

# Chandos Lake Water Level Interim Report

Rev 3 May 20, 2018

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*This report is an interim condensed version of a larger effort being prepared for the CLPOA board. There are many unanswered questions, which we hope to have addressed in a more satisfactory fashion in the final report. Being Interim, no conclusions or specific recommendations relating to level control are included.*

## 1 Executive Summary (so far)

- i. **Please note that the connection between Chandos Lake and the Crowe River is being referred to as “Flat River”. It is variously referred to in other sources as “Flat Creek”, “Deer River”, and “Deer Creek”. Also note that there is a “Deer River” that connects Wollaston Lake to the Crowe River, BUT it is NOT the same waterway that attaches Chandos to the Crowe.**
- ii. Chandos Lake water levels are determined by conditions on the outflow waterway (Flat River) along with the level of the Crowe River, which is sometimes higher than Chandos, thus creating a reverse flow on Flat River. When the Crowe is very low, then it may happen that natural high spots, or silt buildup, or perhaps beaver dams, on Flat River come into play and limit the outflow from Chandos. Flat River can also affect Chandos water levels if it acts as a “choke” that cannot take away the outflow faster than the inflows.

So, there are 3 ways that the level of Chandos can be prevented from falling:

1) that the Crowe River at its junction with Flat River is at a higher elevation than Chandos Lake.

2) that there are natural high spots, eg beaver dams, silt buildup, sand bars, that are at an elevation higher than Chandos Lake.

3) that Flat River is behaving like a choke that cannot handle the Chandos outflow as fast as water is coming into Chandos.

- iii. Chandos Lake is therefore essentially a natural flood control reservoir for the Crowe River. Because the Crowe is the outlet of Paudash Lake, then the Chandos water levels are influenced by the Paudash Lake watershed as well as its own watershed.

- iv. There is a need to formally measure and record the level of Chandos Lake, preferably on a continuous and remote basis. Likewise, for the flow (forward and reverse) of Flat River.
  
- v. If it is deemed desirable to manage the high level of Chandos Lake, then it is necessary to manage the restrictions on Flat River (old and active beaver dams; silt build up; debris build up).  
Further, the control of the dam at Paudash perhaps might need to take into consideration the effect on Chandos of any large water release into the Crowe. (have not yet investigated)
  
- vi. It appears that a nominal level for Chandos Lake is 1025 feet above sea level. This is the elevation of the centreline of the culverts at hwy 620. This elevation has been referenced in 1960's documentation.
  
- vii. It would be desirable, from a recreational point of view, to develop a canoe route from Chandos Lake to Glen Alda via Flat River and the Crowe River. This may require removing debris and creating portages around active beaver dams and other unnavigable features. Maintaining a canoe route provides cause to keep the river clear of major impediments that could affect water levels in Chandos. Also, keeping a water way open would perhaps involve "adjusting" silt deposits. It would be great if the province or county could take this on as a recreational project.
  
- viii. In order to have more formal control over Flat River, if the CLPOA had an interest, it should investigate creating a Land Trust along Flat River from Chandos to the Crowe. This would give the CLPOA stewardship of the Flat River waterway. Apart from this stewardship role, this conservation area could increase overall enjoyment of the area for such activities as hiking, picnicking, canoeing, cross country skiing, and snow shoeing. (hunting, snowmobiles, motor boats, fires, overnight camping prohibited).  
There are many such Land Trusts in Ontario. The Kawartha Lakes Stewards' Association (KLSA) comes to mind with its Boyd Island project.

- ix. Iain G. kayaked up Flat River in early May, 2018. He found no active beaver dams, or other major surface impediments to flow. He has not yet investigated for shallow areas that might indicate a silt buildup, that could come into play as high water levels declined. We really need to scout the area at low water times later in the year to see what the impediments to flow actually are, as they should then be more obvious.
  
- x. Any actions that affect the natural environment, dredging, etc may require permits and consents, along with attendant costs. These may be significant and have not yet been seriously investigated.

## 2 Introduction

In 2017 Chandos Lake experienced fairly high water levels, eliciting both concern and curiosity from property owners. It was decided that an informal committee would look into the entire issue, with a view to a better understanding of what is going on. Longtime residents remember when the lake levels were significantly lower than they are today.

Chandos Lake has only one significant outflow, being “Flat River”<sup>1</sup> at the north end by the beach, which flows into the Crowe River. If the Crowe River is high, or if there is beaver activity on Flat River, or if the river has silted up or otherwise experienced a flow reduction, then the outflow could be impeded, thus contributing to a high water condition. Similarly, the opposites could result in lower lake levels. The other outflow is evaporation, which is greater when it is hot and dry, and lesser when the summer is cold and wet. Inflows are ground water, rainfall, reverse flow from the Crowe, and watershed runoff, particularly in the spring.

There are no man-made water control structures (eg dams or weirs) between Chandos Lake and the Crowe River that could affect levels or flow. There are, however, 2 very large culverts that run under Hwy 620 connecting Chandos Lake to Flat River.

## 3 Background and anecdotal evidence

a) *Email 13 May 17 from Gord M. to GRA*

*There are several dams along the river. Prior to the 80's, our lake level was much lower than in more recent years. For some of us 'long-timers', it was our practice to visit the dams periodically and keep a notch in the dams clear to allow for constant outflow. When Chandos Estates was severed and properties sold, those who built in the shallow bays managed to convince MNR to prohibit tampering with the beaver and the dams, so that they could keep water levels high enough for their larger boats, etc. Since then, it's not just an issue of the dams, but the fact that silt/sandbars have built up on the lake side of the dams, creating further outflow issues. More recent 'comers' to the lake don't recognize or appreciate how the higher water levels in the lake are contributing to increased shoreline erosion, and hence to long-term impacts on lake health.*

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<sup>1</sup> Does not seem to have an official name, being variously referred to as “Flat Creek”, “Deer Creek”, “Deer River”. See commentary at tab “about Chandos lake” at [www.Chandossier.com...](http://www.Chandossier.com...)

b) *Email 19 Jan 18 from G.M. to GRA*

*As I recall, Chandos water levels rose dramatically in the late 80's/early 90's following Chandos Estates's residents' earlier petition to MNR prohibiting tampering with Deer River beaver dams. I replaced the deck of my dock in 1984 which was well above water level during summer months.....now (for years), it remains well under water even in August, requiring an extra frame sitting on top of the old one to support our seasonal decking. This year's anomaly held summer-long water levels at or near recent high springtime levels. The continuing high water levels, together with increased boat traffic and related wake, has contributed to significant shoreline erosion and habitat destruction.*

c) *Email from R.F. to I.G. 17 Nov 17*

*This was the first in 43 seasons we did not have the usual loon activity in our small bay just south of the big shoals. We'd always have a pair with at least one chick. This season we occasionally noticed one loon, and despite its frequent calls, never seemed to get an answer. We thought perhaps this season's abnormally high water level may have destroyed a nesting site.*

*Speaking of water levels, in 43 seasons on the lake we've never seen water levels this high this late in the season. That leaves me with some concern. This coming spring will likely add between another 30 to 50 cm, potentiality causing widespread damage to shorelines and installations. Because the surrounding landscape is already waterlogged, any precipitation will run straight into the lake.*

*Relying on memory, in the 1970's the lake level would have fallen so low in late September, allowing our children to walk along shore on exposed lake bottom.*

*As well, the big shoals in those days were an island with vegetation growing on it.*

*This became quite a concern to the then owner of Westbay Narrows Marina as his docks would hit bottom and get damaged. He organized a work party and they proceeded to the big culverts at the beach, intending to impede the outflow. Their efforts were stopped by a passing member of the Crow Valley Conservation Authority, however.*

*What the party could not accomplish beaver activity eventually did, causing the lake's slow rise, a little every year.*

*Over the last several years the lake level seemed to have stabilized, until this year's awfully rainy spring and summer and it hasn't stopped yet.*

*Now the question, why is the lake no longer able to shed water, as it was able to in the past? Not being flushed will negatively impact the water quality.*

d) Facebook posts...

*P.M. The beaver dams have so much silt around them you can't see the dams. Go to culvert and measure the depth of water in the culvert and then measure depth at exit, the difference is the result of the beavers---several feet. The same applies to every dam. This greatly effects(sic) the outflow of water from our lake. In the 70's we could take our fishing boat, with 9.9 motor to the Crow river....*

*D.M. Forty six years ago we had a magnificent 16 foot deep (at least) sand beach -- now we have NONE. The fish spawning areas are gone and there is significant erosion which is beginning to affect a giant white pine as well not to mention the rest of the shoreline trees.*

e) *Bygone Days at Chandos Lake*

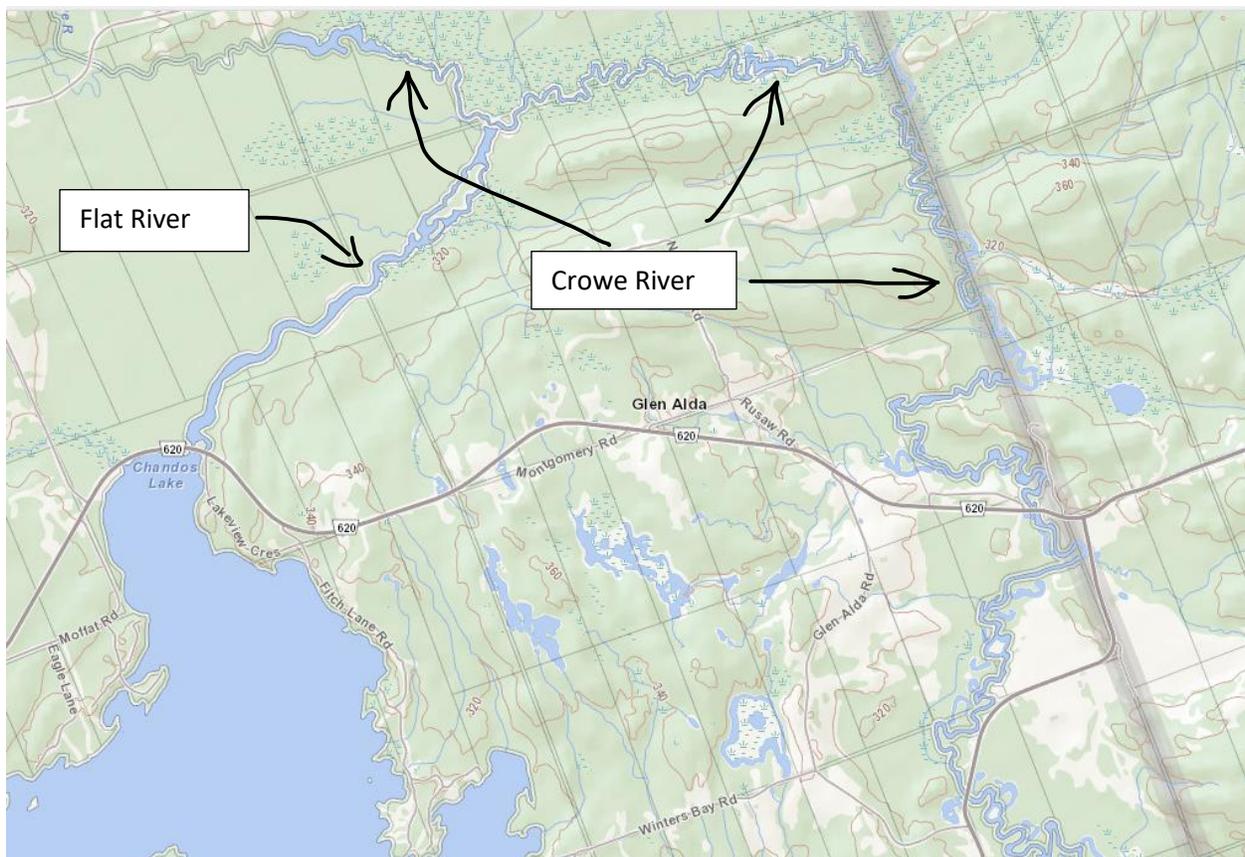
*Murray Paterson, in his book "Bygone Days at Chandos Lake", has a chapter on Record High Water Levels. He says there have been two record high water levels one in 1943 and one in 1976, with both having a variation of 4-5 feet between the September low level and the spring high water level. There is a picture of Bald Island in West Bay almost submerged.*

## 4 Geography

### 4.1 Topographical maps

Here is a topo map of the area around Flat River and the Crowe River:

[http://www.gisapplication.lrc.gov.on.ca/matm/Index.html?site=Make\\_A\\_Topographic\\_Map&viewer=MATM&locale=en-US](http://www.gisapplication.lrc.gov.on.ca/matm/Index.html?site=Make_A_Topographic_Map&viewer=MATM&locale=en-US)



### 4.2 Watershed

Some information on the watershed can be found at (in particular sec 2.4 for The Crowe Valley Source Protection Area):

[http://trentsourceprotection.on.ca/images/assessment-reports/Trent/2017\\_Trent\\_AR\\_Volume\\_1\\_of\\_3\\_Report.pdf](http://trentsourceprotection.on.ca/images/assessment-reports/Trent/2017_Trent_AR_Volume_1_of_3_Report.pdf)

## 5 Water budget and level flow monitoring

### 5.1 Water elevations

The 1966 report gives a nominal lake level figure of 1025 feet (312.42 m).

The two culverts are 15' 6" in diameter.

Bryan T has obtained an elevation benchmark from the CVCA, being the top of west culvert south end at 314.92 m or 1033.20 ft. So, it is simply a matter of measuring down from this position to the water surface to establish the lake elevation above sea level.<sup>2</sup>

Thus the centreline of the culverts is then at approximately the nominal elevation of 1025'.

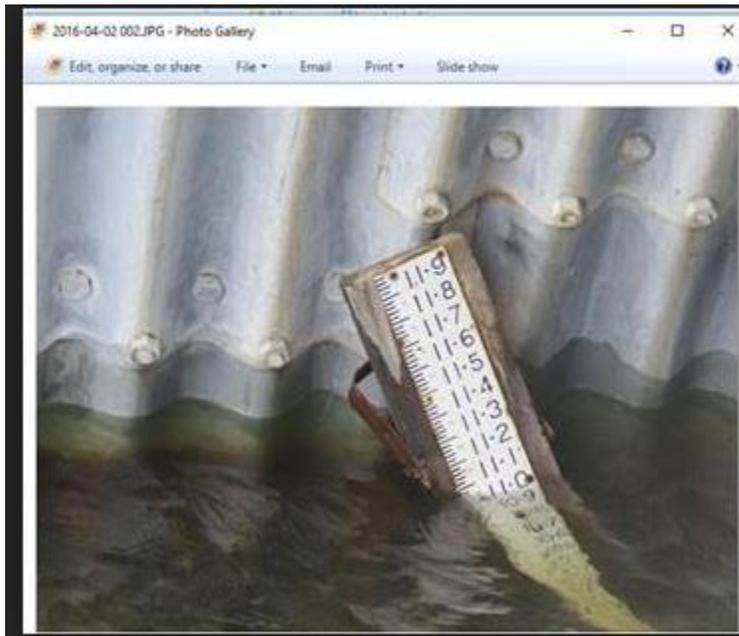
If one actually looks in the west culvert, one will notice an old gauge, marked in inches, affixed inside the south east wall. It seems to be calibrated in inches above a reference, with zero likely being the horizontal centreline of the culvert. At March 31, 2018, it indicated the water level to be 4". We will have to confirm exactly what this gauge measures in absolute terms. This gauge does not appear to have enough range to record abnormal levels.

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<sup>2</sup> *On Saturday 19 May, 2018, the water level at the culvert was measured to be 6 feet and 4.25 inches below the top of the culvert, giving a water elevation of 1026 feet and 10.25 inches.*



There is also a feet/inches gauge in the East culvert, which seems to have become partially unmoored:



It is conjectured that the reference point for this East gauge is the bottom of the culvert.

## 5.2 Monitoring Stations

There seems to be various info on monitoring stations in the area. Some may be Federal (Environment Canada); some Provincial; and some disseminated by the CVCA<sup>3</sup>. *(this info has been omitted from this interim report.)*

## 6 Data

Some historical water level data is contained in the excel spreadsheet "Chandos Lake Historical Water Levels."<sup>4</sup> This was obtained from Mike Chester, who had

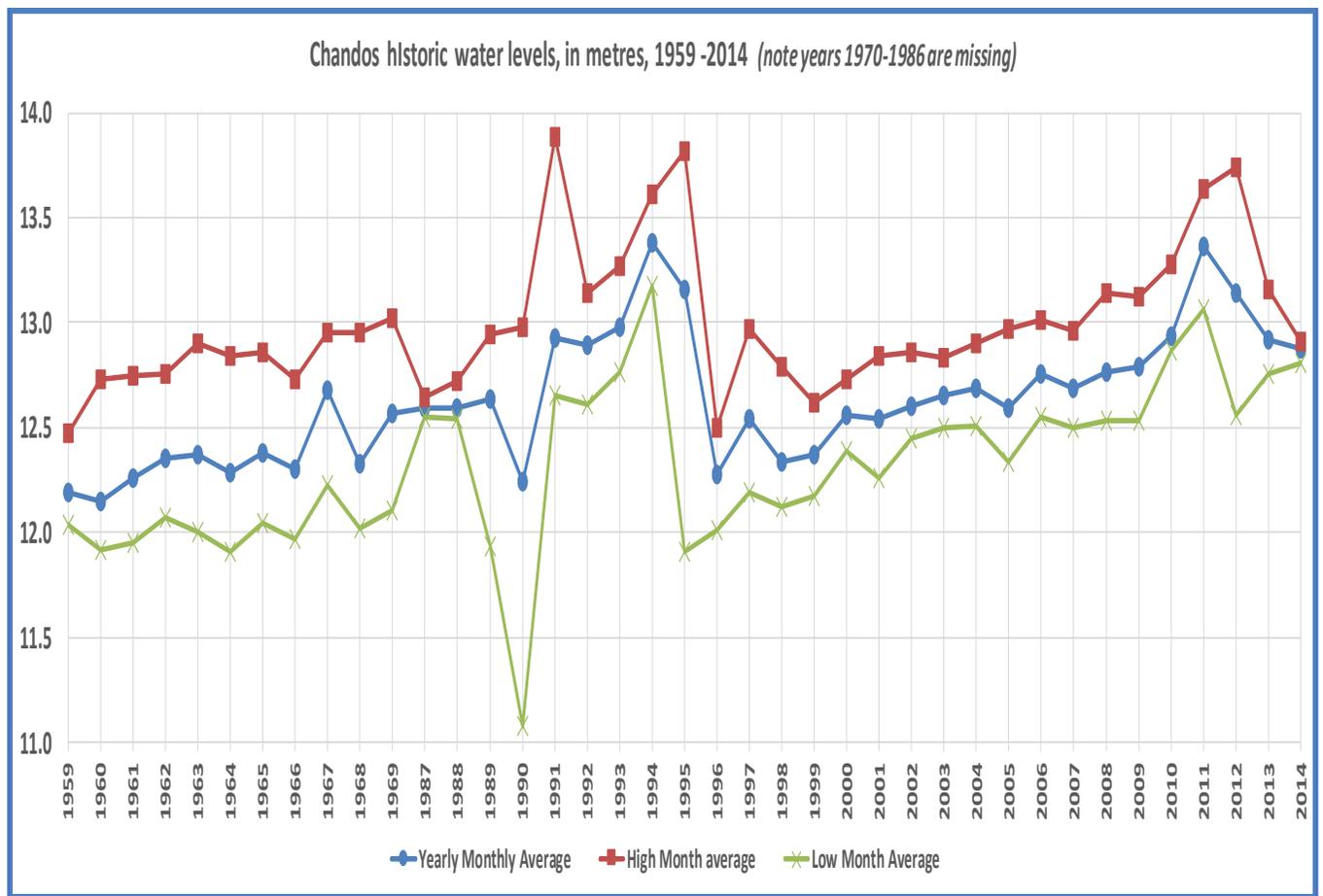
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<sup>3</sup> Think perhaps the cvca accesses the provincial monitoring stations..

<sup>4</sup> Not sure what station these data are from - Hwy 620 at the culvert? Also, do not know what the baseline is for these measurements. Eg 11.0 metres above what?? Above 300 metres?? 312.4m = our nominal 1025 ft

received it in 2014 from Neil McConkey of the Crowe Valley Conservation Authority (CVCA).

Here is a graph from that data showing the high/mean/low water levels from 1959-2014 (1970-1986 missing). It shows that from 1996 - 2014 the average level has increased by about 0.6m. (approx. 2 feet) Please also note that some years do not have complete data, (such as 2014) and so the min/max for such years are not that different. This is the best data we could find - we still can't totally trust it, as we do not yet know its physical source nor under what conditions it was collected.



More investigations on this data will be carried out in relation to other data to see what reasons for the changes might be hypothesized.

## 7 Field Investigations

### 7.1 Trip up Flat River

In early May 2018, a trip was made up Flat River from the Hwy 620 culverts to the Crowe River.



On May 8th 2018, starting at the Chandos Lake Culvert the first low water point where a beaver dam would normally be built is at location: 44°51'06.2"N 77°58'13.1"W.

Approximately a paddle length of water on both sides of the muddy low point which had about 1' flow of water flowing over the top

At the top of the map there was a significant flow of water from the Crowe into Flat River. Map location 44°51'06.2"N 77°58'13.1"W

On May 15th the flow of water from the Crowe into the flat had stopped. Despite a significant drop of 9" in the main lake there was still a flow of water down the Flat River.

These observations are consistent with the Facebook posting of Nov 14 2017 that there are no Beaver dams holding back the water.

## 7.2 Regarding Beaver Activity...

Beaver activity can be classified as follows:

*Active Dams.* -These essentially cross from one side of the river to the other, usually at a narrow spot. One purpose of the dam is raise the water so that the underwater entrance to the beaver lodge can remain ice free during the winter. Obviously a well-built beaver dam will affect the level of Chandos Lake.

*Beaver Lodges* – One might see a “hut” or lodge, usually by the river bank. These do not have a significant effect on levels, though they may contribute to restricted water flow.

*Old Beaver dams* – as a dam deteriorates, various components (sticks, stones, mud) become floating debris, or stay on the bottom of the river bed, contributing to “silt buildup”. At low water levels, these build ups become dams in their own right, or at least restrict water flow. The floating debris can combine with other material, logs, etc, to again restrict water flow.

## 8 Water Level Control

***In order to lower the level of the lake***, one must remember that it can't go lower than the Crowe River at its junction with Flat River. It also can't go lower than any impediment on Flat River, such as silt build up, sand bars, or beaver dams. It also is affected by how much of a choke Flat River is on any outflow, because if the inflows into Chandos are greater than the outflows then the water level will rise, not lower. It is a dynamic situation, wherein the level will rise until some kind of equilibrium is established – “a new normal” as it were.

So, when the Crowe is not the primary influencer, then lake levels can be lowered by increasing the flow out of Chandos. Although beaver dams may be a factor, it is suspected that silt buildup over the years (around such dams perhaps) is the primary influencer. The solution to this is dredging. However, the question is how much to dredge. One could end up with even lower levels than one wished for.

If the Crowe is the primary influencer, then we really need to look at:

a) what is happening on Paudash because they do have a water structure to control their levels, and in some way this may influence the levels of water in the Crowe. (The Crowe originates at Paudash Lake)

and

b) are there any obstructions on the Crowe down stream of Flat River that cause the Crowe to remain high at its junction with Flat River?

A water structure, such as a dam or weir, can be used to maintain a certain water level, ***BUT under the assumption that Flat River is the primary influencer, and not the Crowe, then in order to control water levels, it is necessary to combine both a water structure and dredging.*** Dredging takes whatever is happening on Flat River out of the equation, so that the control of the dam will control the lake level. When you want a low water level, you open the dam and don't have to worry about Flat River impeding flows or affecting levels. (this logic applies no matter if the dam is near the culverts or near the Crowe, or any place in between)

Chandos Lake water level is currently unregulated. Most other lakes in the Crowe Valley watershed have some kind of man-made water structure.

There is obviously a question of how one determines an acceptable range of water level. Some folk like high water for boating and swimming; others like low water for bigger beaches, or to lower the risk of flooding and shore damage. Historical data helps to establish the operating range for any such future structure. Climate scientists predict that climate change will result in lower lake levels due to longer, hotter, and drier summers.

## 9 Historical reports

## 10 Research Questions

- a) We need data for 2014-2018.
- b) Do the data loggers also record flow? (reverse flow on Flat River??)
- c) Where are the data loggers? Is the data publicly accessible? Who operates them?
- d) What's involved in getting a data recorder on Flat River?
- e) We would like to obtain the CVCA report of 1962 concerning lake levels in the watershed.
- f) We need to determine if the Crowe River is the primary influencer on Chandos water levels, by monitoring or estimating the level at the junction of the Crowe and Flat River.

## 11 Correspondence from CVCA

On Dec 8, 2017 4:57 PM, Tim Pidduck of the CVCA wrote: (excerpted)

Crowe Valley Conservation Authority's Water Resource Technician, Neil McConkey and I have discussed the Chandos Lake situation trying to determine why the high water at Chandos Lake continues to be an issue. We think the answer lies within the natural unique conditions of Chandos Lake, Crowe River, and Flat Creek coupled with the abnormally high rainfall we've experienced in our watershed (which includes the headwaters of Paudash Lake, which then becomes Crowe River and then connects with Flat Creek) and non-intervention by people (I'll explain momentarily). Neil has recorded approximately 3.4 feet of rainfall in the northern portion of our watershed since the spring of this year. The steady high rainfall rate has resulted in virtually a higher than average continuous flow of the Crowe River.

This is where it gets interesting because Chandos Lake is the recipient of much of this additional rainfall. It is basically a "catch all" or reservoir for the excess rain and it keeps building up as long as the Crowe River remains flowing at a higher rate and literally pushes excess water into Flat Creek. So, the flow of water goes into Flat Creek and ultimately ends up in Chandos Lake. With no other natural drainage point out of Chandos, it simply keeps filling up. This has been an ongoing scenario for most of the year to date. In fact, there is still a higher than average amount of water in the watershed for this time of year and the normal flow pattern of the river and creek may still not be happening. Under normal circumstances, the Crowe River flow would drop enough to allow the flow to reverse on Flat Creek – which is a unique physical characteristic of this creek and there are only a few places where this occurs in Ontario – and the lake would then drop naturally. But, this hasn't happened very often (if at all) this year. One of the other reasons flows have been slow to return to normal this fall could be beaver activity.

In a world without people, what has occurred on Chandos Lake this year would naturally happen whenever rainfall amounts spike well above normal averages and when you have natural beaver activity. Mother nature would simply see this as an aberration that happens every once in a while and then in subsequent years it would revert to the norm.

However, looking back in our records, the CVCA would often have special programs to clear Flat Creek and Crowe River of debris and beaver dams. This would help (not guarantee of course) to ensure water flow in the direction it should at the right times. Unfortunately, that was in the 1970's and 80's. We haven't had the funding to do any kind of this work in 30+ years. I've checked with the Ministry of Natural Resources and Forestry and they landowners may remove beaver dams on their property, but MNRF does not remove beaver dams on crown land – nature takes its course there. So, there could be a significant amount of beaver activity/dams that will go unchecked.

This reverse flow situation is obviously not new – it has been a natural phenomenon probably since Crowe River and Flat Creek began flowing. The CVCA hired a consultant in the 1960's to investigate the dynamics of the situation as I've tried to describe to you (hopefully it has made some sense!). So this engineer's report is interesting and still relevant because there has been no change to either Crowe River or Flat Creek in fifty years that I know. The report offers a solution to controlling Chandos water levels, primarily for retaining summer recreational levels and to create a man made reservoir (lake) rather than having the excess water run into Chandos Lake. However, these options would all involve either building a dam or a weir, which unfortunately would be very expensive. But, at least it may be worth investigating if a permanent solution is something the Chandos community thinks is worth pursuing.

Regarding a permit to dredge, you would definitely need to contact MNRF and you would need a permit from us to place the silt anywhere in the CVCA's regulated area. If that is a consideration, then please contact us and fill out an application.

## 12 References

## 13 Recommendations for more Investigation (so far)

- i. Plan a spring trip up Flat Creek to evaluate and document the situation. (dams, debris, silt, navigability)
- ii. Plan a summer trip, when waters are deemed at their low point to see what the primary influencer of the level is.
- iii. Establish a manual gauge stick at some convenient point to be used by the CLPOA for monthly recordings.
- iv. Continue to work with the various agencies collecting data relevant to Chandos Lake water levels to share such data with the CLPOA. (there are gauging stations on the Crowe and at Paudash)
- v. Encourage CVCA to establish and maintain a gauging station on Flat River by the culverts (or perhaps resurrect the one already there) with the ability to gather and transmit **both level and bi-directional flow** data
- vi. Investigate what is necessary permit-wise and/or authority-wise to clear Flat River of major impediments that contribute to high water conditions on Chandos Lake.
- vii. Investigate what is necessary permit-wise and/or authority-wise to establish a canoe route (with the necessary portages) from Chandos Lake via Flat River and the Crowe to the Crowe River bridge at Hwy 620 (Glen Alda)
- viii. Determine if there is an interest within the CLPOA in attempting to create a Land Trust conservation area along the Flat River between Chandos Lake and the Crowe River.

## 14 Revision Log

Rev 3 May 20, 2018 Submission version of Interim Report.