
Douglas Co. Water Clarity

Does a centralized sewer system clean up lakes?

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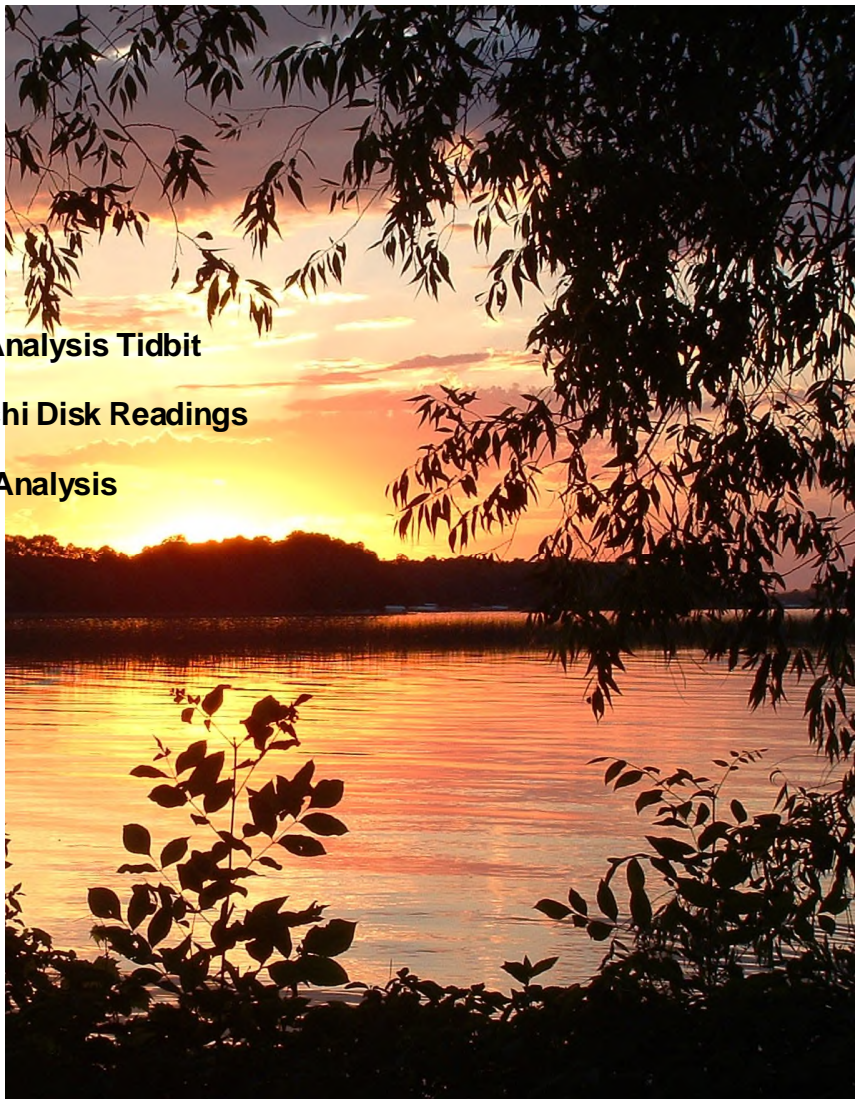
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Douglas County Lake Demographics – Those flowing to Long Prairie River

Seq.	Lake	Flows to	District	Depth	Area	Lit Area	Dam?	OHW	DNR Clarity
100	Carlos	Long Prairie Riv.	ALSD	163	2520	910	No	1357.2	11
110	Le Homme Dieu	Carlos	ALSD	90	1744	767	Bridge	1357.2	8
111	Geneva	Le Homme Dieu	ALSD	63	631	265	Bridge	1357.2	9
112	Victoria	Geneva	ALSD	60	419	122	Bridge	1357.3	12.3
113	Burgen	Victoria	ALSD	43	184	53	Ditch	1360.4	6.3
115	Union	Burgen		45	104	55	Ditch	1387.2	9
114	Jessie	Victoria		26	105	65	channel	1357.9	7
116	Henry	Le Homme Dieu	ALSD	32	152	98	Ditch	1377.8	5
117	Agnes	Henry	ALSD	31	137	59	Culvert	1377.8	4.7
118	Winona	Agnes	ALSD	9	190	190	Culvert	1378	1
120	Darling	Carlos	ALSD	62	1360	477	Bridge	1357.2	9
121	Cowdry	Darling	ALSD	40	238	?	Bridge	1359.3	9.5
122	Stony	Cowdry	ALSD	58	87	48	channel	1359.4	8
123	No. Union	Stony	ALSD	42	117	92	channel	1360.8	9.5
124	Louise	No. Union	ALSD	33	214	99	Yes	1360.8	8
125	Ida	Charlie-Louise	ALSD	106	4426	1673	Yes	1364.4	11
126	Miltona	Ida	CLRSD	105	5724	2802	Yes	1367	8
127	Irene	Miltona	CLRSD	44	630	224	Yes	1382.4	3.5
128	Vermont	Miltona		59	309	207	Ditch	1434.5	18
129	Spring	Miltona		54	120	54	Ditch	1367.1	6
130	Latoka	Cowdry	ALSD	108	776	155	Culvert	1362.9	13
131	Brophy	No. Union	ALSD	44	292	150	Ditch	1359.5	8
132	Mina	Brophy		123	411	178	Culvert	1362.5	8
133	Lobster	Mina	CLRSD	40	1308	667	Yes	1362.2	7
134	Mill	Lobster		40	461	240	ditch	1363.5	11.5
135	Grill	Mill		11	58	58	channel	1363.6	5.5
136	Mary	Grill	ALSD	35	2371	1020	Slough	1369.1	3.5
137	Andrew	Mary	ALSD	83	771	331	Ditch	1372.8	5.5
138	Pocket	Mary		40	263	138	Culvert	1371.9	7.1
139	Gilbert	Lobster		17	201	190	?	1372.1	1.5
140	Round	Lobster		30	66	36	Ditch	1363.5	10.3

Author

Who is Lowell? *With my wife of 47* years - we are 14-year Lake Miltona property owners, fairness concerned Minnesota Citizens, AHS graduates - '56 & '59, a cold-war Army veteran, a 1966' U of MN graduate, 41-year Shoreview homeowners, and retired grandparents.*

Revision History:

October 15, 2008 – Initial paper distribution to CLRSD, CLEER, and an MPCA staff engineer via e-mail.

Introduction

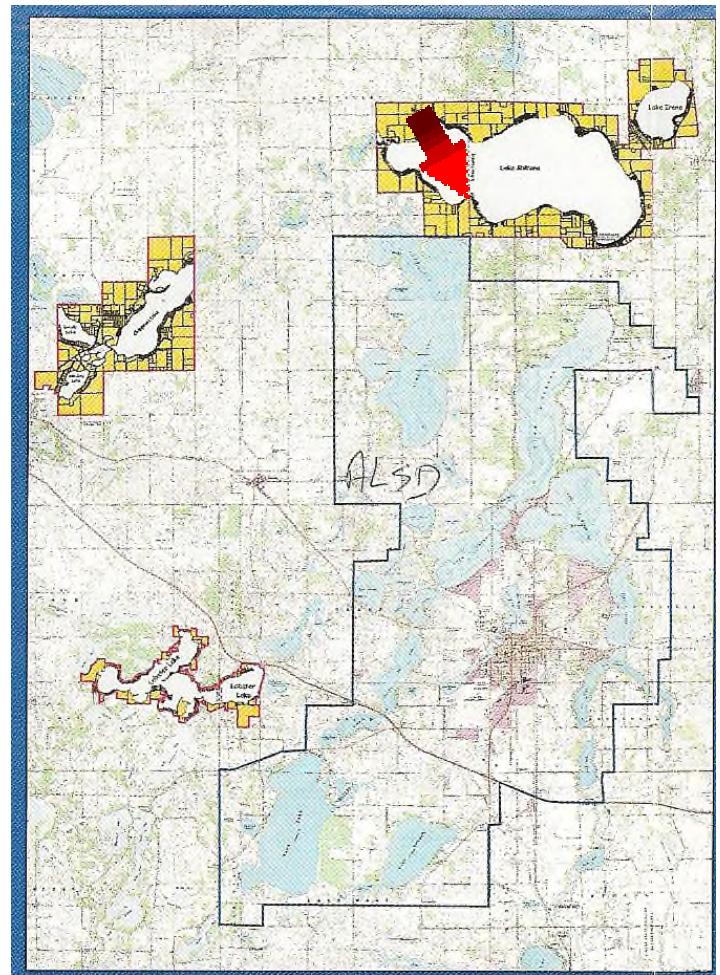
Is the Central Lake Region Sanitary District (CLRSD) a panacea?

While trying to understand the scope, costs, and reasons for the CLRSD planning, I developed a position paper¹ in protest of their cost formulae, trying to provide facts as to why their approach is unfair to the property owners of their jurisdictional areas. That position paper discusses our cabin situation in the demographic context of our Lake Miltona neighborhood. The red arrow on the map below shows the location of this area within the CLRSD Phase III section which is located North of the Alexandria Lakes Sanitary District (ALSD).

While developing that paper, I did a simple analysis, using Secchi disk readings data from the Department of Natural Resources' (DNR) lake finder website for lakes associated with Lake Miltona. For easy reference that paper's Water Quality Analysis section is paraphrased on page two of this paper. At first, it appeared that the ALSD lakeside sewer system was detrimental to the clarity of Lake Carlos.

My engineering curiosity was aroused, so I downloaded DNR Secchi disk readings for several other lakes in Douglas County. Some of the others also had what looked like erroneous data in the late 80's, i.e. about three times what they were in the late 90's and during the last 15 years.

I guessed that some of the DNR posted data may have been recorded in feet instead of meters. After contacting the DNR office in Fergus Falls, the Glenwood DNR office confirmed my guess that some of the early Lake Carlos Secchi disk readings submitted to them by ALSD were in feet instead of meters. The Secchi disk data for the other lakes² is the basis for the rest of this paper's analysis, as extracted from DNR's web site, <http://www.dnr.state.mn.us/lakefind/index.html>.



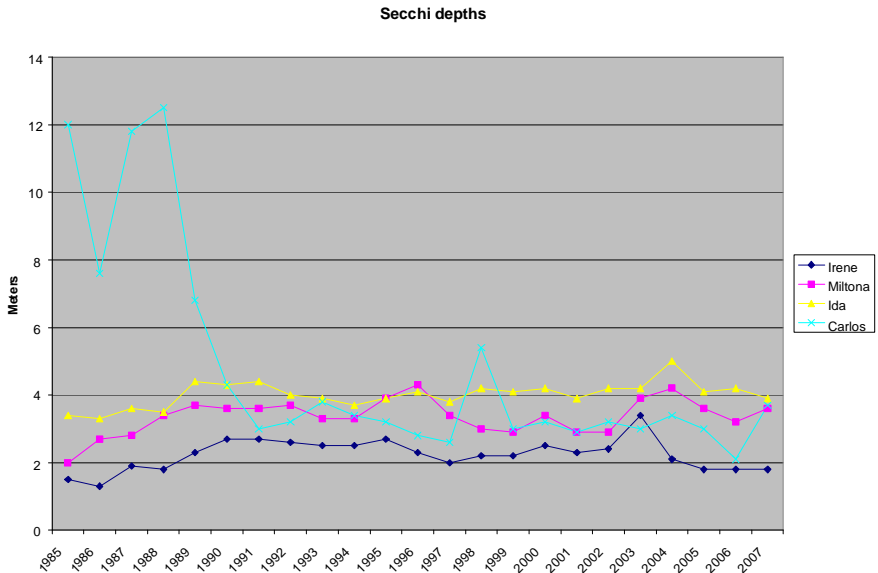
¹ personal web site – <http://www.usfamily.net/web/labenson/docs/PositionPaper2d.pdf>.

² <http://www.usfamily.net/web/labenson/docs/ALSDlakes.xls>

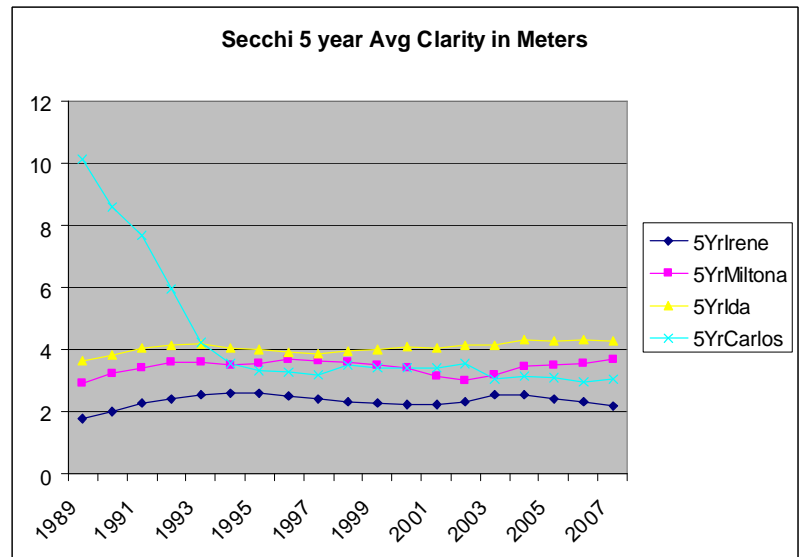
Water Quality Analysis Tidbit

DNR provides data, we must analyze for trends!

We do believe in improving the Lake Miltona water quality for our children, grandchildren, and future generations. Toward that end, I've extracted 25-years of Secchi disk readings from the Minnesota Department of Natural Resources' (DNR) web site. Their table of data for Lake Miltona is listed in meters. Shown here are **Lake Miltona**, the upstream **Lake Irene**, the downstream **Lake Ida**, and **Lake Carlos**. Lake Carlos is included here because as the last lake in the Douglas Co. chain of lakes, it is the 'headwaters' of the Long Prairie River, site of the CLRSD proposed treatment facility.



Since readings can vary quite a bit from year to year, I plotted the 5 year running averages to ascertain trends. **Lake Ida** clarity has had a decade long gradual increase. Over the last six years **Lake Miltona's** clarity has been gradually increasing while **Lake Irene's** clarity has been decreasing. From this trend, we can understand why the DNR designated Lake Irene as **Eutrophic** in July 2008. It appears that **Lake Carlos** continues to have a decreasing clarity problem which began in the late 80's. However, some of the Lake Carlos Secchi disk readings during the 80's were recorded in feet instead of meters, thus the significant plunge at the beginning of the chart isn't a trend, rather the result of different 'dimension' use.



Review of Secchi Disk Readings

Douglas County's watershed area flows to the Mississippi

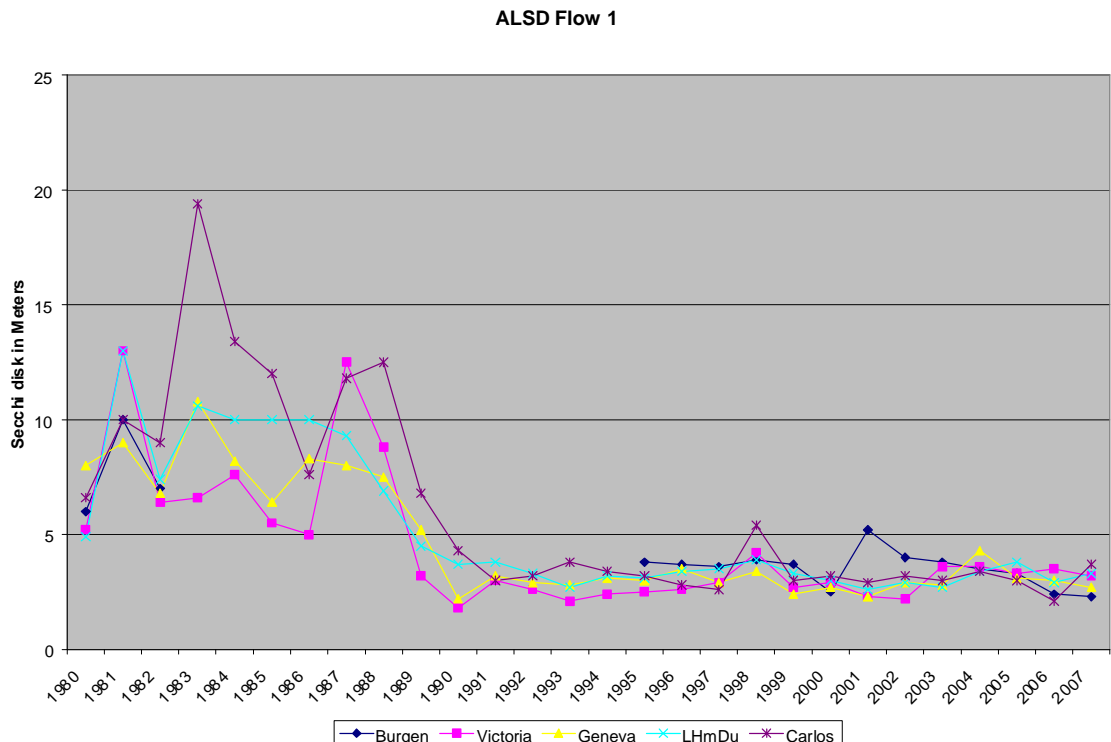
The River Watershed Routes:

Lake Carlos is the beginning of the Long Prairie River near the Northeast corner of the ALSD. The Long Prairie flows eastward from Douglas County into Todd County where it then turns northward past the city of Long Prairie. It then flows into the Crow Wing River a couple of miles northeast of Motley. The Crow Wing River in turn flows eastward from Motley along the north perimeter of Camp Ripley, dumping over a dam into the Mississippi about 10 miles south of Brainerd.

The CLRS and ALSD map in the first section of this paper shows the CLRS Phase II area in the top left quadrant. That area encompasses Chippewa Lake, Devils Lake, and Whiskey Lake adjacent to Brandon Minnesota. Chippewa and Whiskey flow into Devils Lake which flows into Little Chippewa which in turn flows westward into Stowe Lake. The Chippewa River also flows into Stowe Lake. From Stowe Lake, the Chippewa River flows south between the villages of Kensington and Hoffman, past the City of Benson, then into the Minnesota River at Monticello.

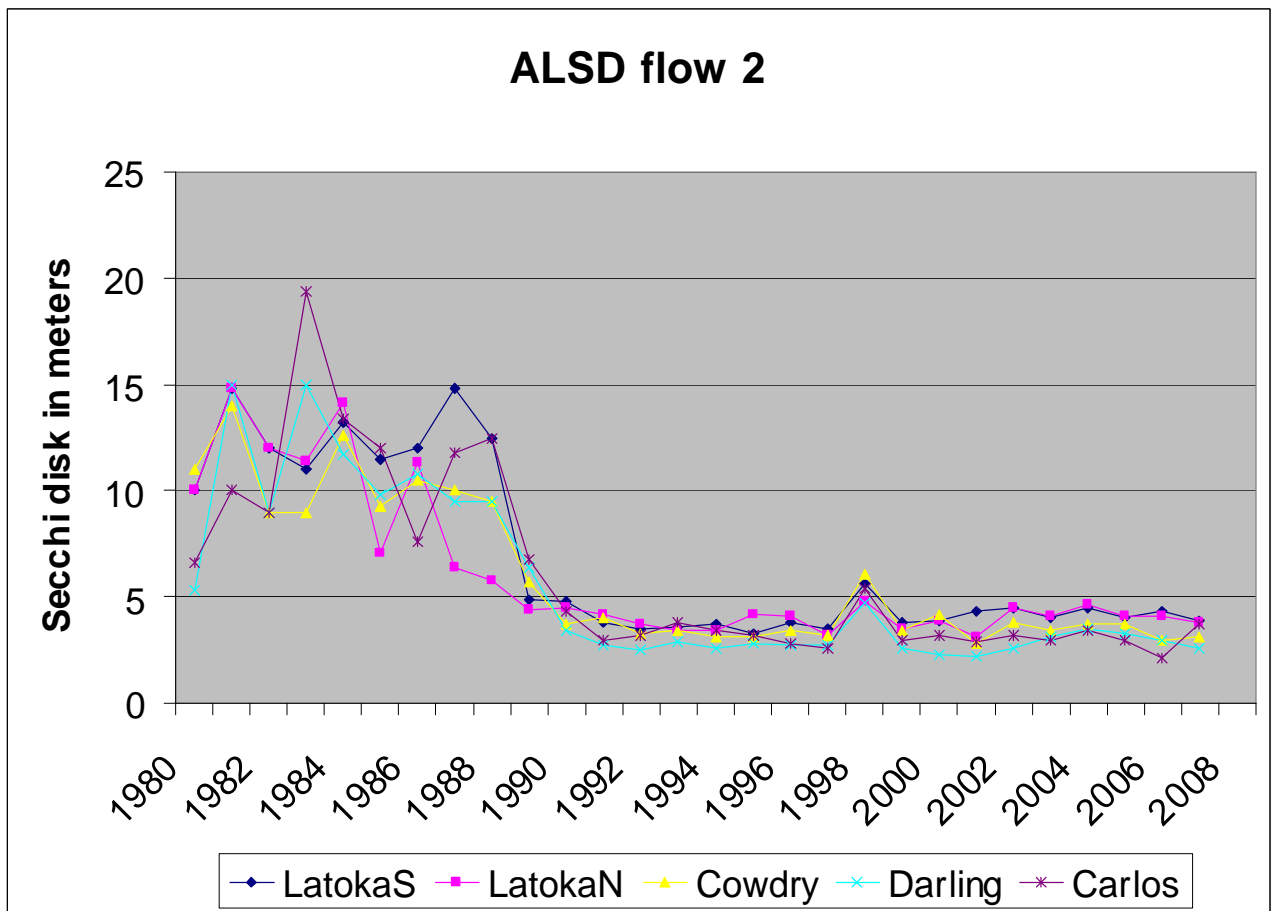
The Lake to Lake Flows:

ALSD Flow #1 sequence on begins with Lake Burgen. This South to North flow is Burgen into Victoria, into Geneva, into Le Homme Dieu, then into Lake Carlos - their clarity data from DNR data is charted here.



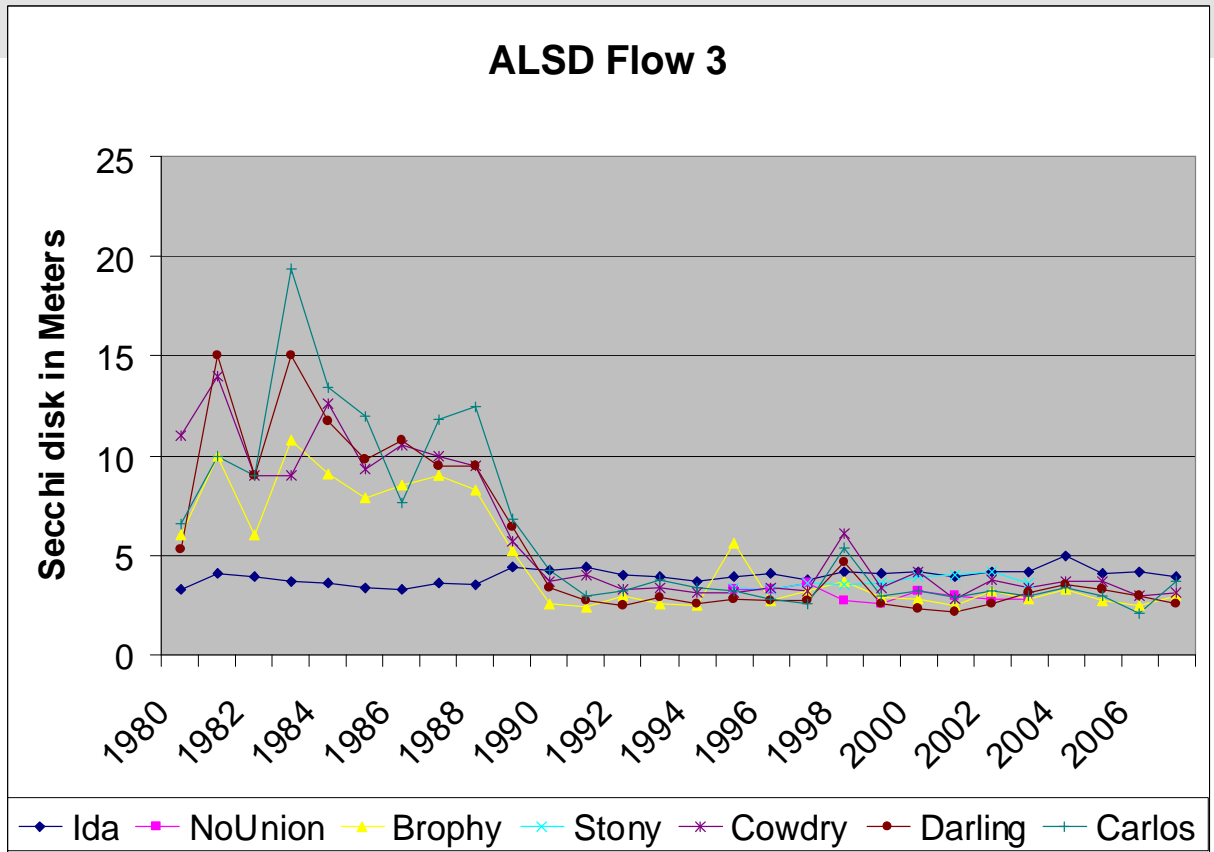
Data wasn't available for Burgen before 1995. From this chart [prepared with Microsoft Excel] it appears that most of the Secchi disk readings between 1990 and 2007 for the lakes in this flow path were relatively stable, i.e. ranged between 2 meters and 4 meters except for Carlos which went above 5 in 1988 and Burgen which went above 5 in 2001. Although I've plotted the DNR readings for these lakes between 1980 and 1989 leading to the 1990 to 2007 plots, it is obvious to me that this data must be feet. Look at Lake Carlos for 1993 – 19 meters just isn't believable! 19 feet could be believable. Lake Jessie which also flows into Lake Victoria and Union Lake which flows into Lake Burgen aren't shown because they are not within the ALSD boundaries.

The Flow #2 sequence begins with Lake Latoka in the West-Southwest side of ALSD. The flow sequence from South to North is Lake Latoka South, Lake Latoka North, Lake Cowdry, Lake Darling, then Lake Carlos.



Again in this flow, I'd discredit the data validity between 1980 and 1989 as possibly being feet instead of meters. Also on this chart we see a spike of five lakes in 1998. Actually there are only four lakes because Lake Latoka is bi-furcated by I-94, thus the designation of Latoka S and Latoka N in the DNR data.

The Flow #3 sequence [next page] begins with Lake Ida, the Northwest corner of the ALSD. Lake Ida sewer mains were installed in the 2003 to 2006 time frame so many of the cabins are still in the process of being connected. The flow from North to South, then turning East at Lake Cowdry is Ida to Charley to Louise to North Union to Stony to Cowdry to Darling to Carlos. Note that Lake Ida is fed from Lake Miltona.

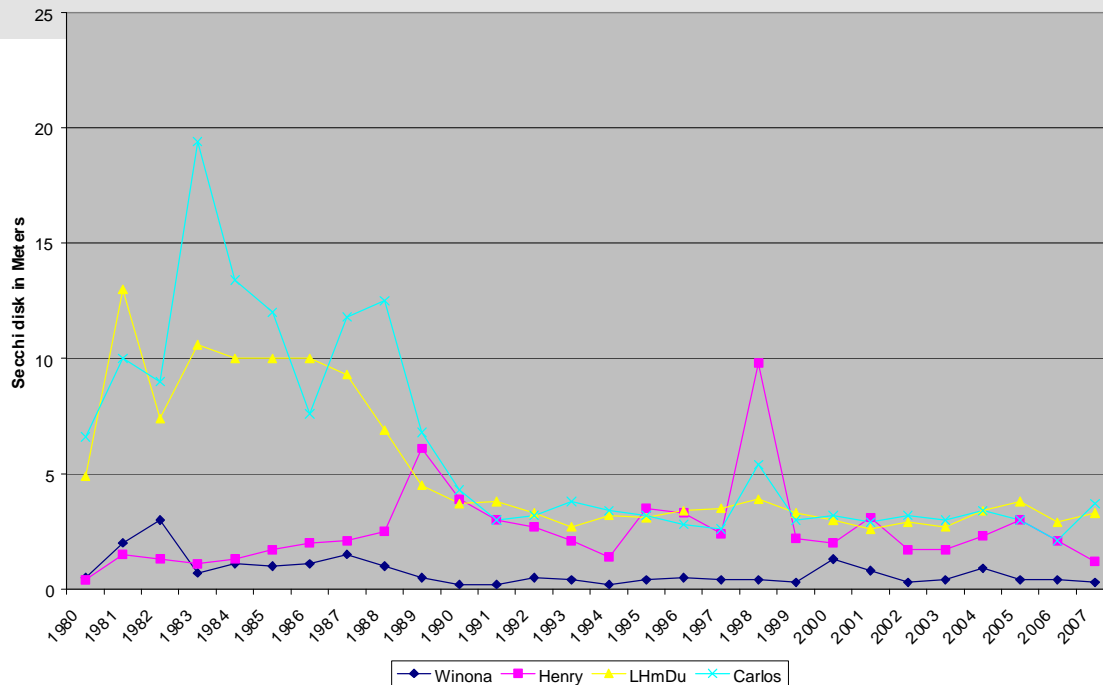


Again, some of the lakes shown on this data review have un-believable data for the 80's. Note that as stated in my Position Paper Lake Ida has had a gradual increase of average clarity over the last decade. There was no North Union Lake nor Lake Stony data available before 1995. There is some curiosity as to why Lake Brophy's clarity almost doubled for 1995 then in 1998 had a slight increase in clarity when Cowdry, Darling, and Carlos clarities jumped up. Lake Brophy shown in yellow on this chart flows into Lake Union from the South and is the recipient of flow # 5 described below.

The Flow #4 sequence begins with Lake Winona, the clarity chart is atop the next page. The South end of Lake Winona is the discharge point for the ALSA's treatment plant. The flow from South to North is Winona to Agnes to Henry to Le Homme Dieu to Carlos

There is no DNR clarity data available for Lake Agnes, lying between Winona and Henry. In this chart, the dark blue disk readings of Lake Winona seem to be crawling across the bottom time line for 27 years. Again, the Lake Carlos and Lake Le Homme Dieu 'amazing clarity' readings between 1980 and 1989 aren't believable, unless those readings are in feet instead of meters. Why would the 1998 Lake Carlos clarity also spike to 5.4 meters between the 2.6 and 3 meter readings of 1997 and 1999. The Lake Henry 1998 posted reading of 9.8 meters between the 1997 and 1999 readings of 2.4 and 2.2 meters is more than suspect considering that the lake's depth is listed as 32 feet! Anomalies such as this, one bad value among ~20 good values, mean that mathematical analysis using the posted data is 95% accurate – not 100%. BUT, it is data, not just opinion!

ALSD Flow 4



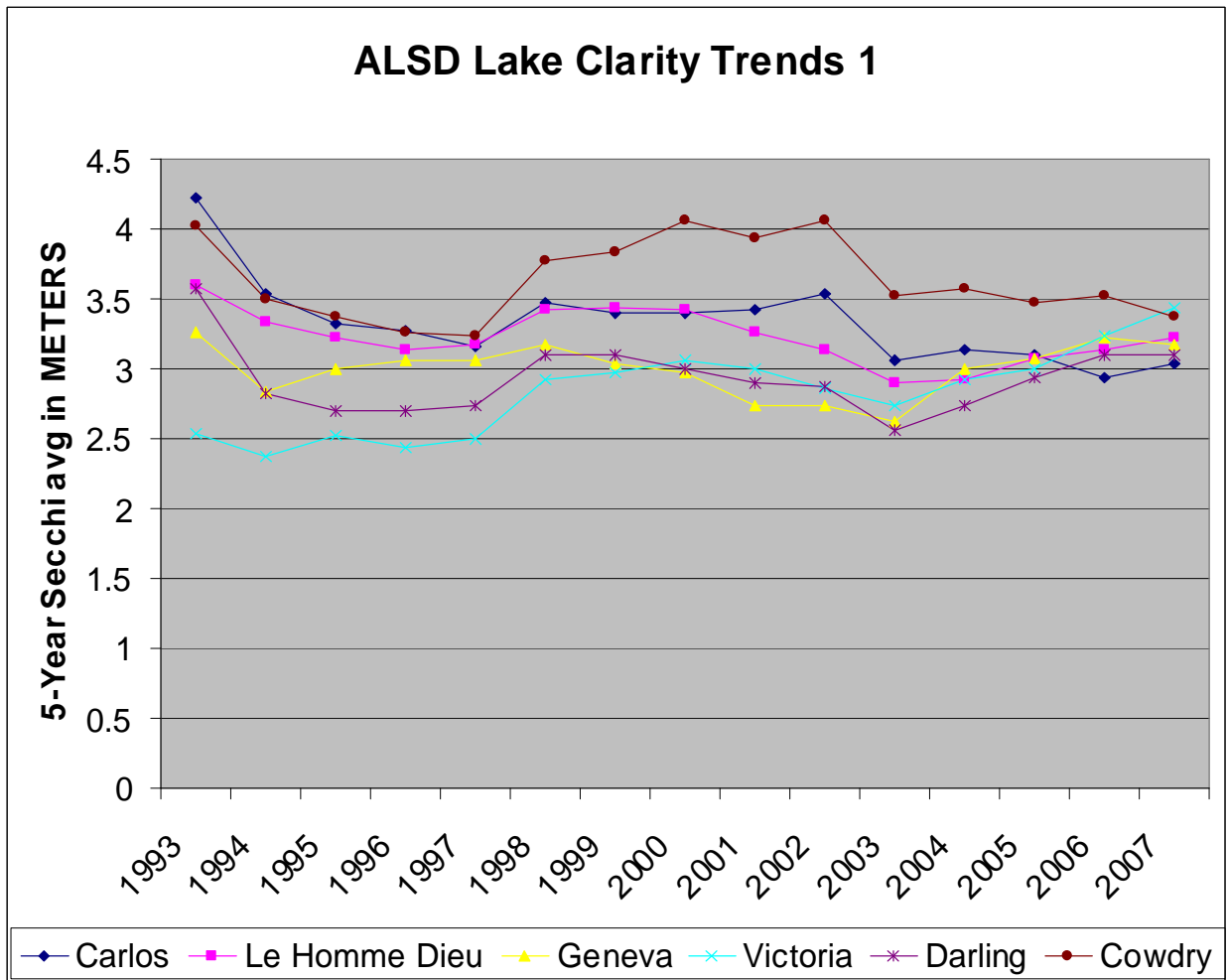
The Flow #5 sequence begins with Lake Andrew located at the bottom of the ALSA area map. Andrew flows into Lake Mary which flows through Skoglund Slough to Grill Lake which flows to Mill Lake which flows to Lobster Lake which flows into Lake Mina which in turn flows into Lake Brophy. The Brophy to Lake Carlos clarity is illustrated in flow 3 above. I haven't gathered DNR readings for all of this flow sequence yet, perhaps when I do a future update. I believe that it is more important at this time to get an initial paper into public hands for feedback than to cover every lake in Douglas County. This flow is introduced here because Lobster Lake is the focus of the CLRSD Phase 1 project. The CLRSD plan for Lobster is to put sewer around the lake, then use pumps to transport effluent to the ALSA treatment plant.

Clarity Trends Analysis

An analysis should focus on the question.

The question is: "Does a centralized sewer system clean up lakes?" This paper only uses water clarity to answer the question; leaving phosphorus content, nitrates, and weed measurements to be analyzed by others. In the early 1800s, the Pembina Trail leading to Ft. Abercrombie went past the South shore of Lake Agnes. Years later, the Great Northern Railroad was built along this trail. From the train station at Alexandria, travelers could see Lake Agnes and Henry to the North and Lake Winona to the South. In the early 1900s, travelers would take 'station wagons' back a mile to the East to enjoy fishing and relaxing at the Geneva Lodge where they could also look at the beauty of Lake Victoria to the South. Now, a century later Lakes Geneva and Lake Victoria are part of the Alexandria Chain of Lakes which formed the foundation for the local tourist trade. In the late 1940s, two brothers started the Darling Dude Ranch on Lake Darling, now Radisson's Arrowwood. Fishermen and other sport boats navigate easily around this Chain of Lakes.

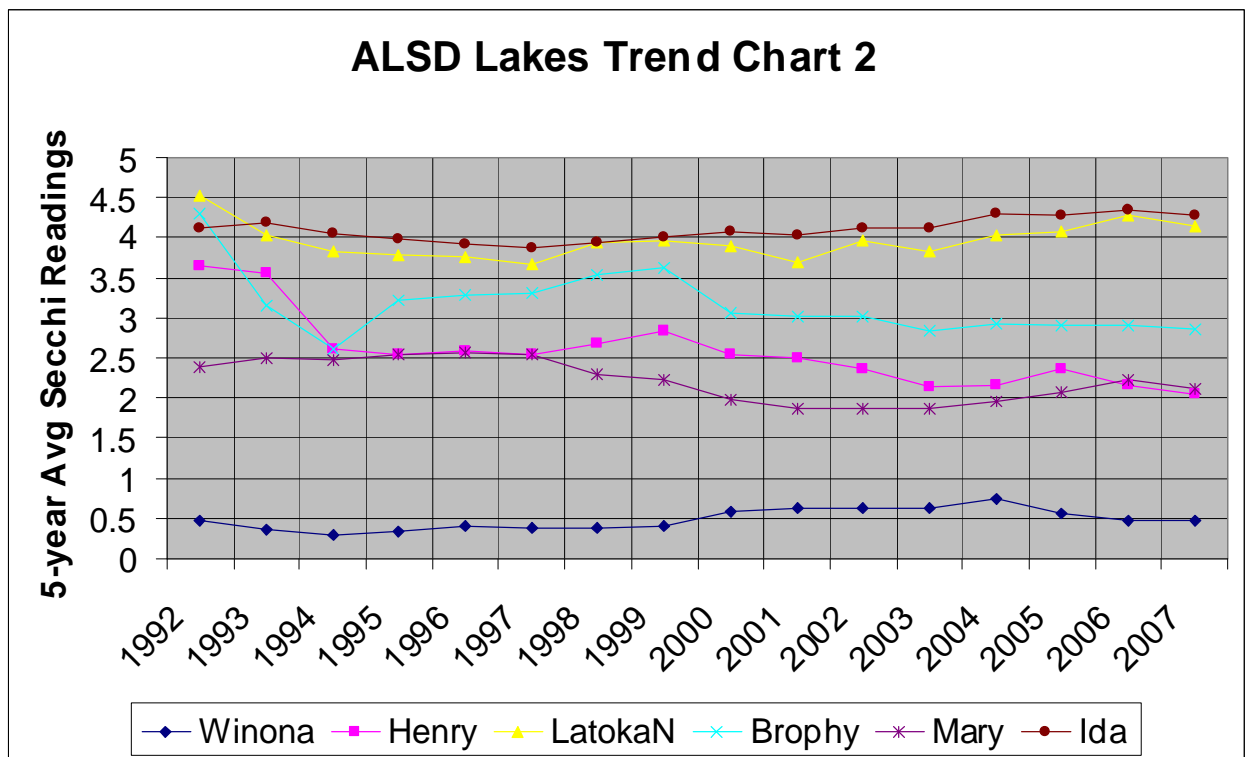
Since the early 1980s when the Alexandria sewer system was replaced by the ALSD, this Chain of Lakes has had a sewer system. According to DNR posted data, the water levels of lakes Carlos, Le Homme Dieu, Geneva, Victoria, Darling, and Cowdry are almost the same. The first four graphs of this paper showed that the Secchi Disk average readings per year vary quite a bit from year to year. To ascertain a trend, i.e. getting better or worse I've calculated the five year running average for the chain of lakes as shown below. For example the 'trend' clarity for year 2007 is the average clarity from 2003 through 2007. For 2004, the trend clarity is the average from 2000 through 2004, etc. The last 15 years of clarity 'trend' calculations are charted here.



Some observations from this first 15-year 'rolling averages' analysis chart

- a. The 1993 points are slightly influenced by suspect data from the late 80's.
- b. The clarity of all five lakes seems to be converging between 3 and 3.5 meters.
- c. Lake Carlos and Lac Le Homme Dieu clarities have decreased over this 15 year period.
- d. The Lake Geneva, Darling, and Cowdry clarity trends have vascillated over this 15 year period, now on a down swing.
- e. Lake Victoria's clarity has been gradually increasing over the last decade.

The bottom line on this second clarity chart is Lake Winona, into which the ALSD treatment plant feeds. As the shallowest lake, 9', it has been a muddy lake since the 40's. Between Lake Winona and Henry is Lake Agnes for which there are no DNR statistics. The Lake Henry trend uses an estimated value [2.8m] in place of the 'false' 9.8 meter DNR clarity value posted for 1998. Even with this generous estimate, Lake Henry's clarity has had a decade long decline. Lake Latoka in yellow seems to have a slight upward trend over the last decade. Lake Brophy seems to be on a general down trend. Lake Mary's clarity trend dropped but is now on a slight upswing. Lake Ida has been fairly steady, perhaps a slight increase trend. The sewer lines were being installed around Lake Ida in 2004 and 2005 so not very many of the properties are connected yet.



Conclusions

1) If an ALSD objective was to improve the area lakes' water quality, i.e. *improve the clarity as measured by Secchi disk readings*, **it hasn't worked!** If a central sewer system were a panacea, i.e. a solution to water clarity problems, then I would have expected to see an increase in overall clarity for most of the lakes. In the 15+ year time span analyzed here using DNR web site data, only Lake Victoria seems to be improving. The clarity of most others are staying the same or declining.

2) Douglas Co. doesn't need a \$53M CLRSO 'centralized' system to 'not improve' their jurisdiction's lake clarity! Perhaps Douglas Co. needs a few more 'storm sewer' settling ponds or more 'wetlands' to filter rainfall to improve water clarity of their area lakes!

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