.03	-0.04	0.07		
4913	-370	4543	7.5%	0.20	3.89	3.92	0.02	(0.17)	-0.01	(0.16)		
3096	-596	2500	19.3%	0.12	3.92	3.66	(0.26)	(0.38)	-0.02	(0.36)		
1639	-79	1559	4.8%	0.07	3.66	3.26	(0.40)	(0.47)	0.00	(0.47)		
1747	-907	840	51.9%	0.07	3.26	2.55	(0.70)	(0.77)	-0.04	(0.74)		
5066	-740	4326	14.6%	0.20	2.55	3.03	0.48	0.28	-0.03	0.31		
3883	-50	3833	1.3%	0.15	3.03	3.14	0.11	(0.05)	0.00	(0.05)		
4507	68	4575	-1.5%	0.18	3.14	#N/A	#N/A	#N/A	0.00	#N/A		