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						
	27.7	33.7	22.1		3.74	4.8	31					36.4	37.3	37.4	37.6	38.0	38.4	38.4	38.7	38.2	38.1	38.3						
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	Tw02.0m	Tw02.5m	H310_z (m)	Lakelevel-mm (4oC)	cumul. rain-mm	Batt min-V	RH% CR10 enc	RH% MUX enc
	-2.4	**0.9**	**-5.5**	**82.5**	**95.1**	**2.2**	**13.8**	**240.6**	**963.6**	**134451245**	**269**	**2.4**	**2.9**	**3.0**	**3.1**	**3.3**	**3.6**	**3.5**	**3.7**	**3.5**	**3.4**	**3.5**	**2.1**	**13.1**	**95.1**	**12.4**	**26.7**	**14.9**

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
ND	100%	12/1/2009	335	0.7	3.8	-2.4	80.4	0.0	1.3	7.3	252	960.5	4768222	10	6	7	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	6.6	2.0	-16.0	0.000	12.4	12.9	14.1
ND	100%	12/2/2009	336	3.4	10.4	-1.0	91.2	5.8	0.9	7.3	177	964.1	3636215	8	6	6	6.3	6.3	6.4	6.4	6.4	6.3	6.4	6.3	6.3	2.0	-17.2	5.800	12.5	12.3	13.5
ND	100%	12/3/2009	337	10.2	13.7	6.2	84.3	16.3	2.5	10.4	242	949.6	2165857	5	7	7	6.6	6.6	6.5	6.7	6.7	6.6	6.7	6.6	6.5	2.1	4.1	22.100	12.5	11.0	14.1
ND	100%	12/4/2009	338	3.1	6.4	0.2	80.4	0.0	1.1	6.0	257	965.4	4533721	9	6	6	6.5	6.5	6.3	6.5	6.5	6.6	6.5	6.5	6.4	2.1	6.3	22.100	12.5	12.4	13.5
ND	100%	12/5/2009	339	-0.7	0.6	-2.3	94.0	0.0	1.6	6.8	202	964.0	1077484	2	6	6	6.0	5.9	5.6	6.0	6.0	6.2	6.0	5.9	6.0	2.1	7.0	22.100	12.4	13.0	14.1
ND	100%	12/6/2009	340	-2.9	-0.6	-4.6	85.1	3.0	2.0	8.3	282	968.0	6595253	13	5	5	5.4	5.4	5.1	5.4	5.5	5.6	5.5	5.4	5.5	2.1	9.4	25.100	12.4	13.6	14.4
ND	100%	12/7/2009	341	-2.9	-0.1	-6.3	90.4	0.0	0.8	4.3	243	969.3	2621920	6	5	5	5.1	5.0	4.9	5.2	5.2	5.4	5.1	5.0	5.1	2.1	6.1	25.100	12.6	13.6	14.6
ND	100%	12/8/2009	342	-0.8	1.1	-2.0	83.6	0.4	1.3	6.4	239	971.2	6130535	12	5	5	4.7	4.8	4.7	4.9	5.0	5.1	4.8	4.8	4.9	2.1	3.3	25.500	12.4	13.0	14.1
ND	100%	12/9/2009	343	1.0	4.3	-1.8	100.3	16.7	2.5	9.1	147	947.8	1681946	4	3	4	3.8	3.9	4.0	4.2	4.3	4.4	4.1	4.0	4.3	2.1	20.6	42.200	12.5	25.0	13.9
ND	100%	12/10/2009	344	-2.1	2.6	-7.6	69.6	0.0	3.1	10.5	276	948.9	4099151	8	4	4	3.6	3.7	3.5	3.8	3.9	4.0	3.8	3.7	3.9	2.1	20.8	42.200	12.4	54.3	14.5
ND	100%	12/11/2009	345	-8.2	-5.9	-11.1	65.7	0.0	3.2	11.1	284	963.6	5672751	11	2	3	2.6	2.6	2.6	2.9	3.0	3.2	2.8	2.7	3.0	2.1	14.3	42.200	12.4	38.9	15.9
ND	100%	12/12/2009	346	-5.2	-0.7	-8.0	72.4	0.0	1.3	7.5	276	976.1	7521630	14	1	2	2.1	2.5	3.0	3.2	3.3	3.5	3.0	2.7	3.2	2.1	10.5	42.200	12.5	33.3	15.5
ND	100%	12/13/2009	347	0.1	3.4	-4.5	85.2	13.5	1.0	5.8	242	966.8	999873	2	1	2	2.2	2.4	3.0	3.2	3.2	3.4	2.9	2.7	3.1	2.1	14.0	55.700	12.5	19.2	15.1
ND	100%	12/14/2009	348	2.4	4.3	1.3	91.1	0.0	1.4	9.3	256	963.4	2740863	6	2	2	2.2	2.3	2.9	3.2	3.2	3.4	2.8	2.8	3.0	2.1	22.6	55.700	12.4	14.5	15.7
ND	100%	12/15/2009	349	3.2	5.9	0.1	93.5	0.0	1.1	9.6	259	960.7	1774047	4	2	2	2.3	2.4	3.1	3.3	3.4	3.6	3.0	3.0	3.0	2.1	22.6	55.700	12.4	13.0	16.4
ND	100%	12/16/2009	350	-4.2	-0.1	-6.3	72.5	0.0	4.1	11.2	314	968.7	5745528	11	2	2	1.9	2.1	2.1	2.3	2.4	2.6	2.2	2.2	2.3	2.1	20.7	55.700	12.4	14.6	15.4
ND	100%	12/17/2009	351	-7.7	-6.2	-11.2	78.0	0.0	3.8	10.5	319	970.7	6984835	13	1	1	1.3	1.5	1.5	1.7	1.8	2.0	1.6	1.6	1.7	2.1	16.0	55.700	12.6	14.8	15.8
ND	100%	12/18/2009	352	-7.9	-2.4	-13.1	68.3	0.0	0.9	4.8	168	967.9	6821256	13	1	1	1.2	1.5	2.0	2.3	2.4	2.5	2.0	1.9	2.0	2.1	12.8	55.700	12.6	14.8	16.0
ND	100%	12/19/2009	353	-6.5	-4.4	-8.7	72.1	0.0	2.3	7.1	96	955.8	1409784	3	1	1	1.5	1.6	2.2	2.5	2.6	2.8	2.3	2.2	2.3	2.1	11.3	55.700	12.6	14.3	15.4
ND	100%	12/20/2009	354	-6.4	-3.3	-9.1	76.4	0.0	3.7	13.8	306	955.3	6608271	13	1	1	1.5	1.6	2.0	2.3	2.3	2.5	2.2	2.0	2.2	2.1	14.6	55.700	12.5	14.3	15.7
ND	100%	12/21/2009	355	-3.7	-2.0	-5.0	78.9	0.0	4.0	10.1	321	960.1	4266307	8	1	1	1.5	1.7	1.9	2.2	2.0	2.3	2.1	1.9	2.2	2.1	11.2	55.700	12.7	13.8	15.0
ND	100%	12/22/2009	356	-4.8	-2.4	-9.7	74.9	0.0	3.9	9.1	317	965.2	5776137	11	1	1	1.5	1.7	2.0	2.3	2.0	2.4	2.2	2.0	2.3	2.1	8.6	55.700	12.6	14.0	15.3
ND	100%	12/23/2009	357	-8.1	-5.6	-10.6	79.0	0.0	3.6	10.8	311	967.4	5333864	10	1	1	1.6	1.8	2.0	2.3	2.1	2.4	2.3	2.0	2.3	2.1	5.8	55.700	12.6	14.7	16.0
ND	100%	12/24/2009	358	-4.5	3.0	-7.0	89.7	0.0	1.3	6.0	212	973.5	7122625	14	1	2	1.6	1.8	2.2	2.5	2.4	2.8	2.4	2.3	2.3	2.1	3.7	55.700	12.6	13.9	15.2
ND	100%	12/25/2009	359	-2.6	0.2	-7.5	101.2	0.3	1.5	5.4	97	973.1	1343387	3	1	2	1.7	1.8	2.2	2.5	2.3	2.8	2.4	2.3	2.3	2.1	2.6	56.000	12.6	13.5	14.6
ND	100%	12/26/2009	360	1.3	3.9	-0.4	100.4	32.3	2.0	8.1	102	965.6	1659784	4	1	2	1.7	1.9	2.2	2.4	2.2	2.6	2.4	2.2	2.4	2.1	17.1	88.300	12.5	38.4	13.8
ND	100%	12/27/2009	361	1.9	5.3	-2.6	86.8	4.0	1.1	7.5	232	958.6	6997400	14	1	2	1.8	2.0	2.4	2.6	2.5	2.9	2.5	2.5	2.4	2.1	45.8	92.300	12.5	72.5	13.9
ND	100%	12/28/2009	362	-2.0	1.6	-5.7	75.9	0.0	2.5	9.8	267	950.6	4159840	8	1	2	2.0	2.1	2.3	2.6	2.4	2.8	2.6	2.5	2.5	2.1	39.4	92.300	12.7	72.4	14.7
ND	100%	12/29/2009	363	-10.4	-4.5	-13.1	71.6	0.0	5.3	13.8	319	961.8	7045329	13	1	2	2.1	2.3	2.2	2.6	2.3	2.6	2.6	2.4	2.6	2.1	29.4	92.300	12.6	65.2	16.6
ND	100%	12/30/2009	364	-6.9	-2.7	-11.4	76.3	0.0	1.3	7.7	262	972.3	5687875	11	1	2	2.3	2.4	2.6	3.0	2.8	3.1	2.9	2.9	2.7	2.1	21.3	92.300	12.6	68.2	15.9
ND	100%	12/31/2009	365	-3.3	-0.5	-5.7	89.1	2.8	0.6	3.0	181	965.4	1469557	6	1	2	2.3	2.5	2.7	3.1	2.9	3.3	3.0	3.0	2.8	2.1	18.1	95.100	12.5	69.4	14.7

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: **13.9%**

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

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	Sum Out flow (lake mm)
Grand sum/avg		**-2.40**	**2.43**	**2.95**	**3.02**	**3.13**	**3.31**	**3.57**	**1.9**	**134451245**	**-25414**	**33.2**	**95.1**	**51.0**	**-36.8**	**0.0**	**-76.4**
12/1/2009	335	0.70	6.46	6.56	6.57	6.58	6.60	6.59	1.2	4768222	-885	-2.707	0.0	0.1	-1.3	0.0	-1.7
12/2/2009	336	3.41	6.27	6.34	6.35	6.31	6.38	6.39	0.7	3636215	-278	7.031	5.8	3.1	-0.4	0.0	-1.5
12/3/2009	337	10.16	6.50	6.55	6.59	6.64	6.53	6.68	2.1	2165857	136	17.366	16.3	3.4	0.2	0.0	-2.5
12/4/2009	338	3.13	6.32	6.43	6.45	6.49	6.26	6.54	1.0	4533721	-554	-1.301	0.0	1.7	-0.8	0.0	-2.2
12/5/2009	339	-0.70	5.85	5.95	5.96	5.88	5.65	6.00	1.4	1077484	-797	6.152	0.0	9.5	-1.2	0.0	-2.2
12/6/2009	340	-2.90	5.30	5.40	5.37	5.35	5.10	5.43	1.9	6595253	-1252	-4.218	3.0	-2.7	-1.8	0.0	-2.7
12/7/2009	341	-2.94	4.96	5.09	5.11	5.05	4.90	5.18	0.6	2621920	-674	-2.742	0.0	0.5	-1.0	0.0	-2.3
12/8/2009	342	-0.85	4.61	4.73	4.73	4.76	4.67	4.94	1.2	6130535	-699	-2.426	0.4	0.3	-1.0	0.0	-2.1
12/9/2009	343	1.00	3.50	3.72	3.80	3.95	4.02	4.21	2.3	1681946	-406	21.725	16.7	10.5	-0.6	0.0	-4.9
12/10/2009	344	-2.08	3.58	3.66	3.64	3.67	3.51	3.80	2.7	4099151	-1486	-6.574	0.0	-0.7	-2.2	0.0	-3.8
12/11/2009	345	-8.24	2.41	2.52	2.55	2.65	2.64	2.86	2.8	5672751	-1875	-6.082	0.0	-1.1	-2.7	0.0	-2.2
12/12/2009	346	-5.20	1.25	1.85	2.14	2.50	2.99	3.18	1.1	7521630	-706	-1.793	0.0	1.3	-1.0	0.0	-2.1
12/13/2009	347	0.10	1.24	2.05	2.21	2.39	2.98	3.17	0.6	999873	-165	12.866	13.5	1.9	-0.2	0.0	-2.3
12/14/2009	348	2.36	1.73	2.09	2.16	2.30	2.87	3.18	1.2	2740863	-21	-0.070	0.0	2.5	0.0	0.0	-2.5
12/15/2009	349	3.16	1.87	2.22	2.30	2.43	3.06	3.31	1.0	1774047	-12	0.000	0.0	2.5	0.0	0.0	-2.5
12/16/2009	350	-4.22	1.75	1.88	1.94	2.06	2.09	2.33	3.7	5745528	-1619	-3.445	0.0	1.4	-2.3	0.0	-2.5
12/17/2009	351	-7.68	1.09	1.24	1.31	1.47	1.46	1.74	3.6	6984835	-1682	-5.343	0.0	-0.6	-2.4	0.0	-2.3
12/18/2009	352	-7.85	0.66	1.04	1.19	1.48	1.99	2.28	0.9	6821256	-731	-1.441	0.0	1.9	-1.1	0.0	-2.2
12/19/2009	353	-6.53	0.76	1.40	1.47	1.59	2.22	2.55	2.2	1409784	-1045	3.340	0.0	7.0	-1.5	0.0	-2.2
12/20/2009	354	-6.44	0.65	1.43	1.51	1.63	2.03	2.34	3.5	6608271	-1455	-3.164	0.0	1.2	-2.1	0.0	-2.3
12/21/2009	355	-3.67	0.65	1.44	1.54	1.68	1.86	2.16	3.7	4266307	-1179	-2.461	0.0	1.4	-1.7	0.0	-2.2
12/22/2009	356	-4.82	0.63	1.45	1.54	1.71	1.99	2.26	3.7	5776137	-1311	-2.672	0.0	1.3	-1.9	0.0	-2.1
12/23/2009	357	-8.11	0.65	1.50	1.59	1.76	2.02	2.26	3.3	5333864	-1515	-2.672	0.0	1.5	-2.2	0.0	-2.0
12/24/2009	358	-4.52	0.65	1.54	1.64	1.78	2.21	2.52	1.2	7122625	-494	-1.512	0.0	1.1	-0.7	0.0	-1.9
12/25/2009	359	-2.59	0.61	1.58	1.68	1.81	2.22	2.53	1.5	1343387	-189	2.250	0.3	4.0	-0.3	0.0	-1.8
12/26/2009	360	1.33	0.59	1.62	1.72	1.86	2.15	2.44	1.9	1659784	114	34.943	32.3	4.9	0.2	0.0	-2.4
12/27/2009	361	1.93	0.81	1.71	1.82	1.95	2.36	2.65	1.0	6997400	-87	3.972	4.0	4.1	-0.1	0.0	-4.0
12/28/2009	362	-1.95	1.17	1.91	1.99	2.11	2.35	2.63	2.2	4159840	-850	-8.964	0.0	-4.3	-1.2	0.0	-3.4
12/29/2009	363	-10.38	1.20	2.07	2.14	2.28	2.25	2.56	4.9	7045329	-2689	-10.265	0.0	-3.6	-3.9	0.0	-2.8
12/30/2009	364	-6.86	0.96	2.21	2.28	2.40	2.64	3.01	1.1	5687875	-740	-6.750	0.0	-3.2	-1.1	0.0	-2.5
12/31/2009	365	-3.32	0.62	2.27	2.34	2.47	2.74	3.08	0.5	1469557	-267	0.176	2.8	0.0	-0.4	0.0	-2.4

									1.000	<=SCALE ADJ (1.0=no adjustment)
									4.184	joule/calorie (= joule/degree for 1cm3)
Nominal diffuse %R from water=7%	**-22872.4**	**71243.5**	**26%**		**3**	**#N/A**	**#N/A**		**-0.9**	**#N/A**
30%										slope
				4.184	<=CONVERT HEAT TO DEGREES				4.184	intercept
	0.9			6000000	cm3/m2 (for 0-4m integrated depth)				6000000	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)
3338	-796	2541	23.9%	0.13	6.59	6.24	(0.36)	(0.49)	-0.03	(0.46)
2545	-250	2295	9.8%	0.10	6.24	6.49	0.25	0.15	-0.01	0.16
1516	122	1638	-8.1%	0.06	6.49	6.49	0.00	(0.06)	0.00	(0.06)
3174	-498	2675	15.7%	0.13	6.49	6.34	(0.15)	(0.27)	-0.02	(0.25)
754	-717	37	95.1%	0.03	6.34	5.54	(0.81)	(0.84)	-0.03	(0.81)
4617	-1127	3490	24.4%	0.18	5.54	5.20	(0.34)	(0.52)	-0.04	(0.48)
1835	-607	1229	33.0%	0.07	5.20	4.87	(0.33)	(0.41)	-0.02	(0.38)
4291	-629	3662	14.7%	0.17	4.87	4.84	(0.03)	(0.20)	-0.03	(0.18)
1177	-366	812	31.1%	0.05	4.84	3.94	(0.89)	(0.94)	-0.01	(0.92)
2869	-1338	1532	46.6%	0.11	3.94	3.15	(0.80)	(0.91)	-0.05	(0.86)
3971	-1688	2283	42.5%	0.16	3.15	2.32	(0.83)	(0.99)	-0.07	(0.92)
5265	-635	4630	12.1%	0.21	2.32	2.99	0.67	0.46	-0.03	0.49
700	-149	551	21.3%	0.03	2.99	2.55	(0.44)	(0.47)	-0.01	(0.46)
1919	-19	1900	1.0%	0.08	2.55	2.87	0.32	0.25	0.00	0.25
1242	-11	1231	0.9%	0.05	2.87	2.62	(0.26)	(0.30)	0.00	(0.30)
4022	-1457	2565	36.2%	0.16	2.62	1.89	(0.73)	(0.89)	-0.06	(0.83)
4889	-1514	3376	31.0%	0.19	1.89	1.27	(0.62)	(0.82)	-0.06	(0.76)
4775	-658	4117	13.8%	0.19	1.27	2.10	0.84	0.64	-0.03	0.67
987	-941	46	95.3%	0.04	2.10	2.07	(0.03)	(0.07)	-0.04	(0.03)
4626	-1310	3316	28.3%	0.18	2.07	1.91	(0.16)	(0.35)	-0.05	(0.30)
2986	-1061	1926	35.5%	0.12	1.91	1.91	(0.00)	(0.12)	-0.04	(0.08)
4043	-1180	2863	29.2%	0.16	1.91	2.00	0.09	(0.07)	-0.05	(0.02)
3734	-1364	2370	36.5%	0.15	2.00	2.00	(0.00)	(0.15)	-0.05	(0.10)
4986	-444	4542	8.9%	0.20	2.00	2.13	0.14	(0.06)	-0.02	(0.04)
940	-170	771	18.1%	0.04	2.13	2.10	(0.03)	(0.07)	-0.01	(0.06)
1162	103	1265	-8.8%	0.05	2.10	2.16	0.06	0.01	0.00	0.01
4898	-78	4820	1.6%	0.20	2.16	2.34	0.18	(0.02)	0.00	(0.01)
2912	-765	2147	26.3%	0.12	2.34	2.34	(0.00)	(0.12)	-0.03	(0.09)
4932	-2420	2512	49.1%	0.20	2.34	2.46	0.12	(0.07)	-0.10	0.02
3982	-666	3315	16.7%	0.16	2.46	2.70	0.25	0.09	-0.03	0.11
1029	-240	789	23.3%	0.04	2.70	#N/A	#N/A	#N/A	-0.01	#N/A