

Summary of flow in stream near northeast side of Devils Lake and stage-discharge rating for the diversion-to-lake conduit, and summary of ground-water levels relative to lake level at four piezometers near Devils Lake

Purpose of this summary:

The purpose of this is to summarize in one document most of the data that were collected by the USGS as part of work partially funded by Wisconsin DNR lake planning grant LPL-717-01.

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Northeast Tributary (Babbling Brook) and Diversion-to-Lake Flow Monitoring:

The Northeast Tributary, which is locally referred to as “Babbling Brook”, drains a 1.7 mi² watershed to the northeast of Devils Lake (Fig. 1). Babbling Brook was monitored from 1994 –2003 to determine flow characteristics such as, volume and temporal distribution of flow during the year. This information was needed to know how much water would be available for diversion into Devils Lake. Hydraulic structures in Babbling Brook and an underground conduit leading to the lake were available, though in disrepair, for diverting flow from the stream to the lake.

Part of funds from the Wisconsin DNR lake planning grant LPL-717-01 were for the following activities: (1) to upgrade the instrumentation as needed in order to monitor flow in the creek and flow diverted to the lake; (2) develop a stage-discharge relationship for the to-the-lake diversion conduit; and (3) determine daily flow volumes for diverted flow and flow down the creek for selected periods of interest to the Wisconsin Department of Resources.

The old instrumentation (float and strip-chart recorder) was upgraded to a system with float, potentiometer, and data logger. The new system recorded stage data at 15-minute intervals. Flow data for the creek for 1994 through 2003 are summarized in Table 1.

Original plans called for developing a stage-discharge relation for the diversion conduit by measuring flow in the conduit for a range of stages at the upstream end of the conduit. However, unusually high lake stages prevented repairing the near-lake end of the conduit. Hence, it was not possible, or needed, to route water through the conduit to the lake according to the original schedule anticipated in 2000. In order to serve planning-purpose needs, a stage discharge rating for the diversion conduit was developed using hydraulic calculations.

The rating was developed using analytical techniques outlined by Bodhaine (1968). Stage-discharge calculations were based on the assumption that the 30-inch corrugated-metal pipe conduit entrance configuration and 590 ft length of the conduit between the entrance and the railroad crossing control the stage-discharge relation. At stages from 0 – 2 ft the flow in the conduit is supercritical and the stage-discharge rating is controlled by the entrance configuration. Above 2 ft there is a transition from super critical flow to sub critical flow, and then to full-pipe flow in the conduit. The rating does not account for the effects of the steel grate installed across the entrance of the conduit. The rating is listed at 0.1-ft stage increments in Table 2.

Ground-Water Monitoring:

Krohelski and Batten (1995) developed a lake water-budget model that was used to simulate the effect of withdrawing Devils Lake water on long-term lake levels. They assumed a constant vertical hydraulic gradient over space and time in the water-budget model. They determined that ground-water outflow was greater than ground-water inflow. For purposes of their model, they assumed this net ground-water flow was

constant throughout the year. The purpose of this monitoring, which was partially funded with funds from planning grant LPL-717-01 was to obtain data to better assess the importance of gradient changes over time.

Four piezometers equipped with water-level recording devices were installed at locations near the edge of the lake. Locations are shown in Figure 1. Because the piezometers are situated at the “corners” of the lake, they are called the Northwest, Northeast, Southwest, and Southeast piezometers in this summary. Piezometer construction information is summarized in Table 3.

Ground water levels in the vicinity of Northwest piezometer, generally were below lake level, indicating that water flows from the lake to the ground most of the time in this lakeshore area (Fig. 2). However, during periods of considerable precipitation and snowmelt, such as spring of 2001, water level in the piezometer rose above lake level, indicating a short-term reversal of flow direction in this region. That is, for short periods flow was from the ground into the lake.

Water levels in Northeast piezometer were from 0.5 ft to 4 ft below lake level during the March 2001 to November 2003 period (Fig. 3). Differences between lake and piezometer water levels were greatest during winter months (as much as four feet in 2003), during which there was little ground-water recharge.

Southwest piezometer, which is situated near the mouth of the small tributary valley from the southwest, indicated ground water flows to the lake most of the time in this region. As shown in Figure 4, water levels in this piezometer are higher than the lake level most of the time. Unconsolidated fill in this small valley provides a recharge area and aquifer to sustain ground water levels in this region that are generally higher than lake level.

Water levels in Southeast piezometer were twenty or more feet below lake level (Fig. 5). In fact, about half the time the piezometer was dry, indicating the water table dropped below the bottom of the piezometer. This confirms that there is an unsaturated zone beneath the southeastern region of the lake, which indicates this part of the lake, is “perched” above the water table. In perched situations the water table level has no bearing on the rate of leakage from the lake to ground water.

The data from the four piezometers, which was mostly continuous, show that the “snapshot” of ground-water gradients obtained from in-lake piezometers on Mar. 5, 1992 (Krohelski and Batten, Fig. 2, p. 5, 1995) represented longer-term conditions pretty well. Although actual gradients may vary, there likely are not significant areas where gradient reversals occur. Hence, assumption #4, constant hydraulic gradient, on page 6 of Krohelski and Batten (1995) is OK even though it does not account for seasonal fluctuations.

References:

Bodhaine, G.L., 1968, Measurement of peak discharge at culverts by indirect methods: U.S. Geological Survey Techniques of Water-Resources Investigations, book 3, chap. A3, 60 p.

Krohelski, J.T. and Batten, W.G., 1995, Simulation of stage and the hydrologic budget of Devils Lake, Sauk County, Wisconsin: U.S. Geological Survey Open-File Report 94-348, 22 p.

Table 1. Discharge in Babbling Brook near Devils Lake near Baraboo, WI, 1994 - 2003

Station number: 05404499

[Daily average discharge, in cubic feet per second]

Water year October 1994 to September 1995

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	1.4	2.3	5	3	---	2.5	2.1	---	---
2	---	---	1.5	1.4	2.3	5	2.4	2	2.4	2.1	---	---
3	---	---	1.5	1.4	2.4	4.9	2.1	1.8	2.3	2.1	---	---
4	---	---	1.5	1.4	2.4	5.1	1.6	1.7	2.3	---	---	---
5	---	---	1.4	1.4	2.4	5.2	1.4	1.7	2.3	---	---	---
6	---	---	1.4	1.4	2.4	5.2	1.4	1.6	---	2.1	---	---
7	---	---	1.4	1.4	2.4	5.2	2.4	1.6	2.3	2	---	---
8	---	---	1.4	1.4	2.3	5.2	4.2	4.7	2.3	2	---	---
9	---	---	1.4	1.4	2.3	5.3	4.7	7.2	2.2	2	---	---
10	---	---	1.4	1.4	2.3	4.8	3.7	13	2.2	2	---	---
11	---	---	1.4	3.6	2.3	6.8	21	5.7	2.1	2	---	---
12	---	---	1.4	5.9	2.3	8.2	15	3.9	2.1	2	---	---
13	---	---	1.4	6.1	2.3	6.8	6.2	7.7	2.1	2	---	---
14	---	---	1.4	3.6	2.3	4.3	4.3	6.4	2.2	2	---	---
15	---	---	1.4	2.3	2.3	3.3	3.6	3.9	2.2	2	---	---
16	---	---	1.4	2.3	2.3	2.9	3.3	17	2.1	2.1	---	---
17	---	---	1.4	2.3	2.3	2.7	3.8	9.7	2.2	2.1	---	---
18	---	---	1.4	2.3	2.3	2.4	16	4.8	2.2	2.1	---	---
19	---	---	1.3	2.3	2.3	2.4	---	3.7	2.3	---	---	---
20	---	---	1.4	2.3	2.9	9.9	---	3.1	2.2	---	---	---
21	---	---	1.4	2.3	4.1	5.3	7.1	2.5	2.2	---	---	---
22	---	---	1.4	2.3	4.8	3.2	4.3	2.4	2.1	---	---	---
23	---	---	1.4	2.3	6.5	2.8	3.5	2.5	2.1	---	---	---
24	---	---	1.4	2.3	5.7	2.2	3.3	2.3	2.1	---	---	---
25	---	---	1.4	2.3	5	1.8	3.1	2.2	2.1	---	---	---
26	---	---	1.4	2.3	5	1.8	2.8	2.3	2.8	---	---	---
27	---	---	1.4	2.3	5	6.1	6.2	15	2.1	---	---	---
28	---	---	1.4	2.3	5	5.5	3.6	22	2.1	---	---	---
29	---	---	1.4	2.3	---	5.8	2.9	7.1	2.1	---	---	---
30	---	---	1.4	2.3	---	4.7	2.5	4.1	2.1	---	---	---
31	---	---	1.4	2.3	---	3.4	---	3.1	---	---	---	---

Table 1. Discharge in Babbling Brook near Devils Lake near Baraboo, WI, 1994 - 2003--continued

Station number: 05404499

[Daily average discharge, in cubic feet per second]

Water year October 1995 to September 1996

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	3	4.5	3.5	---	---	---
2	---	---	---	---	---	---	2.5	3.4	10	---	---	---
3	---	---	---	---	---	---	2.2	2.9	3.1	---	---	---
4	---	---	---	---	---	---	3.2	2.6	3.6	---	---	---
5	---	---	---	---	---	---	2.3	2.4	1.9	---	---	---
6	---	---	---	---	---	---	2.2	2.3	3.3	---	---	---
7	---	---	---	---	---	---	2	2	3.9	---	---	---
8	---	---	---	---	---	---	2	3.9	3.2	---	---	---
9	---	---	---	---	---	---	1.5	3.6	2.3	---	---	---
10	---	---	---	---	---	---	1.5	37	4.3	---	---	---
11	---	---	---	---	---	---	1.5	6.7	3.6	---	---	---
12	---	---	---	---	---	---	1.7	3.8	2.4	---	---	---
13	---	---	---	---	---	---	1.4	3.1	2.2	---	---	---
14	---	---	---	---	---	5.9	1.3	3.4	2.3	---	---	---
15	---	---	---	---	---	4.8	2.9	9.2	2.3	---	---	---
16	---	---	---	---	---	4.2	3.7	4.7	2.4	---	---	---
17	---	---	---	---	---	3.2	3.3	4.1	91	---	---	---
18	---	---	---	---	---	2.7	4.2	6.3	20	---	---	---
19	---	---	---	---	---	2.5	5.6	4.9	2.2	---	---	---
20	---	---	---	---	---	2.1	4.8	4.4	2.1	---	---	---
21	---	---	---	---	---	1.9	3.4	3.9	2.1	---	---	---
22	---	---	---	---	---	1.8	5	2.8	2.1	---	---	---
23	---	---	---	---	---	1.9	3.5	3.4	2.1	---	---	---
24	---	---	---	---	---	5.9	2.2	2.4	2.2	---	---	---
25	---	---	---	---	---	13	2	2	3	---	---	---
26	---	---	---	---	---	5.4	2.6	2.1	---	---	---	---
27	---	---	---	---	---	5.4	1.5	2	---	---	---	---
28	---	---	---	---	---	4.2	1.4	1.9	---	---	---	---
29	---	---	---	---	---	2.5	2.3	1.9	---	---	---	---
30	---	---	---	---	---	3.1	4.7	2.9	---	---	---	---
31	---	---	---	---	---	4.1	---	1.9	---	---	---	---

Table 1. Discharge in Babbling Brook near Devils Lake near Baraboo, WI, 1994 - 2003--continued

Station number: 05404499

[Daily average discharge, in cubic feet per second]

Water year October 1996 to September 1997

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	4.3	11	0.95	2.7	1.5	---
2	---	---	---	---	---	---	3.9	7.2	1.1	5.3	1.5	---
3	---	---	---	---	---	---	3.4	5.2	1.4	1.4	1.5	---
4	---	---	---	---	---	---	2.8	3.3	1.2	1.4	1.5	---
5	---	---	---	---	---	---	3.1	4.4	1.1	1.4	1.5	---
6	---	---	---	---	---	---	3.3	2.2	1.1	1.4	1.5	---
7	---	---	---	---	---	---	2.5	2.2	1.3	1.5	1.5	---
8	---	---	---	---	---	---	2.1	4.6	2.4	11	1.5	---
9	---	---	---	---	---	---	1.7	2.1	1.1	2	1.5	---
10	---	---	---	---	---	---	1.5	1.8	1.1	1.6	1.5	---
11	---	---	---	---	---	---	1.5	2	1.1	1.6	1.6	---
12	---	---	---	---	---	---	1.5	1.9	1.1	1.6	2.1	---
13	---	---	---	---	---	---	1.7	1.7	1.1	1.5	1.7	---
14	---	---	---	---	---	---	3.3	1.6	1.1	1.5	1.6	---
15	---	---	---	---	---	---	3.5	1.6	22	1.5	---	---
16	---	---	---	---	---	---	2.7	1.1	65	1.5	---	---
17	---	---	---	---	---	---	2.2	1.1	14	2.5	---	---
18	---	---	---	---	---	---	3.8	1	7.4	1.5	---	---
19	---	---	---	---	---	---	2.1	0.99	6	1.4	---	---
20	---	---	---	---	---	---	1.7	0.98	4.9	1.4	---	---
21	---	---	---	---	---	---	3	0.97	44	1.4	---	---
22	---	---	---	---	---	---	1.3	2.4	19	1.4	---	---
23	---	---	---	---	---	---	1.3	0.95	9.4	1.4	---	---
24	---	---	---	---	---	---	1.3	0.95	7.7	1.5	---	---
25	---	---	---	---	---	3.1	1.2	0.95	6.6	1.5	---	---
26	---	---	---	---	---	4.6	1.2	0.95	4.9	8.3	---	---
27	---	---	---	---	---	17	1.2	0.95	4.2	8	---	---
28	---	---	---	---	---	26	1.2	0.95	3.9	2.6	---	---
29	---	---	---	---	---	14	1.1	0.95	3.7	1.6	---	---
30	---	---	---	---	---	7.5	7.4	0.95	4.7	1.6	---	---
31	---	---	---	---	---	5.8	---	0.95	---	1.6	---	---

Table 1. Discharge in Babbling Brook near Devils Lake near Baraboo, WI, 1994 - 2003--continued

Station number: 05404499

[Daily average discharge, in cubic feet per second]

Water year October 1997 to September 1998

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.5	1.6	---	---	---	2.5	e35	2.1	0.74	1.8	0	0.2
2	1.5	1.6	---	---	---	2.2	e20	2.8	0.42	1.1	0.01	0.2
3	1.5	1.6	---	---	---	3.8	5.1	6.3	0.27	1.7	0.01	0.19
4	1.5	3.5	---	---	---	1.7	3.8	2.9	0.22	2	2	0.18
5	1.4	2	---	---	---	1.6	3.5	2.4	0.2	1.1	3.7	0.16
6	1.5	1.6	---	---	---	1.5	3.4	2.4	0.16	0.69	7.8	0.14
7	1.5	1.6	---	---	---	1.4	2.9	4.6	0.09	0.68	2.2	0.14
8	1.5	1.6	---	---	---	---	5.8	4.9	0.08	0.7	1.2	0.13
9	1.5	1.6	---	---	---	---	7.6	2.8	0.59	0.64	0.62	0.12
10	1.5	1.6	---	---	---	---	3.7	2.4	0.66	0.53	e1.0	0.08
11	1.5	1.7	---	---	---	---	2.9	2.3	8.9	0.44	e0.50	0.02
12	1.4	1.9	---	---	---	---	2.9	2.3	6.8	0.34	e0.40	0
13	1.4	1.8	---	---	---	---	4.7	2.3	3.1	0.25	0.37	0
14	1.4	1.7	---	---	---	---	5.5	2.3	1.7	0.2	0.28	2.2
15	1.4	1.6	---	---	---	---	11	2.3	1.1	0.13	0.28	2.3
16	1.4	1.6	---	---	---	---	41	2.3	0.95	0.1	0.25	1
17	1.4	1.8	---	---	---	---	7.7	2.4	0.9	0.09	0.28	0.24
18	1.4	2.3	---	---	---	---	e6.0	2.4	e4.0	0.09	0.26	0.2
19	1.4	3.6	---	---	---	---	e4.0	1.5	e2.0	0.09	0.22	0.17
20	2.6	3.6	---	---	---	---	e2.0	0.3	e1.0	0.52	0.21	0.14
21	1.5	2.8	---	---	2	---	e2.0	0.2	e0.90	0.47	0.22	0.13
22	1.4	1.9	---	---	2.3	---	e2.0	0.18	e0.80	0.27	0.21	0.12
23	1.4	1.9	---	---	2.4	---	2.4	0.16	e0.70	0.22	0.19	0.1
24	1.4	1.9	---	---	4.5	---	4.1	1.3	1.1	0.11	0.19	0.11
25	1.4	1.7	---	---	1.8	---	2.3	0.82	0.93	0.08	0.2	0.1
26	1.5	---	---	---	2.4	---	2.7	0.25	0.42	0.08	0.2	0.09
27	1.6	---	---	---	7	---	2.1	0.16	7.5	0.08	0.2	0.09
28	1.6	---	---	---	3.2	e1.0	2	2	e30	0.08	0.21	0.08
29	1.6	---	---	---	---	e3.0	2.1	1.6	e15	0.03	0.21	0.08
30	1.7	---	---	---	---	e15	2.1	0.63	e2.0	0.03	0.22	0.11
31	1.6	---	---	---	---	e80	---	1.8	---	0	0.22	---

Table 1. Discharge in Babbling Brook near Devils Lake near Baraboo, WI, 1994 - 2003--continued

Station number: 05404499

[Daily average discharge, in cubic feet per second]

Water year October 1998 to September 1999

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.09	0.24	---	---	---	---	1.7	2.5	1.3	0.51	0.12	0.15
2	0.08	0.23	---	---	---	---	1.5	2.1	3.7	0.47	0.11	0.12
3	0.07	0.24	---	---	---	---	24	1.9	1.6	0.47	0.09	0.11
4	0.05	0.23	---	---	---	---	11	1.8	1.7	0.42	0.09	0.11
5	0.41	0.22	---	---	---	---	6.5	1.6	1.8	0.33	0.07	0.11
6	0.96	0.22	---	---	---	---	9	3.8	1.1	0.31	0.07	0.11
7	0.27	0.21	---	---	---	---	6.2	5.2	0.97	0.26	0.12	0.11
8	0.13	0.2	---	---	---	---	9.7	3.9	6.7	0.25	0.09	0.11
9	0.11	0.23	---	---	---	---	38	2.6	5.8	0.25	0.13	0.11
10	0.09	6.3	---	---	---	---	8.7	2.1	2	0.25	0.1	0.11
11	---	3.4	---	---	---	---	7.4	1.9	3.6	0.25	0.09	0.08
12	---	2	---	---	---	---	5.5	1.8	3.5	0.25	0.07	0.07
13	---	---	---	---	---	---	4.5	1.5	2.6	0.25	0.07	0.07
14	---	---	---	---	---	---	3.7	1.1	2.2	0.25	0.07	0.07
15	---	---	---	---	---	---	3.4	1.1	2.6	0.22	0.07	0.07
16	0.08	---	---	---	---	---	3.4	2.4	1.4	0.38	0.03	0.07
17	0.21	---	---	---	---	---	2.8	14	1.3	0.34	0	0.07
18	0.72	---	---	---	---	---	2.9	6.4	1	0.31	0	0.07
19	0.6	---	---	---	---	2.8	2.3	3.7	0.72	0.45	2.3	0.07
20	0.3	---	---	---	---	2.7	2.2	2.7	0.61	2.1	0.25	0.07
21	0.24	---	---	---	---	2.8	2.5	2.2	0.57	1.7	0.12	0.07
22	0.22	---	---	---	---	2.5	16	1.9	0.5	0.46	0.08	0.04
23	0.2	---	---	---	---	2.3	47	2.8	0.74	0.46	1.3	0.01
24	0.21	---	---	---	---	2.2	8.8	2.4	0.62	0.31	0.52	0
25	0.21	---	---	---	---	2	6.5	1.7	0.46	0.17	0.33	0
26	0.22	---	---	---	---	1.9	5	3.3	0.38	0.15	0.26	0.01
27	0.91	---	---	---	---	1.8	4.3	1.6	0.38	0.15	0.19	0.19
28	0.83	---	---	---	---	1.8	3.6	1	0.38	0.15	0.19	0.1
29	0.46	---	---	---	---	1.8	3.1	0.67	0.33	0.15	0.16	0.11
30	0.34	---	---	---	---	1.8	2.8	0.47	0.31	1.4	0.15	0.11
31	0.26	---	---	---	---	1.7	---	1.3	---	0.33	0.15	---

Table 1. Discharge in Babbling Brook near Devils Lake near Baraboo, WI, 1994 - 2003--continued

Station number: 05404499

[Daily average discharge, in cubic feet per second]

Water year October 1999 to September 2000

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.09	0.25	---	---	---	---	0.37	1.6	193	0.24	0.16	0.11
2	0.13	0.25	---	---	---	---	0.3	1.4	85	0.67	0.12	0.1
3	0.09	0.25	---	---	---	---	0.26	1.2	7.3	1.7	0.11	0.1
4	0.06	0.19	---	---	---	---	0.23	0.99	9.2	0.89	0.11	0.1
5	0.07	0.19	---	---	---	---	0.22	0.66	12	0.51	0.44	0.1
6	0.07	0.19	---	---	---	---	0.2	0.52	5.4	0.32	0.42	0.08
7	0.07	0.19	---	---	---	---	0.2	0.43	4.5	0.17	0.21	0.03
8	0.07	0.15	---	---	---	---	0.24	0.33	3.1	0.15	0.13	0
9	0.07	0.15	---	---	---	---	0.63	0.26	2.2	0.9	0.08	0
10	0.07	0.15	---	---	---	---	0.91	0.28	1.8	69	0.06	0
11	0.07	0.15	---	---	---	---	0.68	0.22	1.6	5.5	0.06	0.23
12	0.07	0.15	---	---	---	---	0.57	0.32	1.5	2.9	0.04	0.15
13	0.07	0.15	---	---	---	---	0.48	0.35	2.6	2.1	0.06	0.15
14	0.07	0.11	---	---	---	---	0.44	0.17	16	1.5	0.06	0.21
15	0.07	0.11	---	---	---	0.63	0.38	0.13	6	1.1	0.01	0.18
16	0.22	---	---	---	---	0.58	0.3	0.12	3.7	0.75	0	0.15
17	0.17	---	---	---	---	0.49	0.27	6.9	2.6	0.59	0.19	0.14
18	0.15	---	---	---	---	0.46	0.24	35	2	0.37	0.13	0.13
19	0.15	---	---	---	---	0.45	0.73	9.1	1.6	0.32	0.13	0.12
20	0.15	---	---	---	---	0.43	28	4.4	4	0.3	0.12	0.13
21	0.15	---	---	---	---	0.68	14	3.2	2.6	0.24	0.11	0.13
22	0.15	---	---	---	---	0.85	5	2.6	1.6	0.19	0.12	0.25
23	0.15	---	---	---	---	0.79	15	2.1	1.2	0.17	0.11	0.37
24	0.15	---	---	---	---	0.85	5.9	1.6	1	0.16	0.1	0.24
25	0.15	---	---	---	---	1.1	4.2	1.4	1.2	0.15	0.1	0.17
26	0.15	---	---	---	---	0.93	3.3	1.2	0.98	0.15	0.71	0.15
27	0.15	---	---	---	---	1.2	2.8	1.2	0.65	0.15	0.29	0.13
28	0.15	---	---	---	---	1	2.4	2	1.4	0.17	0.15	0.12
29	0.48	---	---	---	---	0.67	2	1.5	0.66	0.22	0.13	0.09
30	0.31	---	---	---	---	0.51	1.8	1.3	0.38	0.21	0.12	0.09
31	0.28	---	---	---	---	0.41	---	8.6	---	0.15	0.12	---

Table 1. Discharge in Babbling Brook near Devils Lake near Baraboo, WI, 1994 - 2003--continued

Station number: 05404499

[Daily average discharge, in cubic feet per second]

Water year October 2000 to September 2001

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.09	0.04	---	---	---	---	6.3	1.7	1.4	0.7	0.41	0.11
2	0.09	0.04	---	---	---	---	5.3	1.7	2.4	0.53	25	0.1
3	0.09	0.05	---	---	---	---	4.4	6.3	1.8	0.41	1.4	0.1
4	0.09	0.04	---	---	---	---	4	19	1.4	0.34	0.57	0.09
5	0.09	0.04	---	---	---	---	5.1	9.5	4.1	0.31	0.32	0.09
6	0.09	0.06	---	---	---	---	5.1	4.4	3.5	0.29	0.25	0.1
7	0.09	1.4	---	---	---	---	15	6.1	2.6	0.27	0.21	0.14
8	0.08	0.64	---	---	---	---	5	4.7	2	0.25	0.15	1.3
9	0.07	1	---	---	---	---	22	3.7	1.6	0.22	0.12	0.86
10	0.06	1.3	---	---	---	---	6.4	3.5	1.4	0.21	0.11	0.84
11	0	1	---	---	---	---	21	4.9	2.2	0.17	0.1	0.33
12	0	0.84	---	---	---	---	11	3.6	15	0.17	0.07	0.25
13	0	---	---	---	---	---	6.4	2.9	4.2	0.17	0.07	0.2
14	0	---	---	---	---	---	5.8	2.6	4.7	0.17	0.07	0.18
15	0	---	---	---	---	---	5	2.3	5.5	0.17	0.07	0.34
16	0	---	---	---	---	---	4.3	2	3.4	0.16	0.07	0.77
17	0	---	---	---	---	---	3.8	1.7	2.6	0.16	0.07	2.3
18	0	---	---	---	---	---	3.5	1.4	4.8	0.59	0.07	0.24
19	0	---	---	---	---	---	3.1	1.2	2.8	0.2	0.07	1.2
20	0	---	---	---	---	---	4.6	1	2.2	0.15	0.07	1.1
21	0	---	---	---	---	---	4.5	0.94	5.8	0.13	0.07	0.57
22	0	---	---	---	---	7.6	3.7	0.96	5.9	0.13	0.32	0.55
23	0.04	---	---	---	---	8.2	3.5	1	3.4	0.17	0.15	9.1
24	0.2	---	---	---	---	7.1	3.1	1.2	2.4	0.17	0.14	6.2
25	0.15	---	---	---	---	7.1	2.9	1.7	1.9	0.13	0.19	2.5
26	0.11	---	---	---	---	7	3	1.4	2.1	0.12	0.21	1.6
27	0.05	---	---	---	---	5.5	2.4	1.3	1.5	0.12	0.15	1.3
28	0.05	---	---	---	---	3.6	2.2	1	1.1	0.12	0.15	1.2
29	0.05	---	---	---	---	4.9	1.9	0.82	0.82	0.13	0.14	0.79
30	0.05	---	---	---	---	5.5	1.8	0.79	0.63	0.13	0.14	0.33
31	0.05	---	---	---	---	6.9	---	0.84	---	0.13	0.13	---

Table 1. Discharge in Babbling Brook near Devils Lake near Baraboo, WI, 1994 - 2003--continued

Station number: 05404499

[Daily average discharge, in cubic feet per second]

Water year October 2001 to September 2002

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.29	1.3	---	---	---	---	---	4.3	0.91	0.18	0.04	0.17
2	0.26	1.4	---	---	---	---	---	8.4	0.45	0.15	0.05	0.74
3	0.26	1.3	---	---	---	---	---	4.2	4.6	0.14	0.07	0.26
4	0.24	1.2	---	---	---	---	1.5	3.5	11	0.13	0.19	0.21
5	0.25	1	---	---	---	---	1.5	3.1	5.4	0.12	0.14	0.19
6	0.25	0.94	---	---	---	---	1.7	4.1	3	0.11	0.14	0.18
7	0.21	0.9	---	---	---	---	3.6	4.3	2.3	0.11	0.14	0.18
8	0.15	0.91	---	---	---	---	8.4	3.2	1.8	0.1	0.13	0.17
9	0.13	0.89	---	---	---	---	6.4	35	1.5	0.1	0.13	0.17
10	0.15	0.86	---	---	---	---	4	6.3	1.3	0.09	0.13	0.15
11	0.18	0.83	---	---	---	---	3.5	6.6	3.1	0.09	0.17	0.14
12	0.18	0.79	---	---	---	---	4.4	7.4	2.6	0.09	0.17	0.13
13	0.18	1.1	---	---	---	---	3.5	4.8	2.5	0.09	0.16	0.12
14	0.21	1.1	---	---	---	---	3.2	3.9	2.6	0.09	0.16	0.12
15	0.21	0.99	---	---	---	---	2.9	3.4	2.3	0.08	0.16	0.12
16	0.21	0.88	---	---	---	---	2.6	3.1	1.9	0.06	0.15	0.11
17	0.21	0.77	---	---	---	---	2.3	2.7	1.4	0.06	0.08	0.11
18	0.21	0.78	---	---	---	---	28	2.4	1.1	0.23	0.1	0.1
19	0.21	1.7	---	---	---	---	15	2.2	0.76	0.12	0.1	0.13
20	0.2	1.4	---	---	---	---	6.5	1.9	0.51	0.15	0.01	0.11
21	0.21	1.4	---	---	---	---	6.6	1.6	1.7	0.11	0.87	0.1
22	0.26	1.5	---	---	---	---	7.6	1.5	2.7	0.19	1.4	0.1
23	0.55	1.5	---	---	---	---	5.3	1.4	1.4	0.1	0.8	0.09
24	0.45	2.4	---	---	---	---	19	1.3	0.25	0.1	0.56	0.09
25	0.86	2.1	---	---	---	---	8.2	3.4	0.21	0.13	0.43	0.09
26	1.4	---	---	---	---	---	4.9	2.7	1.1	0.13	0.25	0.09
27	1.4	---	---	---	---	---	6.8	1.8	0.5	0.1	0.22	0.08
28	1.4	---	---	---	---	---	23	1.4	0.34	0.1	0.21	0.08
29	1.4	---	---	---	---	---	6.6	2.2	0.27	0.06	0.21	0.08
30	1.3	---	---	---	---	---	4.8	1.8	0.21	0.05	0.19	0.08
31	1.3	---	---	---	---	---	---	1.4	---	0.04	0.18	---

Table 1. Discharge in Babbling Brook near Devils Lake near Baraboo, WI, 1994 - 2003--continued

Station number: 05404499

[Daily average discharge, in cubic feet per second]

Water year October 2002 to September 2003

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0.08	0.21	---	---	---	---	---	0.82	0.35	0.11	0	0
2	0.08	0.21	---	---	---	---	---	0.5	0.23	0.07	0	0
3	0.1	0.21	---	---	---	---	---	0.26	0.19	0.04	0	0
4	0.58	0.2	---	---	---	---	---	0.25	0.16	0.04	0	0
5	0.17	0.2	---	---	---	---	---	0.99	0.16	0.04	0	0
6	0.16	0.21	---	---	---	---	---	1.3	0.15	0.04	0	0
7	0.17	0.21	---	---	---	---	---	0.9	0.19	0	0	0
8	0.16	0.21	---	---	---	---	---	0.92	0.22	0	0	0
9	0.17	0.2	---	---	---	---	---	6.5	0.22	0	0	0
10	0.16	0.2	---	---	---	---	---	4.5	0.19	1.5	0	0
11	0.16	0.27	---	---	---	---	0.66	12	0.31	0.53	0	0
12	0.16	0.28	---	---	---	---	0.67	7.3	0.27	0.17	0	0
13	0.16	0.27	---	---	---	---	0.49	4.1	0.2	0.06	0	0.35
14	0.15	0.27	---	---	---	---	0.38	4.7	0.15	0	0	0.57
15	0.14	0.25	---	---	---	---	0.33	4.3	0.12	2.3	0	0.12
16	0.13	0.24	---	---	---	---	0.25	3.2	0.09	0.69	0	0.04
17	0.13	0.24	---	---	---	---	0.2	2.6	0.06	0.17	0	0
18	0.16	0.24	---	---	---	---	0.17	2.3	0.46	0.04	0	0
19	0.19	---	---	---	---	---	0.15	1.9	2.1	0	0	0
20	0.19	---	---	---	---	---	0.15	2.2	0.4	0	0	0
21	0.19	---	---	---	---	---	0.16	1.7	0.21	0	0	0
22	0.19	---	---	---	---	---	0.15	1.5	0.14	0	0	0
23	0.17	---	---	---	---	---	0.15	1.3	0.1	0	0	0
24	0.17	---	---	---	---	---	0.15	0.92	0.08	0	0	0
25	0.22	---	---	---	---	---	0.15	0.55	0.91	0	0	0
26	0.23	---	---	---	---	---	0.14	0.44	0.83	0	0	0
27	0.22	---	---	---	---	---	0.13	0.36	0.15	0	0	0
28	0.21	---	---	---	---	---	0.11	0.31	0.39	0	0.47	0
29	0.22	---	---	---	---	---	0.11	0.27	0.5	0	0.32	0
30	0.21	---	---	---	---	---	0.16	0.2	0.19	0	0	0
31	0.21	---	---	---	---	---	---	0.47	---	0	0	---

Table 2. Stage-discharge rating for diversion conduit to Devils Lake[ft³/s, cubic feet per second]

Stage above local gage datum (feet)	Stage above mean sea level datum (feet)	Stage above invert of inlet (feet)	Discharge (ft ³ /s)
3.18	774.00	0.00	0.0
3.28	774.10	0.10	0.2
3.38	774.20	0.20	0.4
3.48	774.30	0.30	0.6
3.58	774.40	0.40	0.8
3.68	774.50	0.50	1.0
3.78	774.60	0.60	1.7
3.88	774.70	0.70	2.3
3.98	774.80	0.80	2.9
4.08	774.90	0.90	3.5
4.18	775.00	1.00	4.1
4.28	775.10	1.10	5.0
4.38	775.20	1.20	6.0
4.48	775.30	1.30	6.9
4.58	775.40	1.40	7.9
4.68	775.50	1.50	8.8
4.78	775.60	1.60	9.9
4.88	775.70	1.70	11.0
4.98	775.80	1.80	12.1
5.08	775.90	1.90	13.2
5.18	776.00	2.00	14.3
5.28	776.10	2.10	15.4
5.38	776.20	2.20	16.5
5.48	776.30	2.30	17.6
5.58	776.40	2.40	18.8
5.68	776.50	2.50	19.9
5.78	776.60	2.60	21.0
5.88	776.70	2.70	22.1
5.98	776.80	2.80	23.3
6.08	776.90	2.90	24.0
6.18	777.00	3.00	24.8
6.28	777.10	3.10	25.6
6.38	777.20	3.20	26.4
6.48	777.30	3.30	27.2
6.58	777.40	3.40	28.0
6.68	777.50	3.50	28.7
6.78	777.60	3.60	28.9
6.88	777.70	3.70	29.0
6.98	777.80	3.80	29.1
7.08	777.90	3.90	29.3
7.18	778.00	4.00	29.4

Table 3. Construction data for four piezometers installed near Devils Lake

Piezometer	Northwest	Northeast	Southwest	Southeast
Date of construction	3/16/2001	6/22/2001	3/16/2001	6/16/2001
Total depth (feet)	11.0	13.6	10.6	33.9
Screen length (feet)	1	1	1	1
Casing and screen diameter (inches)	1	1	1	1
Altitude of ground surface (feet above mean sea level)	966.1	967.9	965.7	966.7

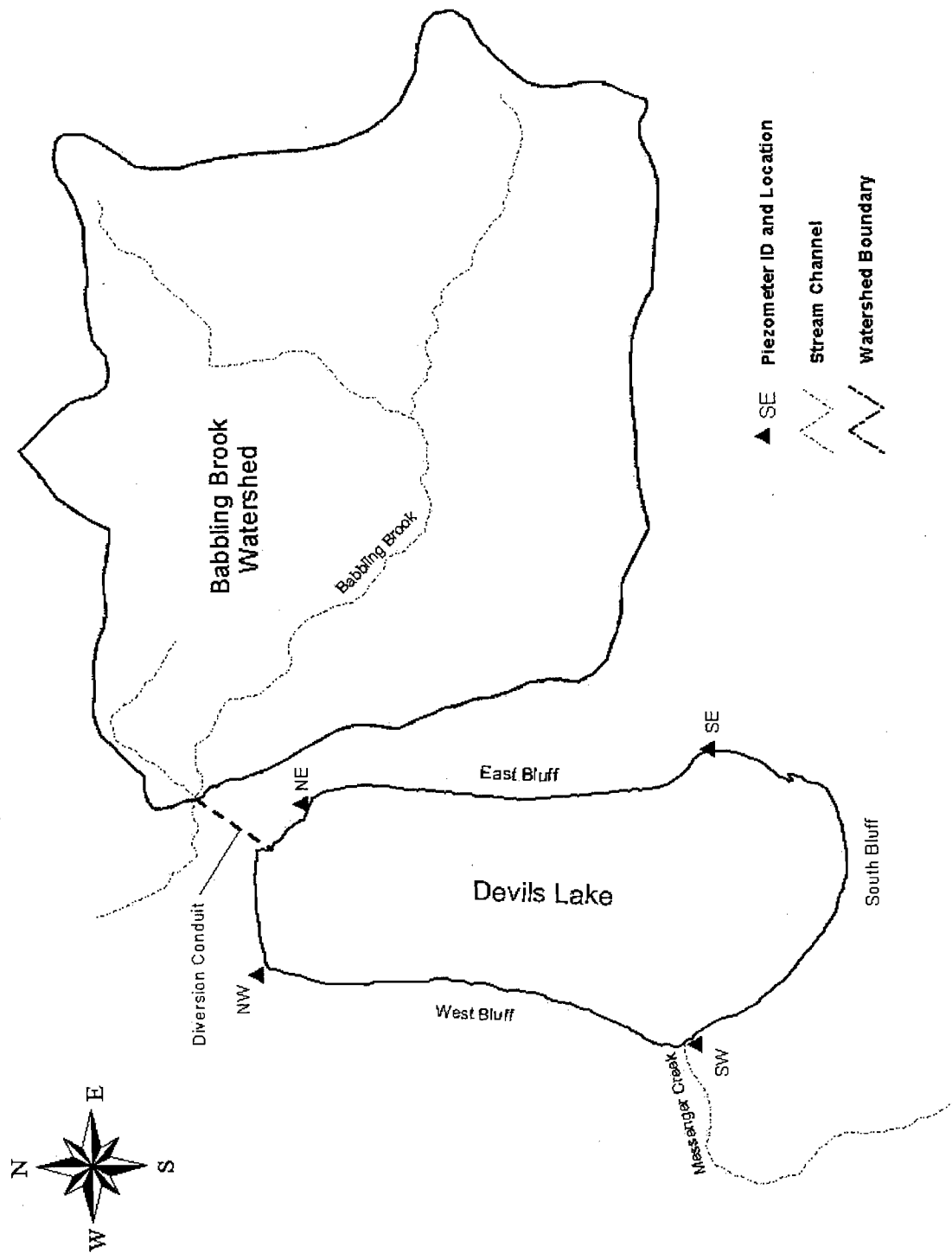


Figure 1. Locations of piezometers in relation to Devils Lake, Sauk County, Wisconsin. [NW, Northwest Piezometer; NE, Northeast Piezometer; SW, Southwest Piezometer; and SE, Southeast Piezometer.]

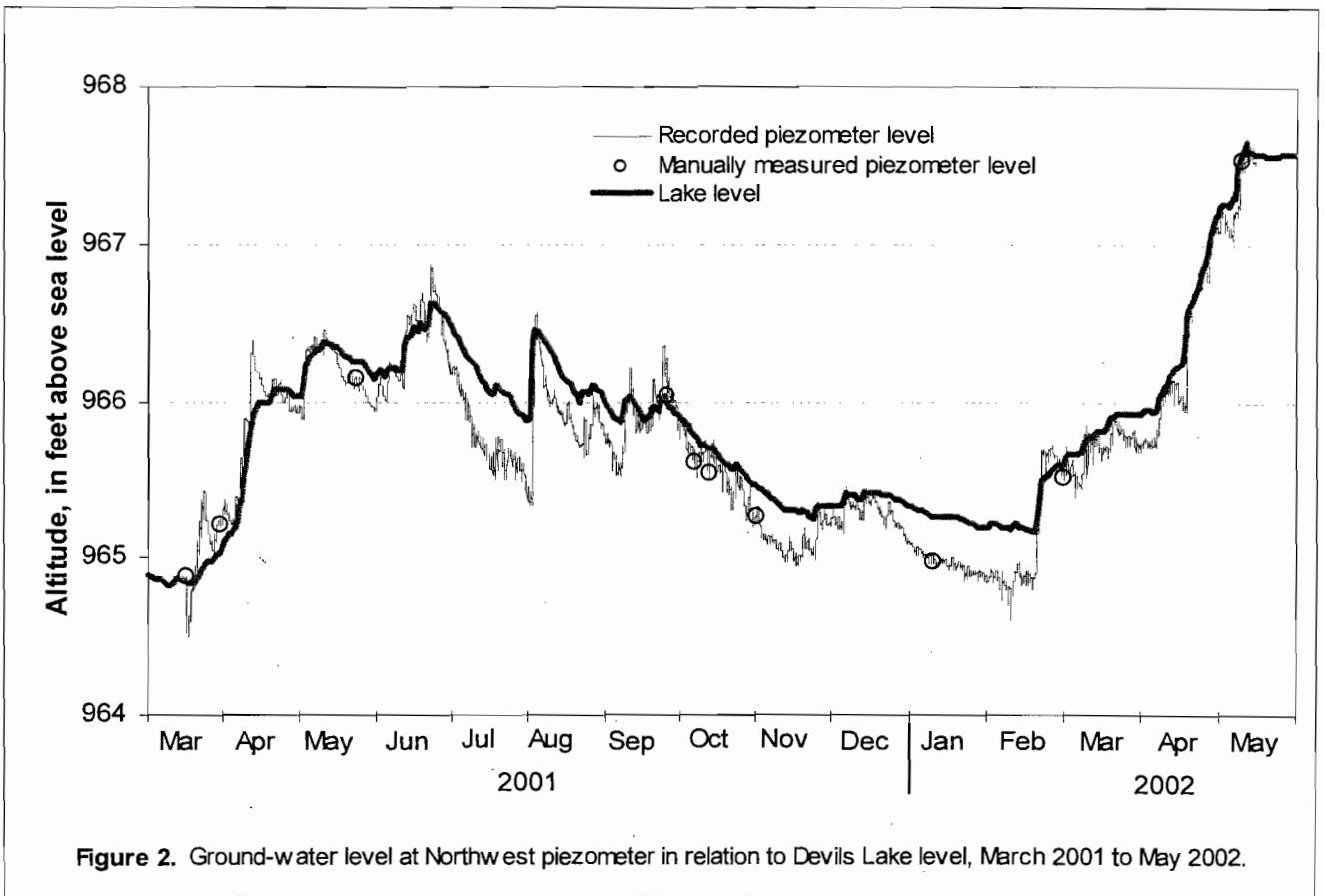


Figure 2. Ground-water level at Northwest piezometer in relation to Devils Lake level, March 2001 to May 2002.

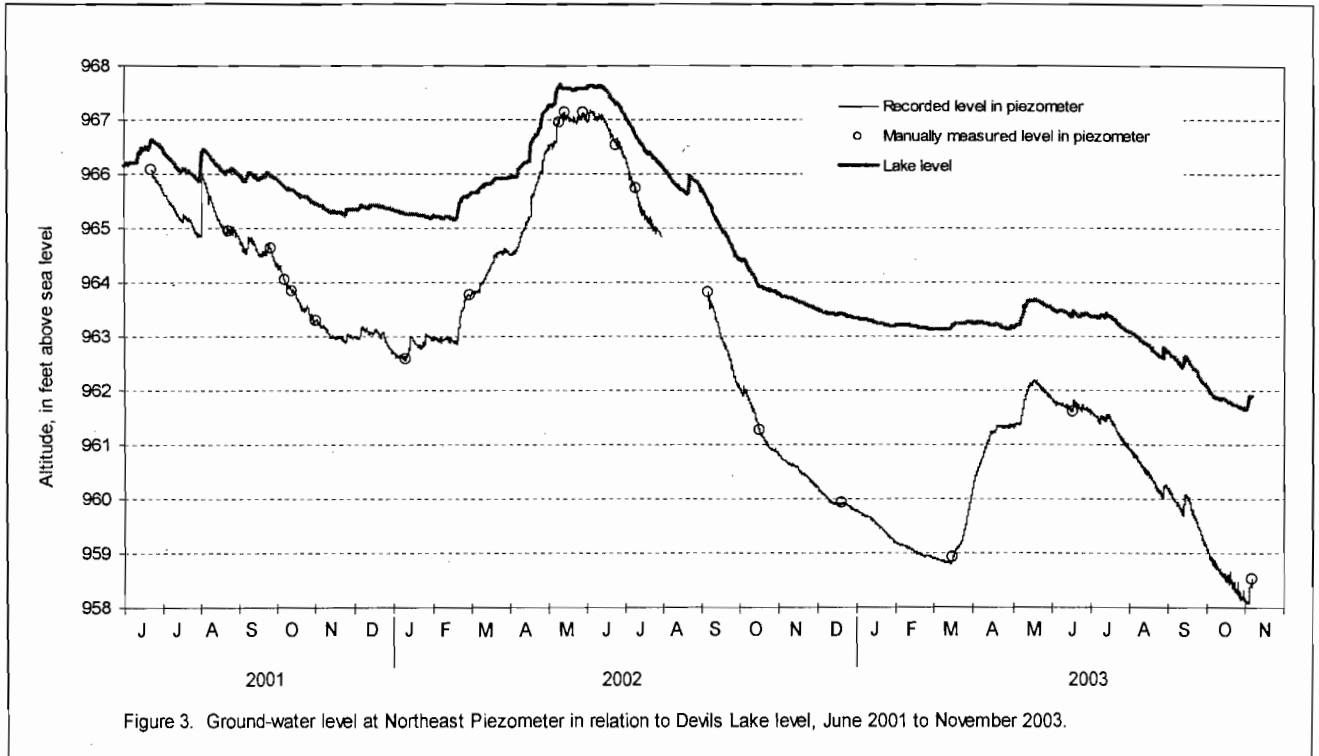


Figure 3. Ground-water level at Northeast Piezometer in relation to Devils Lake level, June 2001 to November 2003.

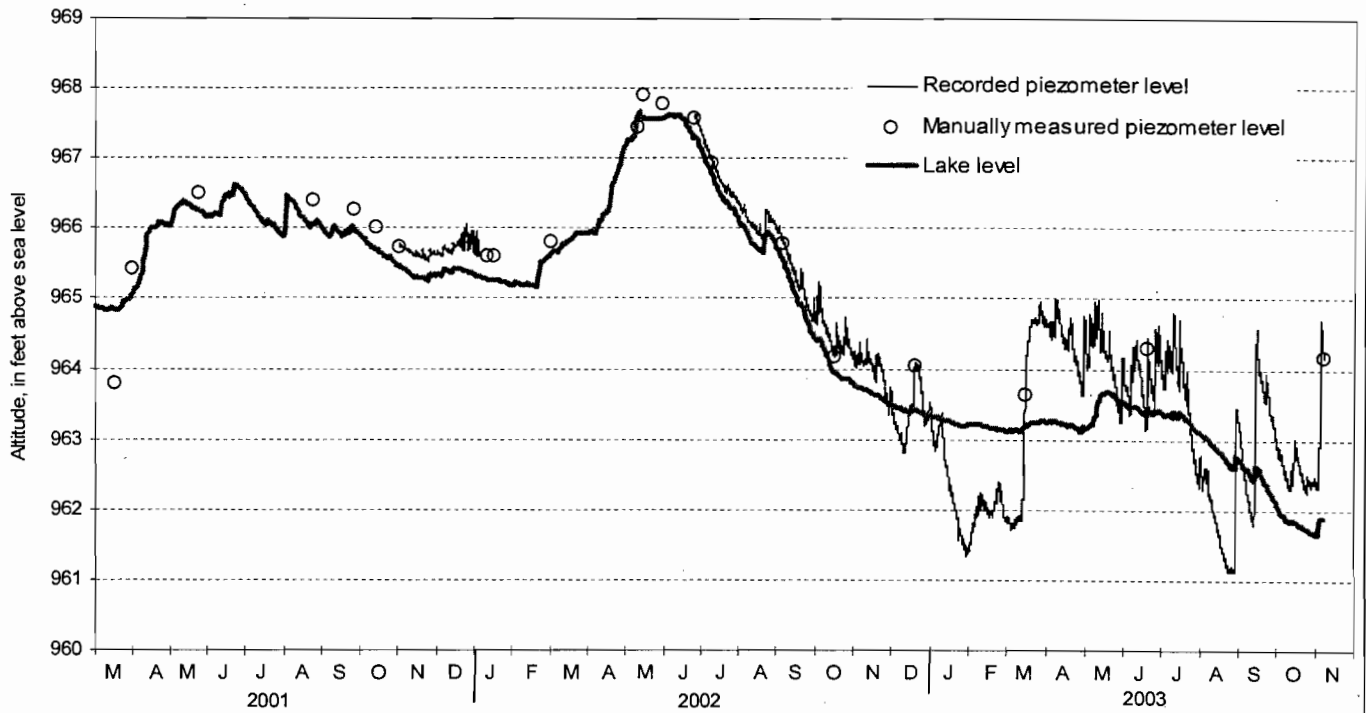


Figure 4. Ground-water level at Southwest piezometer in relation to Devils Lake level, March 2001 to November 2003.

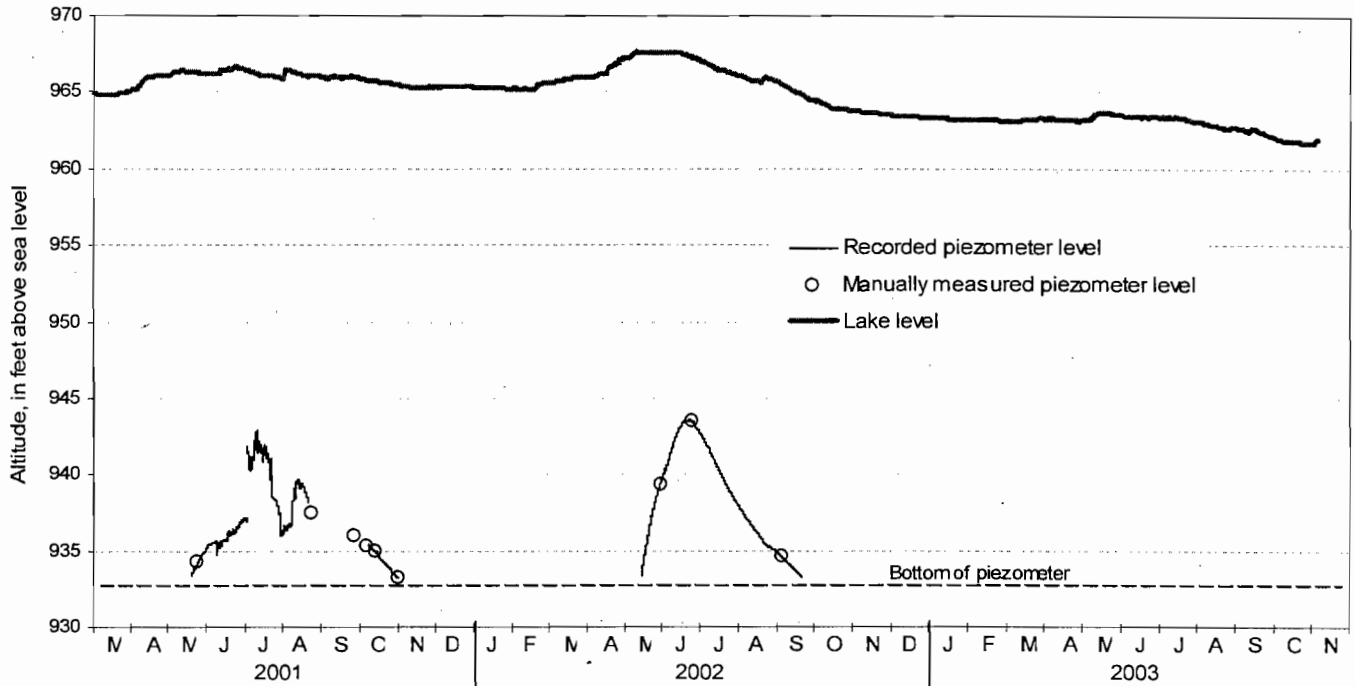


Figure 5. Ground-water level at Southeast piezometer in relation to Devils Lake level, March 2001 to November 2003.