Clary Lake Dam
Water Level Management Plan
Town of Whitefield, Maine

DEP File # L-22585-36-B-N

April 01, 2019

The requirement for a Water Level Management Plan (WLMP) is contained in Special Condition #5 (see Appendix A) of the Clary Lake Water Level Order DEP File # L-22585-36-B-N [WLO or Order]. This WLMP will form the basis of an Operations Manual that will be used in-house to govern dam operations and dam maintenance procedures.

About the Clary Lake Association

The Clary Lake Association (CLA) is an all-volunteer Maine 501 C(3) non-profit organization in good standing with the Maine Secretary of State. The CLA was originally established in 1960 and was incorporated in January, 1995. Our Purpose, in part, from our Bylaws[1]:

1. The purpose of the Corporation shall be to preserve, protect, promote and enhance the natural beauty, quality and use of the land, water and total environment of the Clary Lake and its watershed which includes parts of the towns of Jefferson and Whitefield. These objectives shall be accomplished through a variety of activities which may include but not be limited to education programs; land trust management; scientific programs, particularly water quality monitoring and pollution abatement. Such activities shall be carried out as determined by the Directors and may be undertaken by the Corporation exclusively, or in cooperation with other organizations and government agencies.
2. To receive and hold title to real estate, personal property or any interest therein to the extent allowable by law, including lands and facilities for the joint or common use of its Members.

1 Clary Lake Association Bylaws (found under the Membership menu heading).

3. To do such other things and perform such other business as may be contemplated or permissible under the laws of Maine for a lake association.

The CLA was established in 1960 by concerned lake residents in response to a water level issue that occurred that year and it has been actively engaged in protecting and preserving Clary Lake ever since. The CLA intervened in the 2012 Clary Lake water level petition that resulted in the current Water Level Order being issued in late January 2014. Over the last 5 years the Association has actively worked to support the State in their defense of the Order in Lincoln County Superior Court and help move toward a resolution of the Clary Lake water level crisis. In February 2018 the Lincoln County Superior Court finally issued a ruling upholding the WLO, and on October 13, 2018 after a successful fund raising campaign, the CLA purchased the Clary Lake Dam from the bankruptcy estate of Paul A. Kelley Jr. Repairs to the dam were completed in late December 2018 and the Clary Lake water level has already been restored to its historical wintertime range.

The Water Level Management Plan

Special Condition #5 of the WLO lists 8 items (A) through (H) that the Dam owner is required to address:

A) *The designation of a person or persons to be responsible for the operation of the dam and appurtenant features. This person will maintain a written record of lake levels, and gate opening status. Beginning June 1 through September 30 of any given calendar year, the level of the lake and the gate opening status shall be logged every other week and on a daily basis during times of rapid water level rise. At all other times, the level of the lake and the gate opening status shall be logged on a monthly basis:*

1. Initially the CLA Board collectively will be responsible for conducting and overseeing dam operations, repairs, and routine maintenance. The Board currently consists of 4 Officers and 5 Directors. Board terms are for 3 years and are staggered so there will always be people on the Board who have experience operating the dam to help train new Board Members.

2. The Board will establish a standing committee to take charge of day to day dam operations, which committee will include at least one Board member who will report regularly to the Board. The Dam Operations Committee will consist of at least 3 CLA Members, at least one of whom is an elected Officer or Director.
3. Lake level measurements and gate/weir status will be recorded at least as frequently as suggested in Condition #5(A) and likely more often, and the data will be made available to the General Public on the CLA website. To this end we have set up a web-accessible Clary Lake Dam Operation Log in the form of a Google Spreadsheet and have already begun recording data. This spreadsheet does more than just provide a place to record water levels, and gate and weir status. It also calculates the volumes of water flowing over the weir and through the gate (using standard engineering formulas) and compares total outflows to the amount of water we should be releasing to maintain the downstream aquatic habitat (minimum flows). See Appendix B for more information about the Clary Lake Dam Operation Log.

B) A protocol describing how the Clary Lake Dam is to be operated under a variety of likely water level rise/storm events. The protocol must take into account the ability of the dam to pass water and downstream flows:

1. The water level regime for Clary Lake is part of the WLO (see Appendix E Clary Lake Water Level Regime & Minimum Flows) and is very clearly described in Special Conditions 7, 8, and 9. We believe that operating the Clary Lake Dam so as to maintain the lake level as required in the Order will be a relatively simple and straightforward matter.
2. The Historical Normal High Water Mark (NHWM) of Clary Lake has been determined by survey to be at an elevation of 151.17 feet referenced to the North American Vertical Datum of 1988 (NAVD88)[2].

2 In the Fall of 2014 the DEP retained the services of CES Inc. to establish the elevation of the Historical Normal High Water Mark (NHWM) of Clary Lake. The survey tied into the North American Vertical Datum of 1988 (NAVD88) and determined the elevation of the NHWM to be 151.17 feet. The CLA accepts this determination at this time.

3. The existing 34 inch diameter gate which in the past was the only means of regulating the lake level will generally not be used for that purpose going forward, and it will be kept closed under normal circumstances. Instead, the lake level will be adjusted up or down as required by inserting or removing stop logs in the new outlet weir[3]. The existing 34 inch diameter gate will be opened as necessary to temporarily increase outflows from Clary Lake during periods of excessive inflows to the lake and also to provide additional outflows as necessary to meet the required minimum flows.
4. The WLO provides gate openings (in decimal feet) calculated to release the required minimum flows. As easy as this method of assuring the required minimum flows are being released would be, there are two problems with the gate openings. First, our installation of a 5 foot wide weir on top of the dam makes the supplied gate openings largely inapplicable. Second, the gate openings are based upon incorrect gate geometry. We will calculate new gate openings to release additional water as needed based on the desired flows and actual water level at the time. This matter is thoroughly discussed in Appendix C "Clary Lake Gate Flow Calculations".
5. Every effort will be made to ensure that outflows from Clary Lake equal to the required minimum flows or inflows, whichever is less, will be maintained at all times.
6. By ice out in the Spring or by May 1st (which ever comes first) stop logs will have been placed in the outlet weir so as to raise the lake level up to or as close as is practicable to the elevation of the NHWM. The lake level will be maintained at the NHWM or as close to that level as practicable, until August 1.
7. Starting August 2 and throughout the Fall the lake level will be managed so as to minimize seasonal flooding. In practice this will be accomplished by gradually lowering the lake level to approximately 1 foot below the NHWM starting around September 15th. By the time the lake freezes over (typically in mid-December) the lake level will have been gradually lowered as much as another foot to a maximum of 2 feet below the NHWM.

3 Repairs to the dam completed during the late Fall of 2018 included a complete repair of the hole in the dam and the installation of a 5 feet wide x 2 feet deep weir in the middle of the dam with slots on the sides for stop logs. The upstream face of the dam down to a level of about 4 feet was sealed with gunite.

8. The lake level will generally be maintained throughout the Winter months between 1 and 2 feet below the NHWM, but no lower than 2 feet below the NHWM. The existing 34 inch diameter gate may be used to increase outflows from Clary Lake during periods of excessive inflows to the lake, or to maintain minimum flows.
9. Between August 2 and ice out in the Spring, we will monitor pending weather events and may lower the lake level to as much as 2 feet below the NHWM to accommodate storm runoff and minimize flooding and potential shoreline erosion. The decision to take this action will be based upon the current lake level at the time, the anticipated amount of runoff, the likely duration of the event, and how likely it is that our intervention will actually make a difference. See Appendix D “Handling Flood Events” for more information.

C) *A normal maintenance and repair plan for the Clary Lake Dam including, but not limited to, a schedule of inspections of the dam, a generalized schedule for regular maintenance and repairs of the dam, an erosion and sedimentation plan for implementation during times of normal repair and maintenance, and methods for maintaining the water level in Clary Lake during periods of repair and maintenance:*

1. Now that permanent repairs to the Clary Lake Dam have been completed, we do not anticipate the need for more than a single annual inspection of the dam by the CLA Board and Dam Committee Members. The annual inspection will include testing the outlet gate to make sure it is operational, checking the lake level gauge[4] to make sure it is still accurate and hasn't been affected by ice, and checking the overall structural integrity of the dam including observations to detect potential stone displacement.
2. In addition to the annual inspection, regular periodic inspections while recording water level measurements and gate and weir status will be made to assess whether there are any leaks to be concerned about. Stone masonry dams typically leak small amounts of water and some minor leaking is to be expected.

4 Special Condition #6 of the WLO requires the installation of a permanently mounted lake level gauge in a publicly-visible location on the upstream face of the Clary Lake dam near it's outlet. The lake level gauge was installed on March 20, 2019.

3. Routine maintenance will include replacement of the stop logs as necessary.
4. A coffer dam may be constructed when work on the dam requires that the upstream face of the dam be exposed.
5. We have in the past anticipated constructing a temporary sandbag coffer dam between the narrow gauge railroad abutments located at the head of the mill pond when the entire upstream face of the dam had to be dewatered. Normally this would be done in the late Summer/early Fall when the lake level has been reduced to 2 feet below the NHWM and downstream minimum flows are at the lowest. Recently however, access issues have prevented our using the abutments for this purpose. That may change in the future. In the meantime, if it becomes necessary to dewater part or all of the upstream face of the dam, we will utilize a combination of large (1 cubic yard) and small sandbags to build a temporary cofferdam directly behind the dam (or the portion of the dam that needs to be worked on) and which will be located wholly on property of the Clary Lake Association.
6. Given the nature of the repairs just recently completed, we do not anticipate the need to dewater the upstream face of the dam for any reason, for years to come. Minor maintenance (including locating and plugging minor leaks) and routine inspections can usually be performed underwater by people trained and equipped for the job.
7. Standard soil erosion and sedimentation control measures will be implemented if work on the dam property is expected to result in soil erosion or soil disturbance.

D) A clearly defined entrance/exit point to access the dam and its outlet without encumbrances:

1. There is an existing land survey of the dam property which clearly shows the boundaries of the property. See Appendix F “Clary Lake Dam Property Survey”.
2. The Clary Lake Dam sits on 0.13 acres of land with approximately 146' of road frontage on Route 218, over 100' on the northerly end of which is completely unobstructed offering convenient access to the dam proper with vehicles and equipment.

3. On the southerly end of the property, there is 6 feet between the end of the red building that sits on the dam and the property line which is sufficient for foot traffic to access the dam and gate mechanism.
4. Access to the downstream face of the dam and its outlet is from the north end of the property.

E) A procedure for monitoring and maintaining the required minimum downstream flows from Clary Lake as outlined in Condition #9 [sic]:

1. The required minimum flows are actually outlined in Condition #10, not Condition #9. See Appendix E.
2. According to the WLO Clary Lake has a flushing rate of 1.81 which means in an average year, the complete volume of the lake is fully replaced approximately 1.8 times. The average flushing rate for Maine lakes is 1 to 1.5 flushes per year. Most of these inflows occur in the Spring and Fall with steady but somewhat diminished inflows occurring during the Winter.
3. Mid-Summer inflows can be very small to non-existent depending on rainfall. Mid to late Summer drought conditions in recent years have resulted in effectively negative inflows with a net loss in lake volume due to evaporation. During these periods, zero or near-zero outflows have been observed at the dam outlet despite a wide-open gate.
4. Since the lake level is to be managed to remain within a range not to exceed 2 feet below the NHWM, with the exception of periods of extreme drought, there is almost always going to be some water flowing into and out of the lake, and it follows that all the water that enters the lake will also leave the lake. It is therefore expected that for most of the year outflows will at least equal and often exceed inflows.
5. Generally, we need be concerned with minimum flows primarily when **raising** the lake level such as in the Spring.
6. If the lake level has been lowered from where it is supposed to be, then the minimum flows specified in the Order need to be maintained until such time as the lake level returns to the required level.

7. When lowering the lake level as we will be doing in the Fall, minimum flows need not be considered as outflows invariably will exceed inflows, otherwise the lake level would not be falling.
8. When raising the lake level by inserting stop logs in the weir as we'll be doing in the early Spring, minimum flows must be maintained. The required minimum flows can easily be released by opening the 34 inch diameter outlet gate an amount necessary to release the required minimum flows (see Appendix C).
9. Maintaining minimum flows in the early Spring is not anticipated to be a problem due to the abnormal amount of runoff from snow melt and Spring rains.
10. When it is necessary to actually measure the flows leaving the lake, discharge through the weir and sluice gate is easily calculated (see Appendix C).
11. If it becomes necessary, actual downstream flows can be measured during periods of high flows (such as when there is water over topping the dam) by determining the cross sectional area of the outlet stream between the bridge abutments under Route 218 and measuring the velocity of the flowing water. We have done this in the past, and it provides an easy way to check on calculated outflows.
12. Again, if it becomes necessary, under extreme low water conditions low volume flows can be measured by building a temporary sandbag dam in the outlet stream and installing a temporary “v” weir and using standard engineering procedures to measure the outlet flows.
13. It is not anticipated that making such measurements of downstream flows will be either necessary or required on any kind of regular basis and are offered here for completeness.
14. During periods of extreme low-flow as might be encountered in mid to late Summer, a practical indication of whether sufficient outflows are being maintained is to observe whether the lake level is rising, falling, or is unchanged:

    1. if the lake level is falling, then outflows exceed inflows;
    2. if the lake level is rising, then inflows exceed outflows;
    3. if the lake level is unchanged, then outflows equal inflows.

F) *A procedure for alerting owners of riparian property downstream of the tributary of the Sheepscot River and the owner of the dam of possible flooding events with as much advance notice as practicable:*

1. There are at this time 3 such property owners with land along the outlet stream, only one of whom has property or improvements that might be impacted by high water. We will nonetheless notify in the most expedient means available (either by email, by phone, or by text message) all three property owners of potential significant flood events.
2. We will also post a notice of pending flood events to the CLA website.
3. See Appendix D for additional information about what we consider flood events requiring notification of downstream property owners.

G) *A procedure for alerting owners of littoral and riparian property around Clary Lake and the tributary of the Sheepscot River of dam repair and maintenance with as much advance notice as practicable:*

1. Repair or maintenance activities expected to appreciably affect lake levels or downstream flows will be scheduled in mid-Summer or early Fall and every effort made to provide notice at least 1 month in advance of said activities.
2. Notices when required will be provided via email sent to all affected littoral and riparian property owners describing the pending operations and the likely impact on lake levels or downstream flows. Lake shore owners without an email address will be sent a post card. We will also post notices on the CLA website.
3. For repair and maintenance and other activities that will not significantly affect the water level in Clary Lake or downstream flows, we will only post notices to the CLA website.

H) *A signed, written agreement from a secondary person, persons, or entity outlining their willingness to assume responsibility for the operation of the Clary Lake Dam and its water control features in the event of an emergency. The designee must also*

acknowledge their familiarity with the terms of this Order, Secondary designees may include, but are not limited to, the Town of Jefferson, the Town of Whitefield, or the Clary Lake Association:

1. This requirement of the WLO made perfect sense when the dam was owned by an individual with the sole responsibility for dam operations and who might be unavailable in an emergency. The Clary Lake Dam however is now owned by a long established local organization counting many knowledgeable and competent people among its membership, any number of whom will be available to oversee dam operations at all times. Therefore we do not feel it is necessary to line up a secondary party to assume responsibility for the operation of the Clary Lake Dam in an emergency.
2. Ultimately, the CLA Board collectively will be responsible for dam operations in an emergency.

As required by Special Condition #5, this WLMP will be made available to all littoral and riparian landowners upon request. It will also be posted on the CLA website where it will be available to the General Public. In addition, copies will be provided to the Towns of Whitefield and Jefferson.

This WLMP will also undergo annual review by the CLA Board and any proposed changes, additions, or modifications will be submitted to the Department for review and approval. If as a result of this review process the WLMP is revised or modified, the updated plan will be distributed as above.

Provisional approval of this WLMP was granted by letter dated 25 April 2019.

George Fergusson, Secretary
Clary Lake Association
PO Box 127
Whitefield ME 04353

APPENDIX A

This is Special Condition #5 of the WLO describing the requirement for a Water Level Management Plan:

The owner of the dam shall submit a Water Level Management Plan to the Department for review and approval no later than May 1, 2014. The Water Level Management Plan must include, but is not limited to:

A) The designation of a person or persons to be responsible for the operation of the dam and appurtenant features. This person will maintain a written record of lake levels, and gate opening status. Beginning June 1 through September 30 of any given calendar year, the level of the lake and the gate opening status shall be logged every other week and on a daily basis during times of rapid water level rise. At all other times, the level of the lake and the gate opening status shall be logged on a monthly basis.

B) A protocol describing how the Clary Lake Dam is to be operated under a variety of likely water level rise/storm events. The protocol must take into account the ability of the dam to pass water and downstream flows.

C) A normal maintenance and repair plan for the Clary Lake Dam including, but not limited to, a schedule of inspections of the dam, a generalized schedule for regular maintenance and repairs of the dam, an erosion and sedimentation plan for implementation during times of normal repair and maintenance, and methods for maintaining the water level in Clary Lake during periods of repair and maintenance.

D) A clearly defined entrance/exit point to access the dam and its outlet without encumbrances.

E) A procedure for monitoring and maintaining the required minimum downstream flows from Clary Lake as outlined in Condition #9.

F) A procedure for alerting owners of riparian property downstream of the tributary of the Sheepscot River and the owner of the dam of possible flooding events with as much advance notice as practicable.

G) A procedure for alerting owners of littoral and riparian property around Clary Lake and the tributary of the Sheepscot River of dam repair and maintenance with as much advance notice as practicable.

H) A signed, written agreement from a secondary person, persons, or entity outlining their willingness to assume responsibility for the operation of the Clary Lake Dam and its water control features in the event of an emergency. The designee must also acknowledge their familiarity with the terms of this Order, Secondary designees may include, but are not limited to, the Town of Jefferson, the Town of Whitefield, or the Clary Lake Association.

The final Water Level Management Plan shall be made available by the owner of the dam to all littoral and riparian landowners for review upon request. A copy of the final plan shall be distributed to the Town of Jefferson and the Town of Whitefield. As experience is gained by the owner of the dam in managing the water levels and minimum flows of Clary Lake, the Department encourages an annual review of the plan by the owner of the dam. If the Department concludes that modification to the Water Level Management Plan is warranted following a written request for review and modification submitted by the owner of the dam, updated copies of the modified or revised plan must be distributed by the owner of the dam to the Town of Jefferson, the Town of Whitefield, and the Department.

APPENDIX B

Clary Lake Dam Operation Log

We have implemented a publicly-accessible Google Spreadsheet to serve as a log of dam operations which will be maintained by the Dam Operation Committee. There is a link to the Log on the Clary Lake Association website (see below). This spreadsheet provides a place to record the date, lake levels, and gate and weir status as required in the WLO. Given the water level at the dam, weir status (height of stop logs in decimal feet), and gate opening (in decimal feet) the spreadsheet also calculates the volumes of water flowing over the weir and through the gate (using standard engineering formulas). It then compares the total outflows to the minimum flows we should be releasing to maintain the downstream aquatic habitat. This information will then be used by the Dam Operation Committee to operate the dam.

In addition to the basic log function, the spreadsheet also calculates some additional information of general interest including the approximate acreage of the lake at the current water level and the inflows, in cubic feet per second, that are required to raise or lower the lake the amount observed in a 24 hour period. Knowing how much water is flowing OUT of the lake during the same time period allows us to algebraically sum the figures to get the total amount of water that was flowing INTO the lake necessary to meet both conditions. We can tell at a glance whether the lake level is rising, stable, or falling. Going forward, it remains to be seen just how useful some of this additional information will be and whether it will remain a part of the spreadsheet but for now it appears to be helpful data to have.

A hard copy of all data recorded in the field will be kept in a standard field survey book maintained by the Dam Operations Committee.

It is anticipated that the form and function of the Clary Lake Dam Operation Log will evolve over time as practices and procedures are refined, but the basic functionality described here will remain. We anticipate that use of the Operation Log will assist us in understanding and managing the water level regime for Clary Lake.

Here's a link to the Clary Dam Operation Log. Alternatively, a link can be found under the Charts & Data menu on the CLA website.

APPENDIX C

Clary Lake Gate Flow Calculations

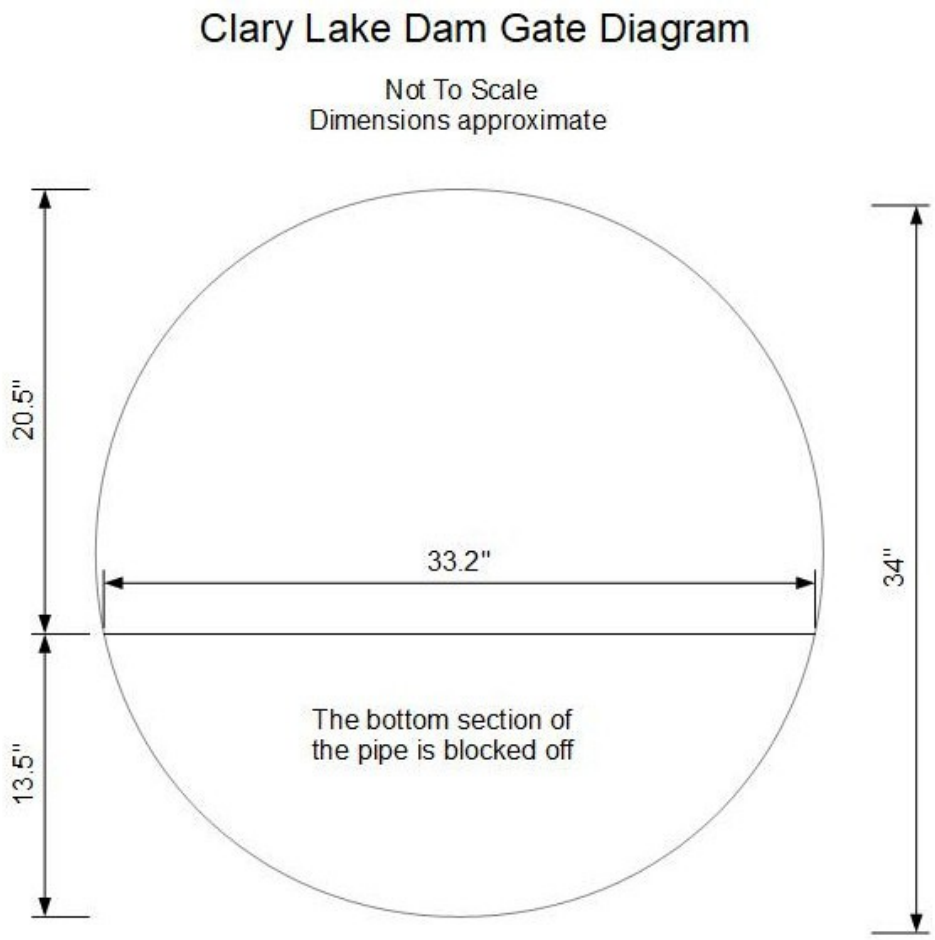
The WLO provides gate openings (in decimal feet) calculated to release the required minimum flows. However, in the process of repairing the hole in the dam we installed a 5 foot wide weir which will be the primary means of managing the lake level. Consequently, the stated gate openings are not particularly helpful to us.

Illustration 1: Photograph of the Clary Dam gate showing the obstruction on the bottom. Photograph by George Fergusson 09 October 2017

We have built a spreadsheet to calculate gate openings and flow values based on a given water level. As with the Clary Lake Dam Operation Log, this spreadsheet is linked on the CLA website and is publicly accessible. Used in conjunction with the Dam Operation Log (Appendix B) which shows existing and desired outflows, a gate opening necessary to release a given amount of water can be easily calculated[5].

5 An Engineer with the Division of Environmental Assessment has modeled the Clary dam gate using HydroCad and compared the output with that of the Gate Flow spreadsheet and found them to be in close agreement.

Here are the approximate dimensions of the 34 inch diameter gate structure:



For flows up to about 40 cfs (a 12 inch gate opening with a full head of water) we can consider the gate to be a rectangular sluice 33.2 inch wide and of variable height without incurring unacceptable errors due to pipe curvature[6]; calculating the discharge under such a sluice for any given gate opening and head is a standard engineering exercise. Since the largest minimum flow for Clary Lake is 35.9 cfs, we need not concern ourselves with the reduced accuracy of cfs values for larger gate openings due to curvature of the pipe. When we want to release the maximum amount of water through the gate, we'll likely open it all the way: when fully open and with a full head of water the gate will pass approximately 18% less

6 A 12” gate opening with a full head of water results in an overestimate of the outflow of approximately 2% or about 0.7 cfs. The error increases to approximately 18% when the gate is fully open.

water than the spreadsheet indicates, or about 55 cfs. This is the value historically associated with the gate when fully open.

There may well be times when there is no water flowing over the weir, and then the following gate openings will result in the release of the required minimum flows. They are based upon the following assumptions: 1) the water level is at -2.0 below the NHWM, 2) there is no water flowing over the weir, and 3) leaks are ignored. Leaks of course will increase outflows. If the lake level is actually higher than -2.0 below the NHWM and/or there is also water flowing over the weir, actual outflows will be greater than stated:

Date	Minimum Flow	Gate Opening
1-1 to 3-15	11.3 cfs	0.32 ft.
3-16 to 5-15	35.9 cfs	1.04 ft.
5-16 to 6-30	8.3 cfs	0.24 ft.
7-1 to 9-15	1.9 cfs	0.06 ft.
9-16 to 11-15	3.5 cfs	0.10 ft.
11-16 to 12-31	15.5 cfs	0.45 ft.

Here's a link to the Clary Lake Gate Flow Calculations spreadsheet. It can be found under the Charts & Data menu heading on the CLA website. We expect that use of the Gate Flow spreadsheet will assist us in better understanding and managing the water level regime for Clary Lake.

Illustration 2: This is not a flood event. This is routine over topping of the dam which is to be expected when the lake level is maintained at the Normal High Water Mark of the dam. Note the gate is wide open; total estimated flow is approximately 100 cfs. Photograph by George Fergusson April 30, 2008

Handling Flood Events There is nothing wrong with lake water flowing over the Clary Lake Dam. It was built for the purpose of impounding as much water as possible for use in the downstream mill, and the lake level since the dam's construction in 1903 has historically been maintained at or very close to the top of the dam for much of the time. It is unreasonable to assume the lake level could be maintained even near the top of the dam without having water routinely flowing over the top, and this explains why the Historical Normal High Water Mark (NHWM) of the lake was determined to correspond to the top of the dam. Since the WLO requires at ice-out in the Spring that the level of the lake be raised, as near as practicable to its full capacity (i.e., at the NHWM or top of dam) and be maintained there until August 1, lake

water is virtually assured to over top the dam on a more or less regular basis and we're not inclined to consider such minor over topping events to be “flood events” requiring notification of downstream property owners.

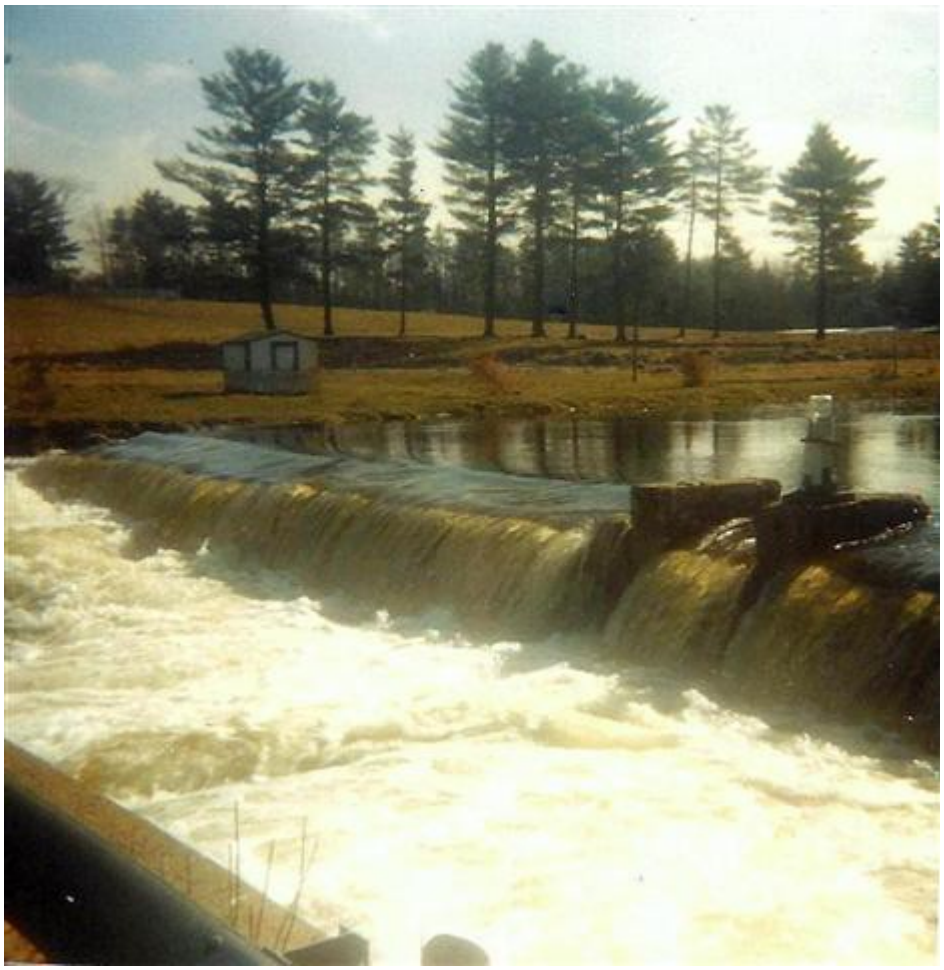


Illustration 3: Now this is a flood. With estimated flows over the dam in excess of 200 cfs, notification of downstream property owners would be warranted! The ponding of the water below the dam indicates that the Clary mill pond dam located just downstream was full and over topping as well. Photograph presumably taken by former dam owner Chester Chase, dated June 1984.

If and when a significant precipitation event is forecast that is likely to result in flooding in the real sense of the word, downstream property owners will be notified of the possible flood conditions at once. Whether we choose to take steps to lower the lake level so as to try and make room to accommodate storm runoff depends on a number of factors, including the time of year and the current water level behind the dam. There is no provision in the WLO allowing

for variations in lake level to prevent flooding from ice-out in the Spring through August 1 so lowering the lake level to accommodate potential storm water runoff can really only take place during the other half of the year, the period between August 2 and ice out in the Spring. Furthermore, since it is our stated intention by ice-in to have already lowered the lake level to or close to it's lowest allowed level of 2 feet below the NHWM, this discussion really only applies to the period August 2 until the lake freezes over. We're loath to lower the lake level appreciably during the month of August and early September because this is prime time for lake recreation: boating, swimming, fishing, etc. Therefore, we're really only concerned with possibly lowering the lake level to create capacity for storm water runoff in the Fall period, roughly September through December. We've already stated it is our intention to lower the lake level to approximately 1 foot below the NHWM by September 15 (Section B) 7 page 4) so the question really boils down to when between September and December might we decide to lower the lake an additional foot, to 2 feet below the NHWM to accommodate storm water runoff.

That decision will depend on how certain we are the precipitation event is actually going to occur, the potential magnitude of the rain event, and the likelihood that such an effort to reduce the lake level and create additional reservoir will be helpful in preventing flooding. We're not going to lower the lake on a rumor of a possible large upcoming rain storm a week away lest we drop the lake level in anticipation of a rain event that doesn't materialize then find ourselves playing catch up with minimum flows.

Furthermore, there is no guarantee that taking such drastic emergency action will prevent the lake from over topping the dam, even if both the 34 inch diameter gate and the 5 foot wide weir are fully open. Combined the two outlets will pass about 100 cfs. Consequently, flood events with sustained flows in excess of 100 cfs are almost guaranteed to result in some water over topping the dam unless they are of very short duration and occur at at time when the lake is at its lowest allowable level.

That we can eventually expect significant flood events is a certainty. The following table generated by the USGS StreamStats Program[7] for the Clary Lake watershed give peak flood frequency and estimated peak flood values for Clary Lake in cubic feet per second:

Peak Flood Values for Clary Lake

Statistic	Value	Unit
2 Year Peak Flood	169	ft^3/s
5 Year Peak Flood	258	ft^3/s
10 Year Peak Flood	313	ft^3/s
25 Year Peak Flood	412	ft^3/s
50 Year Peak Flood	464	ft^3/s
100 Year Peak Flood	544	ft^3/s
250 Year Peak Flood	594	ft^3/s
500 Year Peak Flood	709	ft^3/s

A 2 Year Peak Flood event with flows on the order of 169 cfs would result in approximately 0.5 feet of water flowing over the dam. A 250 Year Peak Flood event with flows on the order of 594 cfs would result in approximately 1.5 feet of water flowing over the dam. A 500 Year Peak Flood with flows on the order of 709 cfs would result in approximately 1.75 feet of water flowing over the dam. Over the years the Clary Dam and the downstream properties have undoubtedly withstood and survived numerous flood events on a scale of those listed in the above table without apparent damage.

7 https://streamstats.usgs.gov/ss/

APPENDIX E

Clary Lake Water Level Regime & Minimum Flows

The Water Level Regime proposed for Clary lake is included in sections 7, 8, and 9 on page 13 of the WLO:

> *7. Pursuant to the Department's rules at Chapter 587, Instream Flow and Lake and Pond Water Levels, the water level in Clary Lake shall be maintained within a range of fluctuations, not to extend more than 2.0 feet below the established normal high water line, as described in Condition #3, to the extent practicable. This approximates a change of up to 17% of the total lake volume (6,353 acre-feet) or 14% of the total lake surface area (667.2 acres) with the lake level set at normal high water.*
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> *8. From August 2 until ice-out conditions, the dam shall be managed to prevent seasonal flooding and ice action against the dam's outlet by maintaining a reasonably stable water level with sufficient in-lake capacity to accommodate Winter and Spring stormwater runoff. Water levels may be reduced during this time period. However, as described in Condition #6, the water level shall not extend more than 2.0 feet below the established normal high water line to the extent practicable during this time.*
>
> *9. Immediately following ice-out conditions (or May 1, whichever comes first) until August 1 of any given year, the level of the lake shall be gradually raised, as near as practicable, to its full capacity to provide a reasonable amount of water access for the recreational launch of boats and use at the MDIFW boat launch and the Duncan Road boat launch, capture high water in order to maximize wildlife brood cover, ensure waterfowl production and survival, safeguard spawning activities, provide essential habitat, cover, and protection for fry, and provide adequate feeding locations for juvenile fish for as long as possible. At no time during this period shall the lake level be artificially manipulated to be lower than the established normal high water line, as defined by the procedures described in Condition #3* [sic].[8]

8 The correct reference is Condition #4, the requirement that the dam owner establish the elevation of the Historical Normal High Water Mark.

The required minimum flows for Clary Lake are included in section 10 on page 14 of the WLO:

> *10. Minimum downstream flows from Clary Lake shall be maintained at not less than the following seasonal flows, or inflow, whichever is less:*
>
> *11.3 cfs between January 1 and March 15;*
>
> *35.9 cfs between March 16 and May 15;*
>
> *8.3 cfs between May 16 and June 30;*
>
> *1.9 cfs between July 1 and September 15;*
>
> *3.5 cfs between September 16 and November 15;*
>
> *15.5 cfs between November 16 and December 31.*

APPENDIX F

Clary Lake Dam Property Survey

Below is a sketch based upon the original survey by Lemuel L. Brown, PLS #225 conducted by him in 1994 for the conveyance from Chester Chase to Arthur Enos. Access to the property to the east of the bridge abutment is unrestricted. The property line on the west side is approximately 6' off the side of the Old Mill Building which is sufficient access to the westerly end of the dam by foot-traffic. A copy of the original survey is available upon request.