

BEPCO 2016 LICENSE REVIEW COMMENTS TO WVIC AND FERC

A. UNIQUENESS OF THE BIG EAU PLEINE RESERVOIR

The Big Eau Pleine (BEP) reservoir is unique within the Wisconsin Valley Improvement Company (WVIC) reservoir system. It is located the furthest to the south and often receives precipitation in differing amounts than the other 16 natural and 4 manmade reservoirs clustered more closely to the north. It is the only reservoir that cannot directly impact the Merrill flow control point.

The Big Eau Pleine is also the only reservoir in the system that is located in a highly agricultural watershed. Due to high agricultural use, agricultural drainage systems, and soil types, precipitation runoff is considered flashy. This makes it more subject than the other reservoirs to the adverse affects of heavier precipitation events which may be accelerating due to climate changes. These differences support it being managed as more of a separate resource than it currently is. Yet WVIC's "index system" within their operating rule curves attempt to treat all five manmade reservoirs the same operations-wise.

B. HISTORICAL PROBEMS WITH FISH KILLS

Problems with excess nutrient runoff resulting in algae blooms and wintertime oxygen depletion under the ice in winter have been studied many times. Oxygen depletion and lower water levels in winter have led to fish kills on average every 3 to 4 years historically. In 1981 an aerator was installed to help. It has shown it can provide only a limited fish refuge and cannot alone stop fish kills. There have been 6 fish kills on the BEP since the aerator was installed in 1981 (1989, 1990, 2005, 2008, 2009, and 2013).

There was a large amount of discussion captured within the 1996 re-licensing Environmental Impact Statement regarding on going fish kills on the Big Eau Pleine reservoir. Management changes as a result of the 1996 relicensing have not ended the fish kills as there have been 4 documented fish kills since in 2005, 2008, 2009, and 2013.

Changes since the massive 2009 fish kill include rebuilding the aerator in 2010 utilizing \$46,000 in funding that BEPCO raised, adding 3 new triggers to WVIC's Drought Contingency Plan in 2011, and raising the minimum reservoir volume to 10% in 2011. All these changes also have not ended the fish kills as there was another in 2013. Fish kills continue to be directly linked to wintertime water levels as BEPCO will again show.

C. CONSULTANT RECOMMENDATIONS /REGULATORY CONCERNS/ADAPTIVE MANAGEMENT

BEPCO has been consulting with many groups including the Wisconsin DNR, WVIC, Marathon County Planning and Zoning, US Fish and Wildlife Service, River Alliance of Wisconsin and the University of Wisconsin Stevens Point in the last several years regarding the nutrient loading and fish kill problems. We have come to understand that FERC should be requiring the licensee to provide mechanisms to assure the Clean Water Act (CWA) and the Fish and Wildlife Coordination Acts (FWCA) are followed.

As a result of the persistent fish kills that have occurred on the BEP since the 1970s, FERC should, in compliance with the CWA, require the licensee to perform or coordinate peer-reviewed studies on the BEP that definitively determine whether operational changes—

including changing the water level regime—can provide adequate dissolved oxygen to protect the fishery. These studies should be required by FERC now. They should be actual trials that feature changed water level regimes, and not theoretical studies. The studies should answer the question definitively; how much of the low DO and fish kill problem is operational control vs. phosphorus control.

The persistent fish kills should trigger enforcement and changes in dam operating practices also under the FWCA, which was enacted to ensure fish and wildlife resources receive equal consideration to other features of water resource development projects. The FWCA requires Federal agencies involved with such projects to first consult with the US Fish and Wildlife Service and the respective state fish and wildlife agencies regarding the potential impacts of the project on fish and wildlife resources. The Federal agency must strongly consider input received during consultation to prevent loss or damage to wildlife resources and provide for any measures taken to mitigate such impacts.

Any changes that result from invoking the CWA and FWCA don't have to be permanent changes—all should be prescribed under “adaptive management”—changing management based on best available science and data. This will help determine whether, and which, operational changes can meet CWA standards. An “adaptive management” in the license requires that licensees have annual meetings with stakeholders, and discuss what worked last year, and what they'll do next year.

In 1986 Congress amended the Electric Consumer's Protection Act (ECPA) to FERC's operating law (the Federal Power Act). ECPA required FERC to take a more balanced approach to dam licensing. The amendment requires FERC, when deciding whether to issue a license, to consider not only the power generation potential of a river, but also to give equal consideration to energy conservation, protection of fish and wildlife, protection of recreational opportunities, and preservation of general environmental quality. This “equal consideration” mandate requires FERC to consult with federal, state and local resource agencies, including fish, wildlife, recreation and land management agencies, in order to assess more accurately the impact of a hydro dam on the surrounding environment. In its evaluation of environmental impacts, FERC is obligated to comply with the National Environmental Policy Act (NEPA). This requires FERC to prepare an Environmental Impact Statement (EIS) or Environmental Assessment (EA), investigative reports which assess the environmental consequences of a proposed hydropower project and compare the impacts with those of alternatives to the suggested action. State and federal agencies as well as tribal nations have the authority to prescribe mandatory conditions in hydropower licensing proceedings. Thus it would seem that studies and adaptive management strategies should commence now in order to develop the necessary data and conclusions for the next relicensing.

To insure compliance with Wisconsin's phosphorus rules adopted December 1, 2010, FERC should order WVIC (and its parent companies) to enter into negotiations with all municipalities and farmers in the watershed on phosphorus compliance to the extent that reservoir operation can reduce municipal or agricultural phosphorus levels. Studies should be done to determine what portion of phosphorus control could be achieved via operational control. FERC should order that studies begin now, consulting with federal, state and local agencies, to assess the

environmental impact of this project on the fisheries--well in advance of the 2021 license review and 2026 re-licensing.

D. 2010 STATISTICAL ANALYSIS

Both BEPCO's 2010 and 2016 statistical analysis use data provided by WVIC. That data table was included by WVIC at the 2011 license review as "Attachment A" in "WVIC response to comment letters received".

In 2010 BEPCO had BEP reservoir operating data going back to 1970 statistically analyzed for correlations to fish kills. The results showed that there were very strong correlations between fish kills and both water level at the start of winter, and water level at the end of winter. BEPCO proposed what we called the "60% Solution" to fish kills. This two part solution called for a minimum of 60% water level at the start of winter and a minimum of 20% water level at the end of winter based on the 2010 statistical analysis findings. This statistical analysis was included with BEPCO's 2011 WVIC License Review comments to FERC.

WVIC stated in their 2011 response to BEPCO's comments "BEPCO presents a statistical analysis of reservoir operations and fish kills that is based, in part, on historic reservoir operations that have not been practiced since the 1970's or for over 30 years...By using historical reservoir operational data that is no longer relevant with associated fish kill events the analyses are biased. It is pointless to statistically analyze irrelevant reservoir operations and associated fish kills." In the 1970's the reservoir was commonly drawn down to less than 10% capacity by the end of winter. That has changed.

BEPCO disagrees with WVIC's assertion that our 2010 analysis is "pointless". We were not attempting to compare different reservoir operating methods, but only to show how water levels, the end result of operations, are associated to fish kills. The results of the 2010 analysis are valid.

E. 2016 STATISTICAL ANALYSIS

To satisfy WVIC's assertion, BEPCO in 2016 had a six-sigma master black belt certified analyst (Mark Wallenfang) analyze just the data relative to current operational practices. That is operational data since the 1981 aerator startup updated through the present. **SEE ATTACHMENT 1.** With the aerator installation in 1981, the end of winter draw down is now commonly around 20% full. This keeps the aerator nozzles covered with water allowing the aerator to function and protects the submerged aerator system from ice damage. Because the aerator changed operations, the end of winter water level correlation to fish kills is now very weak. But the start of winter water level correlation to fish kills is still very strong.

The fact that the end of winter water level correlation to fish kills went from strongly positive when 1970 through 1980 operating data were included (2010 analysis), to very weak when those years are excluded (2016 analysis), further validates that end of winter water levels generally below 10% level in the 1970's were strongly associated with fish kills.

ATTACHMENT 2 graphically shows the correlation between December 1 water levels and fish kills. Since 1981 there have been NO fish kills in any of the 23 years when the BEP water level

started out at 60% full or greater on December 1 (start of winter). Yet fish kills occurred in 6 of the 13 winters when that level was below 60%--almost a 50% risk. Statistically there is less than a 0.1% chance that this correlation is just random. This operating data shows that 60% water level at the start of winter and aerator operations during winter if low oxygen levels are present, minimize the risks of fish kills over winter. Thus BEPCO recommends that a goal of 60% reservoir volume on December 1 be integrated into WVIC's rule curves. This is a proactive approach to reduce the risk of fish kills that can be considered a short to intermediate term solution until the excess nutrient problem is solved. The oxygen mass provided by these two management systems since 1981 has always prevented fish kills thus far despite large variations year to year in sediment oxygen demand, in the lengths of winters, in base inlet river flows, in mid-winter runoff events, and in any other variations that occur.

BEPCO does not request a change in the minimum required water level at this time in 2016. The statistical analysis of operations since 1981 does not support it. Aerator operation and protection require keeping the water level up closer to 20% at the end of winter. Also in 2011 WVIC raised the minimum required water level from 2.4% of capacity to 10% of capacity for these reasons. However a return to the 1970's practice of routinely lowering the reservoir level to well below 10% level by the end of winter cannot be allowed to happen.

F. STATISTICAL CORRELATION

In statistics a strong statistical correlation does not necessarily mean causation. There is sometimes a third variable at work. Here it appears to be oxygen mass. The strong correlation indicates that start of winter water level strongly impacts oxygen mass. And then oxygen mass depletion kills the fish. THE STRONG CORRELATION "DOES" SAY THAT 60% WATER LEVEL AT THE START OF WINTER IS "A" SOLUTION TO FISH KILLS. Just as fixing the runoff problem is also "a" solution to fish kills.

G. RESPONSIBILITY

WVIC in their 2011 response to BEPCO's comments insists that reservoir operations are not the cause of fish kills. "If reservoir operation in itself was the cause of fish kills, then chronic low dissolved oxygen (D.O.), anoxic conditions and fish kills would occur at the other four WVIC man-made reservoirs--they do not." "The 2009 fish kill was not a result of project operation...the reservoir was operated within the operating requirements and water level limitations stipulated in WVIC's FERC license."

WVIC also asserts that BEPCO is sidestepping the significance of the pollution problem "BEPCO's proposed "60 -20% Solution" sidesteps the significance of addressing the chronic water quality issue and proposes instead that a change in Eau Pleine Reservoir operation is necessary as discussed below. Without acceptance of its proposal, BEPCO holds WVIC solely responsible for any future fish kills, inferring that fish kills, including the fish kill in 2009, are a reservoir operation issue."

First, BEPCO acknowledges that runoff pollution is a significant part of the problem. BEPCO is or has been a key player in many cooperative efforts to address the runoff pollution part of the problem including: the Marathon County Task Force that formed after the 2009 fish kill, the DNR's TMDL study on the upper Wisconsin River system for Clean Water Act compliance, writing

the grant and participating in the UWSP Oxygen Depletion modeling study, writing the grant and participating in the ongoing Lake Management Planning effort.

Secondly, as discussed in the opening two paragraphs the BEP is different than the other manmade reservoirs in important ways and needs a different management strategy. It is not reasonable to expect to manage all five manmade reservoirs to the same index level simply because they are all manmade. WVIC built the BEP reservoir in 1937 on a watershed that was already highly agricultural. WVIC should be responsible and accountable to use the best science and technology available and do what they can, using adaptive management practices that adjust for what the waterway is, for the preservation of the fishery and all environmental aspects of the reservoir. It is within WVIC's authority to make those changes for the benefit of the fishery and the central Wisconsin communities. Our two statistical analysis show that changes in reservoir management have the potential to positively impact fish kills.

H. MODIFYING SUMMER OPERATIONS TO PROVIDE 60% MINIMUM WATER LEVEL DECEMBER 1

At the 2011 license review BEPCO showed how 60% water level could have been accomplished in Appendix III in a document called "2008 Rerun using 60% Solution to fish kills". The example we chose was the summer of 2008. It was the peak of the drought and the reservoir level was the lowest December 1 level going back as far as we have records (1970). In spite of the drought the BEP reservoir refilled completely in the spring as it has almost every year throughout its history. We showed how the reservoir could have been 60% full at the start of winter instead of 21% full if water had been conserved in the dry part of summer/fall, while still protecting the environments of the rest of WVIC's system. Given that the reservoir could have been 60% full December 1 at the peak of this serious drought with a different water level management approach, it can probably be at the 60% level most every year at the start of winter with that different water level management approach.

I. BACKTESTING THE CONCEPT OF MORE WATER AT START OF WINTER / ECONOMICS

In 2011 WVIC back tested our proposed concept to modify summer operations to provide 60% water volume on December 1 using their WIRSOM model. We were given the impression that WVIC would be including this analysis in their 2011 license review submittal to FERC because it was included in their May 2011 draft of the Final Report as appendix 7. However it was not included in the final submittal to FERC. Why not? Apparently WVIC did not want FERC to see it? We are including the entire document as ATTACHMENT 3. The second part, the "May 2011 Update" is the more relevant analysis.

Data back 60 years to 1950 was analyzed. Results showed it was feasible. There is enough water. One criterion was that there would be no impact to any water levels or flow rates to the north of the BEP. During dry summers the river flow rates at Wisconsin Rapids would be decreased to save water in the BEP for winter. Another criteria was that existing minimum required flow rates in the Wisconsin River would remain protected.

In WVIC's 2011 license review submission to FERC, on page 20 of the "WVIC response to comment letters received" section, WVIC states: "WVIC concurs that, based on WIRSOM modeling, it would be possible to reduce flow goals at Wisconsin Rapids enough to meet 60% storage on December 1 without affecting the water levels in the northern reservoirs." "WVIC

concur that the annual hydropower loss would be 1.7 million KWh per year."

1.7 million KWH per year is just ¼ of 1% of the total hydropower generated by the 25 hydroelectric dams on the Wisconsin River. These are the dams that WVIC's owners, the power companies and paper mills, operate and control. The hydropower loss is at most \$172,000 per year based on the highest rates currently shown on the Wisconsin Public Service website. (10.1 cents per Kwh)

The upside of 60% December 1 is protection of the fishery. Economic impact studies on the recreational value of Lake Holcombe in Chippewa County and the Lake Winnebago chain in Wisconsin were found. These studies suggest that the positive economic impact of a good fishery on the Big Eau Pleine is worth over 2 million of dollars per year. These studies were summarized and referenced in BEPCO's 2011 license review comments as Appendix IV "Economic Impact of Big Eau Pleine fishing and recreation." But just one fish kill wipes out several years of fishing. The BEP has many times been a great fishery. It is now well into recovery from the most recent 2013 fish kill as evidenced by the number of people ice fishing this past winter and out fishing this spring and summer.

WVIC's back testing of our 2011 proposed 60% Solution also came up with a hydropower loss of 2.4 MKWh for every 10% water volume in the BEP that is NOT used in winter. While 10% volume is the license-required minimum, in reality it appears that WVIC normally targets to draw it down to around 20% volume by the end of winter. In the winter of 2012-2013 WVIC stopped the reservoir drawdown midway through the winter after low oxygen tests were found, keeping it around 40% full in a failed effort to avoid a fish kill. This apparently cost 4.8 MKWh in lost hydropower generation. Would the 2013 fish kill and that hydropower loss have both been averted had the reservoir been 60% full at the start of winter? Using this logic, is it possible that having the reservoir 60% full at the start of every winter will in the end not cost any hydropower. This could be true because that water volume seems to provide the oxygen mass needed for fish survival throughout the winter, thus potentially allowing a larger drawdown to a lower water level by the end of winter.

J. 1997 DROUGHT CONTINGENCY PLAN

The original July 1997 DCP (Drought Contingency Plan) was written as a directive from the 1996 re-licensing to "define drought conditions and set triggers to decrease minimum releases or downstream target flows when drought conditions occur". It outlined two concerns:

- 1) "Wisconsin River flows not protecting water quality " ...the primary Wisconsin River water quality protection criteria is to keep flows above the Q(7,10) flow (1300 cfs at Wisconsin Rapids, 900 at Merrill) if possible.
- 2) "Decreasing minimum releases (from reservoirs) below those specified in Article 404"losing minimum flow protection for the waterways beneath reservoir dams.

The 1997 DCP had one trigger that would initiate a consultation if flow goals could drop below 900 cfs at Merrill or 1300 cfs at Wisconsin Rapids within 1 month if no precipitation were to occur. The only way this would happen is if the reservoirs would be at their minimum required levels—1.2% of capacity for the Big Eau Pleine reservoir at that time (nearly empty) within a month. Thus with the original 1997 DCP there was no concern for the fisheries in the reservoirs. In fact, one of the "possible options" listed to keep river flows up is "increasing the drawdowns

of the man-made reservoirs beyond what is specified in the operating rules”. What the original DCP in effect says is the reservoir environments and fisheries would essentially be sacrificed to maintain flows in the water bodies below the reservoir dams and the Wisconsin River to protect them.

Further evidence that the original 1997 DCP was not written to protect the BEP fishery is the fact that the DCP trigger was not hit in 2008 prior to the 2009 fish kill. That was during the peak of the extended drought. The BEP reservoir was only 22% full on December 1, 2008. There was a consultation only because several of the lake groups voiced great concern about the extremely low reservoir levels in the fall of 2008.

K. 2011 MODIFIED DROUGHT CONTINGENCY PLAN

Due to BEPCO and other lake association 2011 license review comments, WVIC made changes to the DCP in 2011. A third concern was added at BEPCO’s request “low water levels in reservoirs that could adversely affect the reservoir fishery”. Plus 3 new triggers were added, requested by groups other than BEPCO, that would further define drought conditions and trigger consultations. BEPCO sees that the 2011 DCP new triggers add little value toward protecting the fishery on the BEP.

At the 2011 license review WVIC says in their response p18 “The Drought Contingency Plan is the mechanism for managing Wisconsin River flows and reservoir water levels during drought events. It provides the decision making process for addressing drought situations. Changing reservoir operations is not the mechanism and would preclude the very purpose of the Plan.” As discussed above, the original purpose of the 1997 DCP was to protect the environments of the Wisconsin River and the waterways beneath the reservoir dams, at the expense of the reservoir environments if necessary. So yes, BEPCO feels that the very purpose of the DPC as written is detrimental to the BEP fishery. It needs to change by changing reservoir operations if necessary. WVIC did indeed make changes to the DCP in 2011 by adding triggers, but has not provided the analysis to show how the new 2011 triggers provide improved fishery protection for the BEP. The new triggers should stay in place if they benefit the rest of WVIC’s system, but they are not sufficient for the BEP.

WVIC on page 18: “That the seven-year drought (2003-2009) was extreme resulting in the 2009 fish kill is clear. It does not seem necessary however to impose a significant change in Eau Pleine Reservoir operations based on this one rare event” “The new triggers were set based on lessons learned during the 7-year drought of 2003-2010...” It is not just the 2009 fish kill that concerns BEPCO. It is all 6 fish kills that have occurred since 1981 with the current operating system that utilizes the aerator in winter. All it takes is a single dry summer and fall. Dry summers happen pretty frequently and all the fish kills are associated with relatively dry summers and low water levels going into winter. With the current DCP and operating methods, single dry summers such as 2012 remain very susceptible to water levels below 60% full going into winter and fish kills.

WVIC claims on pages 18 and 21 in their 2011 responses that the new DCP triggers “will help mitigate the possibility of low water levels and the associated impact of BOD and COD on dissolved oxygen.” WVIC is acknowledging that low water levels are associated with oxygen depletion. “The new triggers will allow WVIC to identify both long-term and short-term droughts much faster in the future and initiate consultation with the agencies before potential

environmental problems occur.” BEPCO questions that the triggers are timely enough to assure sufficient water levels. The DCP is reactive by its design. It seeks to flag drought conditions (the triggers) after they have occurred. Then consultations with unspecified actions needing discussion result in further delays.

L. 2013 FISH KILL AND THE DCP ACTION OPTIONS

An example of how the new DCP triggers work are the 2012 consultations prior to the 2013 fish kill. The DCP triggers hit in 2012 “did not” protect the BEP fishery in the winter of 2013—just 3 years ago. The 2011 revised Drought Contingency Plan was in place. WVIC’s “May 2016 draft” of the Article 421 Operating Plan Status Report and Review, pages 8 and 9, states:

“Based on the requirements of trigger events in the DCP, the following consultations occurred during the 2011-2015 period.

Wisconsin River Natural Flow Triggers

During August and September 2012, the Wisconsin River experienced low flows because of a hot, dry summer and low groundwater levels (hence low base flows) that was a carry-over from the 2003-2012 drought. Prior to the consultation meeting, in late August, WIC reduced target river flows to the allowable minimums prescribed in its FERC license. (This was required by the rule curves) Despite lowering flows to these Q₁₀ levels, there was not sufficient reservoir storage to maintain these flows through the winter. (There is no requirement to maintain these river flows past October 31) WVIC proposed to lower the target flows from 900 to 750 cfs at Merrill and from 1300 to 950 cfs at Wisconsin Rapids in order to conserve reservoir storage for the winter.

During a consultation meeting on October 5, 2012, previous reductions in target flows were discussed. Similar consultations resulted in lowered target flows in 2009 (The river flow at Wisconsin Rapids was never taken below 1300 during the summer before the 2009 fish kill) and similar flow reductions had also occurred in 1976 and 1988-89. Under WIC’s old license, consultation with the agencies was not required at that time.

The resource agencies expressed concerns that further lowering of the target flow may adversely affect Wisconsin River water quality and may be harmful to mussel populations. Minimum flow reductions at WIC’s Rainbow and Spirit Reservoirs at the same ratios as the main Wisconsin River cuts were also discussed to conserve storage in those reservoirs due to their Index Levels being the lowest of the five reservoirs.

No final decisions were made during the meeting as not all parties were able to attend. However, soon after runoff events occurred and the consultation was no longer required.”

According to WVIC’s email (attachment D) 3 triggers were hit in 2012. WVIC did consult at least 2 times per the discussion above. No actions were taken. The Wisconsin River flow was already at the minimum at the time of the first consultation. The BEP reservoir level on December 1 was 48% full. The process is terribly reactive when a proactive approach could be taken to protect the Big Eau Pleine fishery. Oxygen tests were near 0 by the end of winter. There was another fish kill during the winter of 2013.

Section 3.1.2 of the DCP presents the “Possible Options During Extreme Drought”:

- Reducing flow goals to Q(7,10) (1300 cfs at Wisconsin Rapids) or lower earlier than specified in the operating rules and thus conserving reservoir storage for use later in the drought.
- Increasing the drawdowns of the natural-lake reservoirs beyond what is specified in the operating rules.
- Increasing the drawdowns of the man-made reservoirs beyond what is specified in the operating rules.
- Requesting operators of hydro plants with large reservoirs to institute drawdowns to augment river flow.
- Simply allow flows to drop below Q(7/10).

Within all these possible options, only one action would benefit the Big Eau Pleine fishery, that is to reduce flow rates in the Wisconsin River, reducing BEP reservoir water release rates sooner and thus keeping the reservoir level higher. Since more water in the reservoir is the only possible action that is positive for the BEP fishery, why bother with the delays of the triggers and consultations? Why not just be proactive and integrate the water level needs into the operations plan to keep the water level up to begin with? (Obviously the answer is because that action potentially reduces hydropower generation.)

M. 2016 LICENSE REVIEW AND THE DROUGHT CONTINGENCY PLAN

Beginning in 2011 BEPCO has several times asked, and have not yet seen complete back testing as to how the new DCP triggers can get the results that WVIC claims they will (quoted near the bottom of p7 above). On page 8 of BEPCO’s comments to WVIC & FERC at the 2011 license review under “Article 409—Drought Contingency Plan” we first asked these types of questions.

- What scientific methods or data analysis was used to show that hitting any of these triggers is associated with fish kills? (the back testing)
- What specific dates in what years would these triggers have been hit?
- What were the reservoir water levels (elevations) at those times?
- What were the Wisconsin River flows at those times?
- What options were available to mitigate the potential for fish kills?

Responses were finally received from WVIC in May and June of 2016 in an email. **SEE ATTACHMENT 4.** The included table indicates which years that which triggers would have been hit going back to 1996. But the response still does not answer the questions on specific dates, specific BEP reservoir elevations and specific Wisconsin River flow rates on the dates that triggers are hit. WVIC also indicated they plan to make modifications to the 3 existing triggers in 2016. The very same questions apply to the proposed 2016 modified triggers.

That emailed table shows that triggers indicating “drought conditions” requiring consultations would have been hit in 14 of the last 20 years. A total of 29 triggers would have been hit. It appears having lots triggers that initiate lots of consultations is a measure of success? The measure of success for the BEP should be; NOT having a fish kill. The 2011 DCP with its new triggers failed in 2013. With the 2016 modified DCP, BEPCO fully expects fish kills to continue to happen in the future. The triggers are hit too late. Then there are delays with consultations. There are no prescribed actions. Most importantly, the WVIC proposed 2016 DCP does not address the one correlation that data shows to be important to fish kills, which is to provide 60% water level at the start of winter (December 1).

N. BEPCO PROPOSED NEW DCP TRIGGER

BEPCO suggests that WVIC try to provide 60% minimum volume on December 1 by some other means if they will not adopt it within their operating rule curves. This will allow trying it without the commitment of having its requirements integrated into the operating rule curves. We propose for consideration an additional trigger whose goal is to provide 60% water volume December 1. If WVIC has a different trigger proposal than BEPCO's that would target this water volume, that would be acceptable.

Specifically the following series of minimum water levels during June through December could be added into the Drought Contingency Plan as triggers for consultation. The outcome/goal of those consultations would be to adjust Wisconsin River flow targets at Wisconsin Rapids as needed to target 60% remaining volume in the Big Eau Pleine reservoir on December 1, while still maintaining a minimum of 1300 cfs flow rate in the Wisconsin River at Wisconsin Rapids through October 31, while maintaining the minimum required reservoir releases, and without changing operations of reservoirs to the north from what they otherwise would be. A new approach targeting 60% reservoir volume December 1 deserves at least a trial because the statistical evidence is so strong that it is likely to work.

-90% full June 1

-85% full July 1

-80% full August 1

-75% full September 1

-70% full October 1

-65% full November 1

-60% full December 1

BEPCO's "2008 Rerun..." study referenced earlier indicates that in a dry summer reservoir releases need to be decreased as soon as early July while the reservoir level is still above 80% full to provide for a 60% level December 1 goal.

O. REQUIRE SIMILAR LEVEL OF FISHERY AND ENVIRONMENTAL PROTECTION FOR BIG EAU PLEINE RESERVOIR AS THE WISCONSIN RIVER HAS.

WVIC's operating license rule curves integrate in required 900 cfs (Merrill) and 1300 cfs (Wisconsin Rapids) minimum flow rates in the Wisconsin River from April through October. The purpose is to protect the Wisconsin River fishery and environment. This water flow rate was calculated 1996 according to the EIS as being the minimum necessary during the warmer months of the year to assimilate pollutants in the river. The major pollutants are DNR permitted point-source discharges from municipalities and industry. These pollution discharges are not within WVIC's control.

The WVIC operations license also has integrated in requirements for minimum gate openings or flow discharge rates on all reservoir dams at all times to protect the fishery and environment of the rivers between the dams and the Wisconsin River.

The WVIC operations license also has built in environmental protections for the natural lakes. These are much tighter restrictions on minimum and maximum water levels. This keeps those lakes more "natural" and protects their environments.

All of these “built into the operating license” environmental protections are restrictions on WVIC’s right to use water when and as desired. These restrictions result in significant reductions in the amount of hydropower that could otherwise be generated. There is much discussion about these “built into the operating license” environmental protections for the rivers and natural lakes in the 1996 Environmental Impact Statement.

Why should the Big Eau Pleine not have equal protection for its fishery and environment? The Big Eau Pleine reservoir is the only part of the entire Wisconsin River watershed within which WVIC operates that is allowed to suffer chronic fish kills. Excessive non-point source nutrient runoff from the Big Eau Pleine watershed is not within WVIC’s control. Just as the point-source industry and municipality pollutants on the Wisconsin River are not within WVIC’s control. Yet WVIC is forced to mitigate pollution in the Wisconsin River through the required minimum flow rates at Merrill and Wisconsin Rapids. A start of winter minimum 60% volume target built into the operating license for the Big Eau Pleine would be expected to mitigate the oxygen robbing pollution. This is based on the scientific analysis of data. The Big Eau Pleine reservoir should be provided an equivalent “built into the operations license” fishery protection as the Wisconsin River has. The only reason not to that we are aware of is hydropower.

P. UWSP OXYGEN DEPLETION MODELING STUDY

In 2014 BEPCO obtained a Wisconsin DNR Lake Planning Grant to fund an oxygen depletion modeling study that is being completed at the University of Wisconsin at Stevens Point. Professor Paul McGinley’s used various data sources including wintertime dissolved oxygen test data from WVIC to input into a modified CE-QUAL-W2 model. Sitting on the Technical Committee overseeing this process were representatives of BEPCO, WVIC, Wisconsin DNR, Marathon County Conservation Planning and Zoning, and the River Alliance of Wisconsin. The UWSP modeling study results find there is a correlation between fish kills and wintertime water levels. The study and the results are largely completed but the report is still undergoing final revisions. BEPCO will forward a copy to FERC when it is completed.

A two-page summary edited for the general public has been made available. **ATTACHMENT 5** is a copy of that summary. A paragraph within that summary states: “The **water level in the reservoir** is important to how the oxygen concentration drops during the winter. The model can be used to estimate how different water levels would have affected the oxygen concentrations. For example, Figure 3 shows how, using characteristics of the 2013 winter, higher starting water levels at the start of winter would decrease the number of days that the average oxygen concentration is low. For example, starting the winter at 60% full, would result in almost ten more days where the dissolved oxygen would be greater than 2 mg/l than starting at 45% full.”

From the Technical Committee came a number of unanimously arrived at recommendations. Those recommendations are also not final pending issuing of the final report. Two important recommendation currently state:

1) “Adaptively manage water levels to maintain Big Eau Pleine Reservoir water levels as high as is practical, and for as long as possible in advance of the winter drawdown. According to the CE-QUAL-W2 modeling results, “starting the winter at a higher water level increases the average dissolved oxygen concentration near the dam late in the winter” and will “decrease the severity but not guarantee the prevention of late-winter anoxia.” At the onset of most winters (December 1), greater volume equates to more dissolved oxygen to support the fishery

throughout the winter, prolonging the onset of anoxia. Also, “holding the starting elevation longer into the winter could also delay reaching lower average dissolved oxygen concentrations”.

2) Using the Aeration Decision Matrix developed under Recommendation 3, adaptively manage aerator operations to determine and optimize which operational practices best maximize the wintertime zone of refuge for fish within and downstream of the aeration zone. The model shows that turning on the aerator earlier can increase the wintertime dissolved oxygen in the zone of refuge downstream of the aerator, and increases the chances of protecting fish. To the extent possible, this Committee recommends evaluating earlier start dates for the aeration system...”

BEPCO will also send a copy of these Technical Committee recommendations to FERC once they are completed.

Q. SUMMARY AND BEPCO RECOMMENDATIONS

WVIC has a strong presence and a large impact on the north-central Wisconsin communities through recreation and fishing on the system of 21 reservoirs that it manages. On behalf of the central Wisconsin communities BEPCO requests that WVIC strongly consider changing their operations on the BEP, doing what it can, using all the information available, to stop fish kills on the Big Eau Pleine reservoir. The increased recreational and economic value to the community would be huge.

1. FERC should require studies and adaptive management actions, as prescribed under the CWA, the FWCA, and the “equal consideration” mandate of the ECPA, that definitively determine whether operational changes—including changing the water level regime—can provide adequate dissolved oxygen to protect the fishery on the Big Eau Pleine reservoir.
2. BEPCO requests that WVIC change operations to target 60% minimum level in the BEP reservoir each year on December 1 as a shorter term solution proactive approach to minimizing the risk of fish kills. This is until the longer term solution of excess nutrient runoff is fixed. The reactive approach utilizing the WVIC proposed 2016 Drought Contingency Plan is not likely to work because it does not support that water volume. There is an undeniably strong correlation between water levels and fish kills both through historical data and through the UWSP oxygen depletion modeling study.
3. If WVIC feels that triggers within their Drought Contingency Plan are the preferred method to “minimize the potential for fish kills” then we propose they develop triggers that can target to provide 60% water volume at the start of winter.
4. WVIC should be required to present a scientific analysis to show how the triggers in the Drought Contingency Plan triggers are associated with fish kills. This could be an analysis similar to what BEPCO has done that shows water level on December 1 is highly associated with fish kills. WVIC claims the triggers “will help mitigate the possibility of low water levels and the associated impact of BOD and COD on dissolved oxygen.” “The new triggers were set based on lessons learned during the 7-year drought of 2003-2010...”. “The new triggers will allow WVIC to identify both long-term and short-term droughts much faster in the future and initiate consultation with the agencies before potential environmental problems occur.”
5. BEPCO still wants answers to our questions about the dates when each trigger has been hit historically. What specific dates in what years were the triggers hit? What were the reservoir water levels or elevations at those times? What were the Wisconsin River flows at those times? What options were available to mitigate the potential for fish kills in the BEP reservoir?
6. WVIC should be required to provide a similar level of environmental and fishery protection integrated into its operating rule curves for the Big Eau Pleine reservoir as the Wisconsin River, and the waterways below each reservoir dam and the natural lakes. This is discussed in the section titled “Require similar level...”.

7. BEPCO requests that all water-level triggered required agency consultations, such as those required within the Drought Contingency Plan, be posted on WVIC's website immediately after the consultation. Postings should be left up for one year minimum. This should include what was discussed, who was in on the discussion, the decisions and the action steps. The public should know in a timely manner what is going on with THEIR fishery and how decisions being made may impact recreation and the fishery.
8. BEPCO request that lake associations such as BEPCO be allowed to comment on WVIC's Fish and Wildlife Management Plan (FWLP). In 2011 BEPCO requested that WVIC document wintertime operations of the Big Eau Pleine reservoir including discussions about the aerator. To their credit WVIC did this in an extensive write-up in 2011. Also within the FWLP is where WVIC reports and discusses fish kills to FERC. The information and discussions about these and other topics such as water quality and farmland runoff should also be open to BEPCO and public comment within the FWLP.
9. BEPCO requests that all fish kills be reported and discussed with their Annual Operations Report to FERC. Currently they are only reported within the Fish and Wildlife plan updates, which are required at 5-year intervals. Fish kills are too critical of an event occurring all too frequently on the Big Eau Pleine flowage and they deserve reporting and discussion on a more timely basis.
10. WVIC, BEPCO, WDNR, Marathon County, River Alliance of Wisconsin, University of Wisconsin Stevens Point must continue to cooperatively invest in continued research into the correlations between runoff pollution, water levels and fish kills.
11. BEPCO currently supports all the recommendations from the pending UWSP modeling study. Two key recommendations from the Technical Advisory Committee state: A) Adaptively manage water levels to maintain Big Eau Pleine Reservoir water levels as high as is practical, and for as long as possible in advance of the winter drawdown. B) Develop and use an Aeration Decision Matrix to adaptively manage aerator operations to determine and optimize which operational practices best maximize the wintertime zone of refuge for fish within and downstream of the aeration zone. We would like to see FERC support these recommendations.

Attachment 1

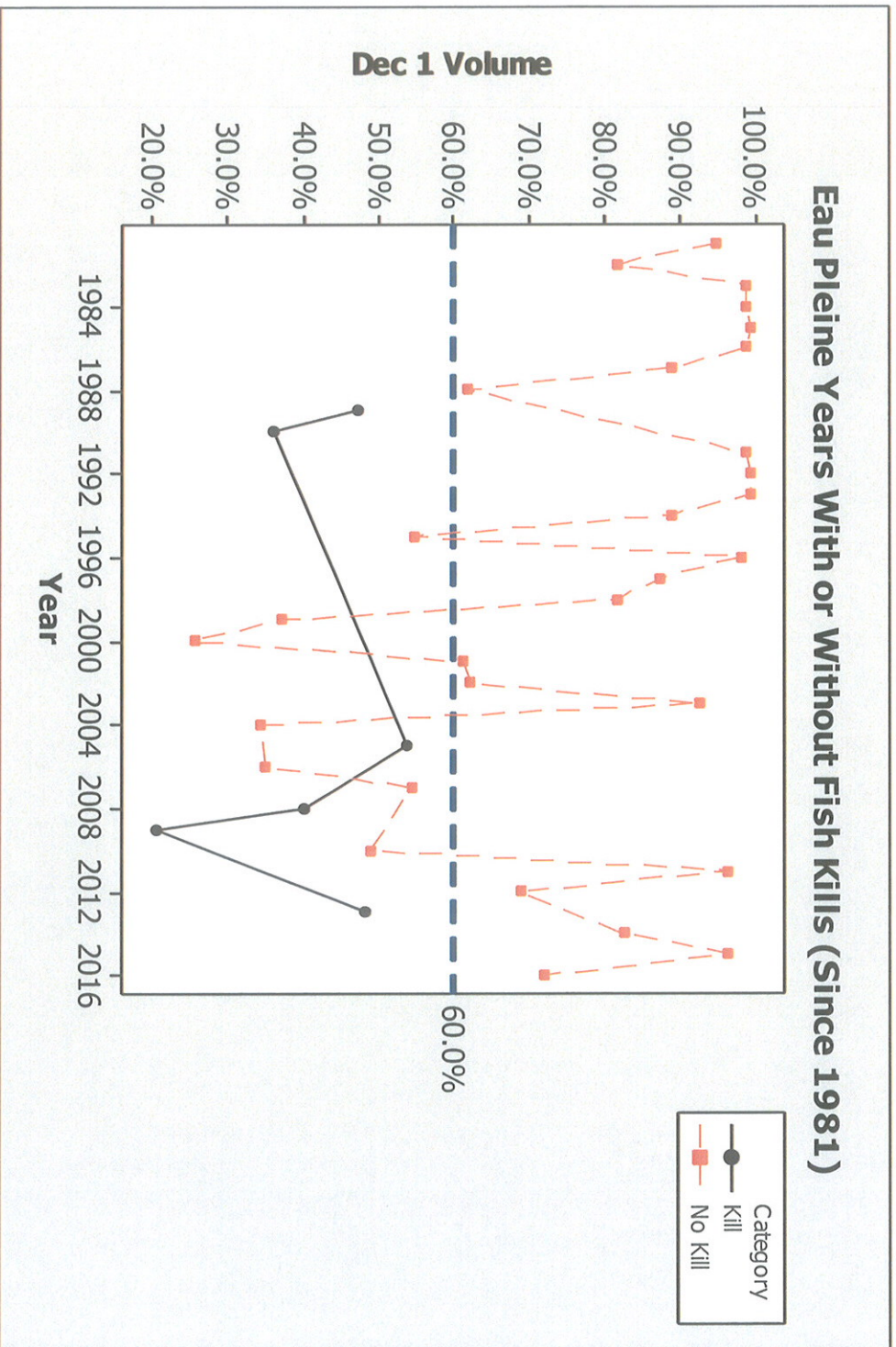
Wisconsin Valley Improvement Company
Eau Claire Reservoir Operations

2016 Statistics Analysis

No	Year	Category	Ft Below Full at Freeze Up	Dec 1 Volume	Dec 1 Category	Projected Stratford Base Flow	Runoff Events	Date 1135 Reached	Month & Day 1135 Reached	Max Drawdown Volume	Delta Volume	Max Drawdown Date	Month & Day of Max Drawdown	Mgmt Category	
1	1970	Kill	9	46.7%	<60%	11	0	12/28/1969	363	1118.8	3.1%	43.6%	2/19/1970	51	Pre 81
2	1971	No Kill	2.1	85.8%	>60%	14	4	2/5/1971	36	117.3	2.0%	83.8%	3/5/1971	64	Pre 81
3	1972	No Kill	4.5	70.8%	>60%	15	3	1/1/1972	1	118.9	3.2%	67.6%	2/28/1972	59	Pre 81
4	1973	No Kill	0.1	99.1%	>60%	24	3	2/23/1973	55	1129.7	22.1%	77.0%	3/5/1973	65	Pre 81
5	1974	Kill	11.2	37.2%	<60%	9	0	9/13/1973	257	1120.3	4.5%	32.7%	3/3/1974	63	Pre 81
6	1975	Kill	11	37.9%	<60%	6	0	11/10/1974	315	1117.3	2.0%	35.9%	2/7/1975	38	Pre 81
7	1976	Kill	6.4	59.9%	<60%	13	4	1/28/1976	28	1115.8	1.2%	58.7%	3/10/1976	70	Pre 81
8	1977	Kill	15.9	21.5%	<60%	1	0	9/9/1976	253	1115.7	1.2%	20.3%	1/31/1977	32	Pre 81
9	1978	No Kill	4.7	69.6%	>60%	10	3	2/20/1978	52	1123.7	9.1%	60.5%	3/23/1978	83	Pre 81
10	1979	No Kill	1.2	91.8%	>60%	17	1	2/17/1979	48	1124.7	10.8%	81.0%	3/19/1979	78	Pre 81
11	1980	Kill	0.5	96.4%	>60%	8	5	2/23/1980	54	1125.7	12.7%	83.7%	3/19/1980	79	Pre 81
12	1981	No Kill	0.8	94.4%	>60%	6	0	2/4/1981	46	1134.4	37.9%	56.5%	2/17/1981	49	81 & After
13	1982	No Kill	2.8	81.4%	>60%	12	2	2/7/1982	39	1126.3	13.9%	67.5%	3/18/1982	78	81 & After
14	1983	No Kill	0.2	98.5%	>60%	29	6			1137.3	55.1%	43.4%	3/1/1983	60	81 & After
15	1984	No Kill	0.2	98.5%	>60%	30	4			1138.4	51.0%	47.5%	2/13/1984	44	81 & After
16	1985	No Kill	0.1	99.1%	>60%	19	6			1138.4	56.7%	42.4%	2/23/1985	55	81 & After
17	1986	No Kill	0.2	98.5%	>60%	25	2	3/5/1986	65	1131.2	26.5%	72.0%	3/18/1986	78	81 & After
18	1987	No Kill	1.7	88.5%	>60%	16	0	2/14/1987	45	1132.1	29.5%	59.0%	3/7/1987	66	81 & After
19	1988	No Kill	6.1	61.6%	>60%	12	4	2/28/1988	59	1133.6	34.8%	26.8%	3/9/1988	69	81 & After
20	1989	Kill	8.9	47.2%	<60%	6	1	1/13/1989	14	1129.6	21.8%	25.4%	3/24/1989	84	81 & After
21	1990	Kill	11.5	36.0%	<60%	2	0	10/26/1989	300	1131.3	26.9%	9.1%	3/8/1990	68	81 & After
22	1991	No Kill	0.2	98.5%	>60%	13	2	2/27/1992		1136.2	45.8%	52.7%	3/19/1991	78	81 & After
23	1992	No Kill	0.1	99.1%	>60%	15	5	2/27/1992	58	1132.8	31.9%	67.2%	3/5/1992	65	81 & After
24	1993	No Kill	0.1	99.1%	>60%	10	4	2/27/1993	59	1124.8	11.0%	88.1%	3/25/1993	85	81 & After
25	1994	No Kill	1.7	88.5%	>60%	14	1	4/8/1994	99	1134.1	36.8%	51.7%	4/13/1994	104	81 & After
26	1995	No Kill	7.4	54.6%	<60%	8	1	2/6/1995	37	1128.1	17.9%	36.7%	3/12/1995	71	81 & After
27	1996	No Kill	0.3	97.8%	>60%	22	1	2/25/1996	56	1129	20.2%	77.6%	3/16/1996	76	81 & After
28	1997	No Kill	1.9	87.1%	>60%	14	2	3/10/1997	70	1131.3	26.9%	60.2%	3/26/1997	86	81 & After
29	1998	No Kill	2.8	81.4%	>60%	14	0	3/31/1998	248	1131.4	27.2%	54.2%	2/19/1998	51	81 & After
30	1999	No Kill	11.3	36.8%	<60%	7	1	9/4/1998	91	1128.6	19.0%	17.8%	3/17/1999	76	81 & After
31	2000	No Kill	14.6	25.3%	<60%	7	1	10/20/1999	293	1128.3	13.9%	11.4%	2/25/2000	56	81 & After
32	2001	No Kill	6.2	61.0%	>60%	8	0	1/30/2001	31	1129.7	22.1%	38.9%	3/22/2001	82	81 & After
33	2002	No Kill	6.1	62.1%	>60%	58	2	2/10/2003		1136.7	48.1%	14.0%	2/19/2020	50	81 & After
34	2003	No Kill	1.1	92.4%	>60%	7	1	9/26/2003	41	1130.1	23.2%	69.2%	3/15/2003	74	81 & After
35	2004	No Kill	1.2	34.1%	<60%	6	3	2/25/2005	269	1128.8	19.7%	14.4%	3/2/2004	62	81 & After
36	2005	Kill	7.6	53.6%	<60%	33	3	2/25/2005	57	1132.1	29.5%	24.1%	3/27/2005	87	81 & After
37	2006	No Kill	11.8	11.8	<60%	18	0	9/2/2005	246	1129.3	21.0%	13.8%	3/11/2006	71	81 & After
38	2007	No Kill	7.5	54.1%	<60%	15	1	3/12/2007	71	1134.8	39.6%	14.5%	3/12/2007	71	81 & After
39	2008	Kill	10.5	40.0%	<60%	15	0	11/30/2007	334	1128.6	19.2%	20.8%	3/17/2008	77	81 & After
40	2009	Kill	16.3	20.5%	<60%	10	0	9/9/2008	253	1128.9	19.9%	0.6%	2/10/2009	42	81 & After
41	2010	No Kill	8.6	48.6%	<60%	17		2/8/2010	40	1132.8	31.9%	16.7%	3/9/2010	69	81 & After
42	2011	No Kill	0.6	96.1%	>60%	20		3/15/2011	74	1134.5	38.4%	57.7%	3/17/2011	76	81 & After
43	2012	No Kill	4.8	68.8%	>60%			2/28/2012	59	1134.6	38.8%	30.0%	2/12/2012	43	81 & After
44	2013	Kill	8.8	48.0%	<60%			1/21/2013	22	1134.3	38.0%	10.0%	3/8/2013	68	81 & After
45	2014	No Kill	2.7	82.5%	>60%			3/22/2014	82	1133.8	36.0%	46.5%	3/30/2013	90	81 & After
46	2015	No Kill	0.6	96.1%	>60%					1135.4	47.0%	49.1%	3/8/2015	67	81 & After
47	2016	No Kill	4.3	72.0%	>60%					1140.1	65.6%	6.4%	2/28/2016	59	81 & After

Data per table above. Pre 1981 data was discarded due to change in level management strategy (addition of aerators.)

Are kills less likely if on 12/1 the reservoir is >60% full?

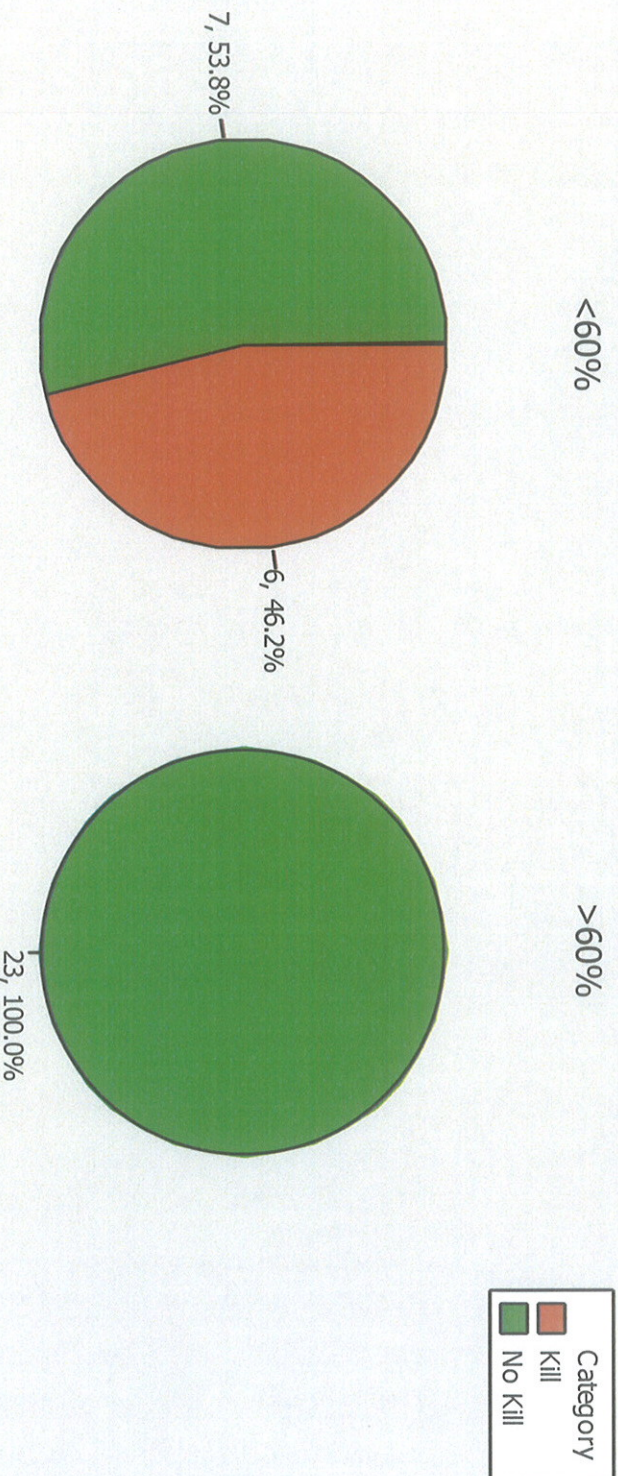


Kills do appear only to occur when the 12/1 level is <60%. However, this isn't true for all years <60%. Why?

Are kills less likely if on 12/1 the reservoir is >60% full?

Eau Pleine Years With or Without Fish Kills (Since 1981)

Mix of Kill to No Kill for Years With 12/1 >60% Volume vs <60% Volume

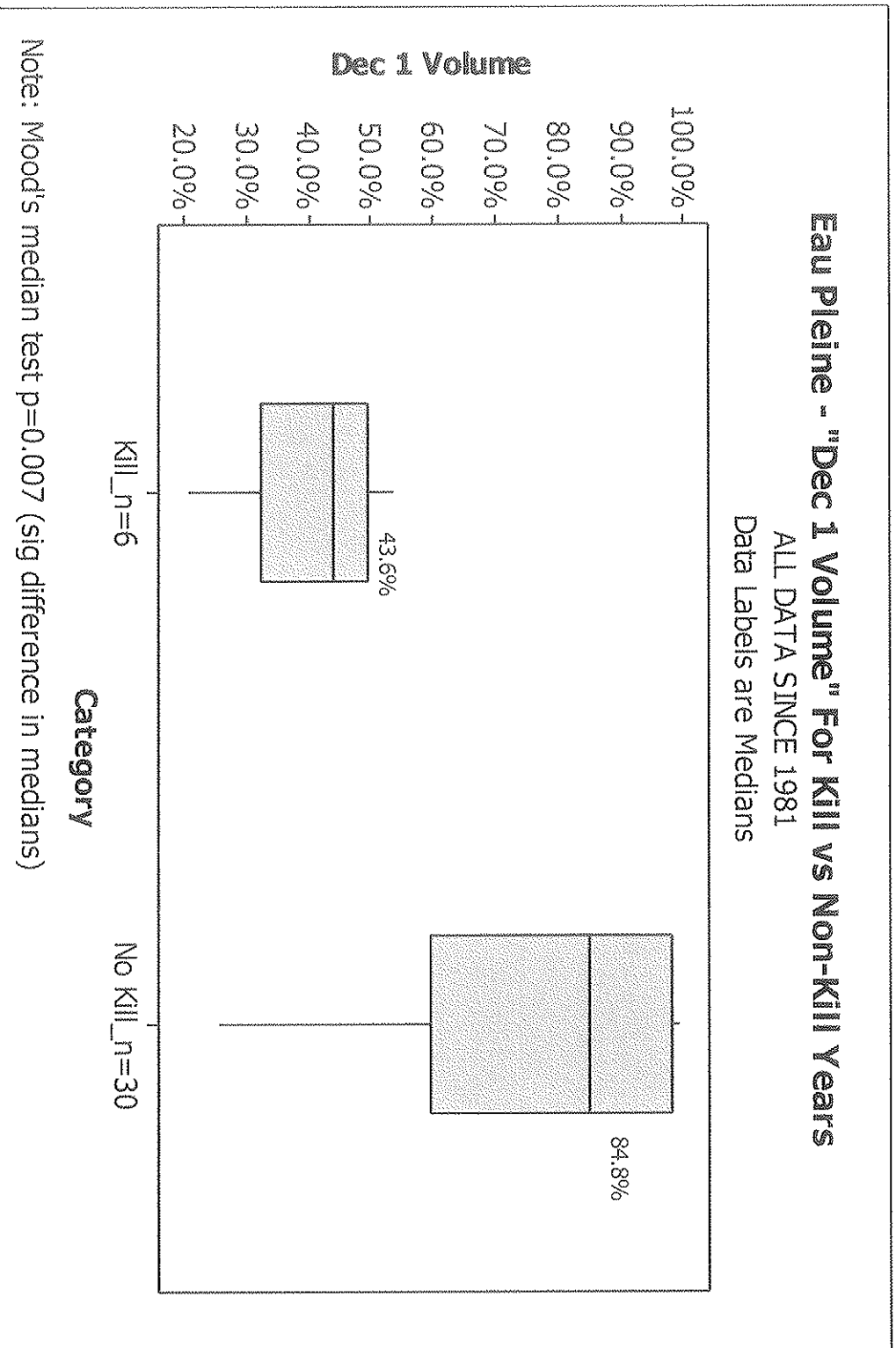


2-proportions test $p=0.001$ (sig difference in proportions)

Panel variable: Dec 1 Category

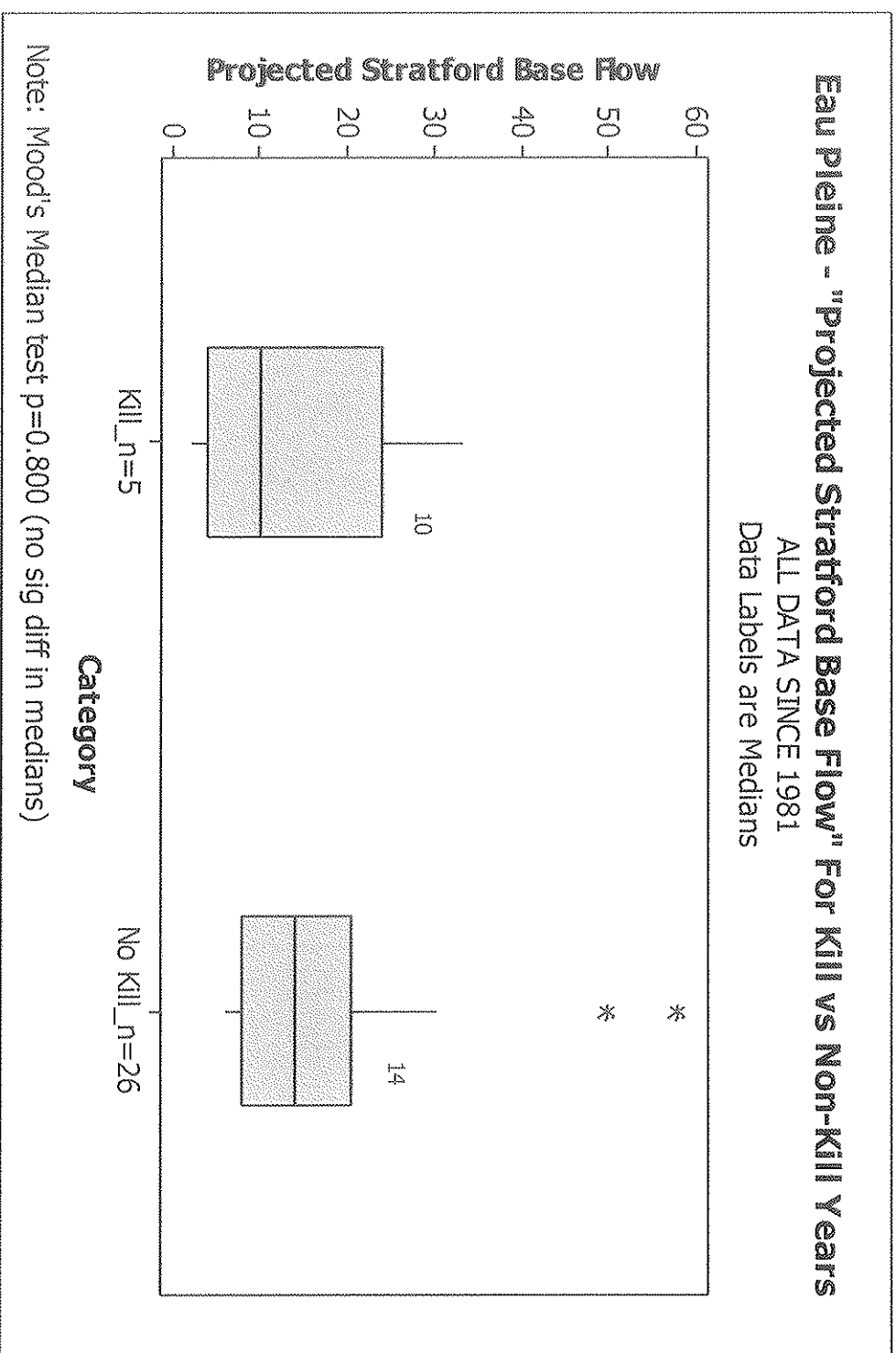
Statistically (99.9% confident) kills are less likely in years where the 12/1 level >60%, though this doesn't necessarily imply causation.

Is there a difference in December 1st reservoir volume in “kill” vs “no kill” years?



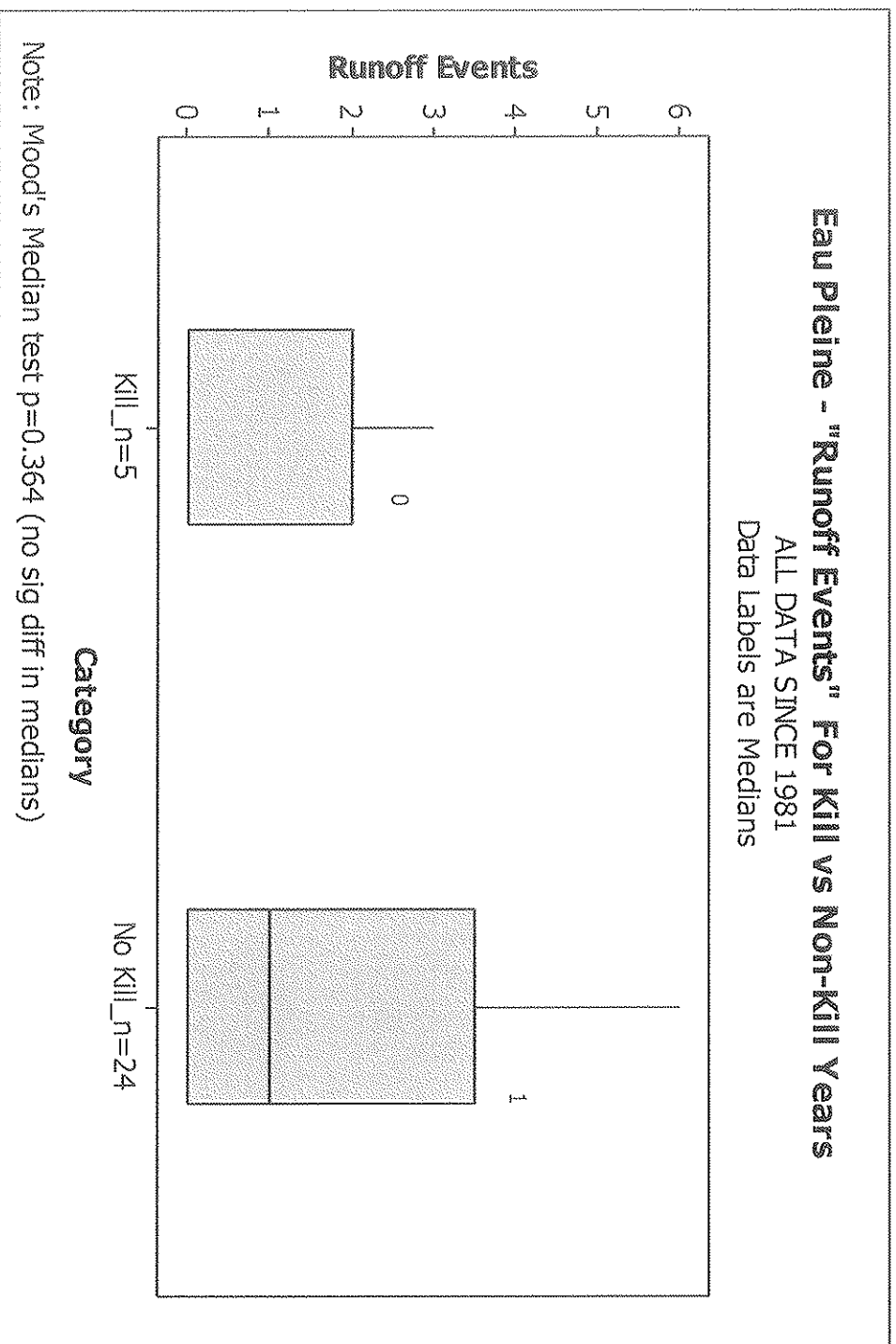
Yes...typical median reservoir levels are almost double for “no kill” vs “kill” years.

Is there a difference in flow rates for "kill" vs "no kill" years?



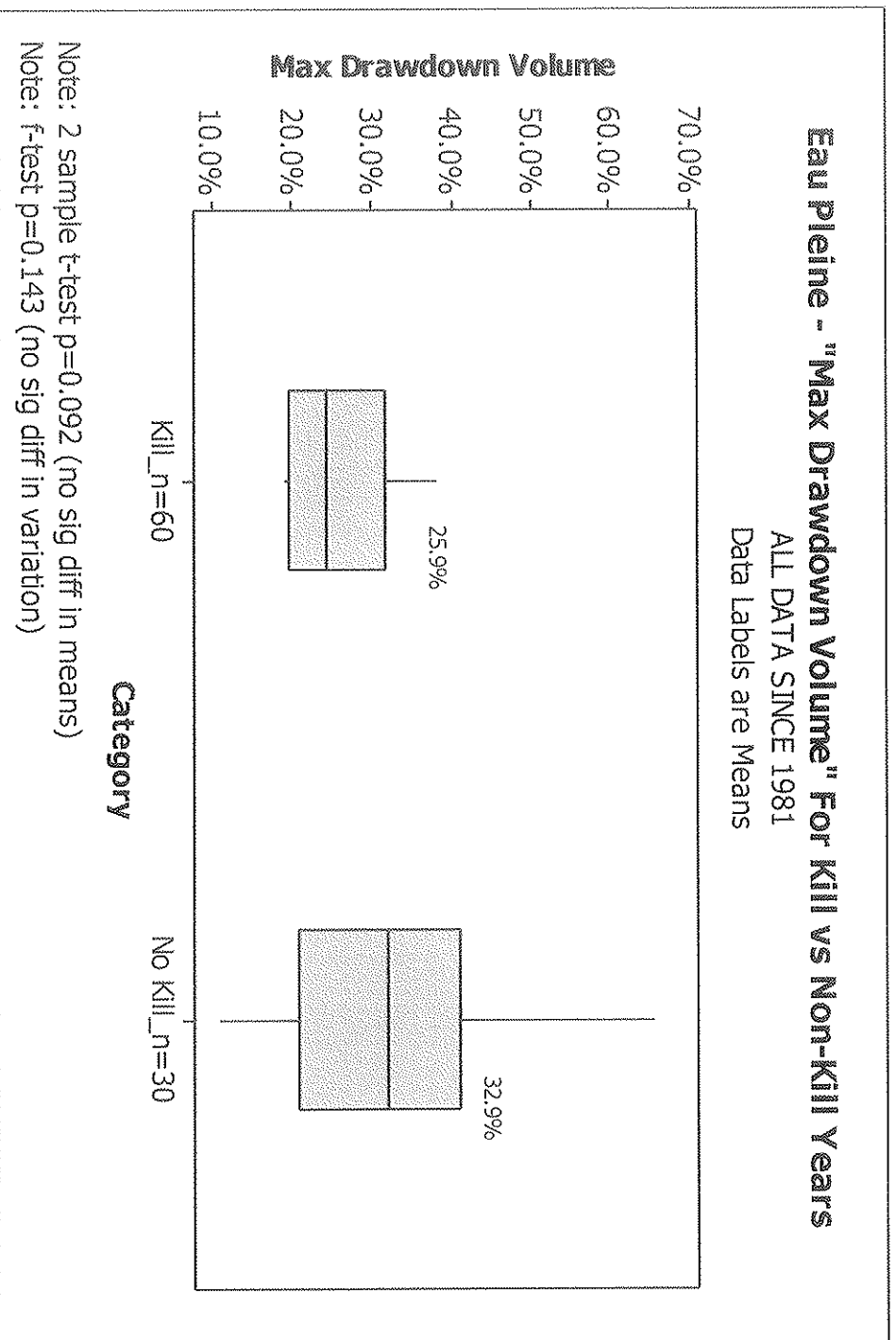
No...the difference in medians is not statistically significant.

Is there a difference in the number of runoff events for “kill” vs “no kill” years?



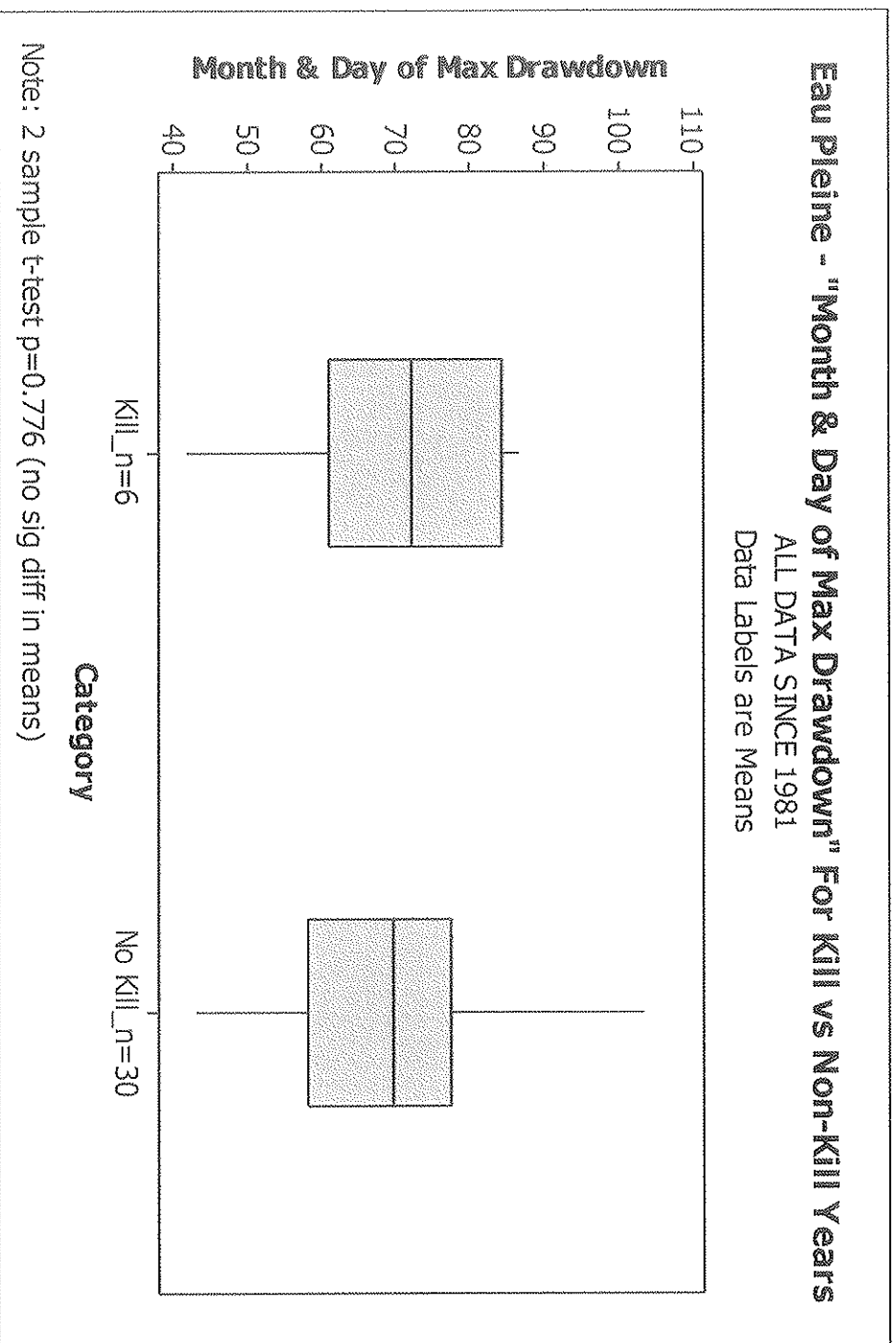
No...the difference in medians is not statistically significant.

Is there a difference in maximum drawdown volume for “kill” vs “no kill” years?



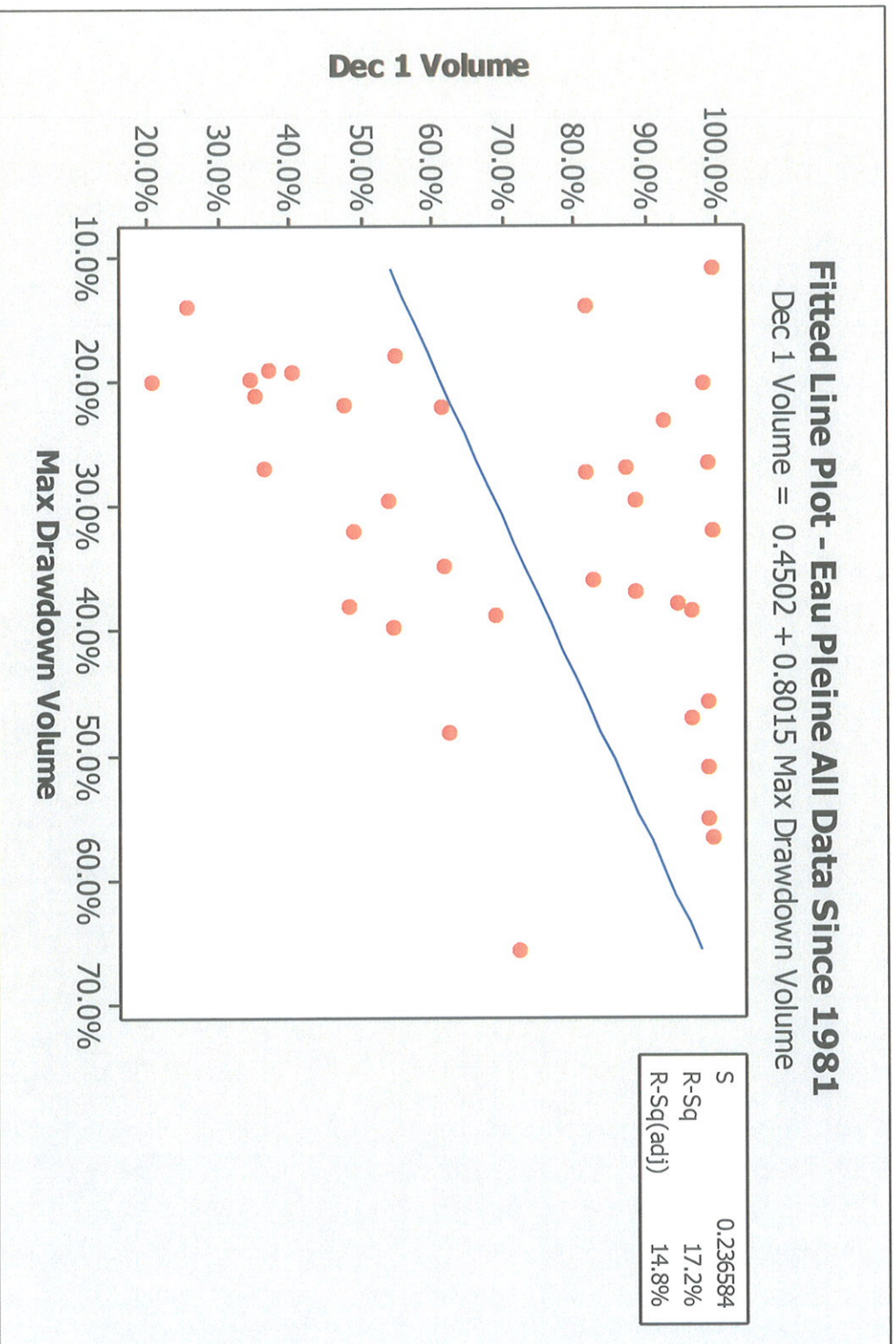
No...the difference in means and variation are not statistically significant. Note this is different then conclusions in 2010 study as that study is believed to have included pre 1981 data.

Is there a difference in the day of the year when maximum drawdown occurred for "kill" vs "no kill" years?



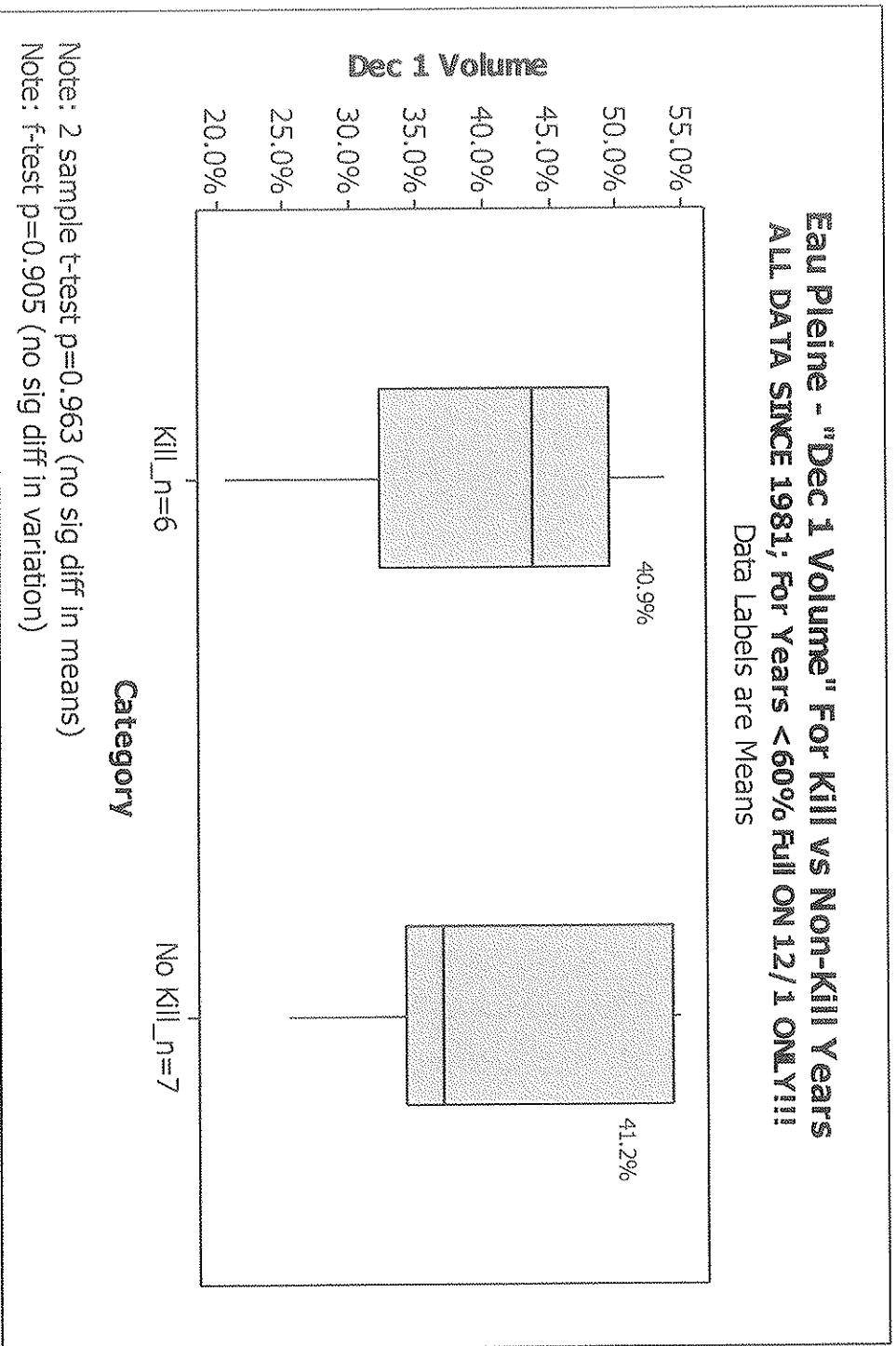
No...the difference in means is not statistically significant.

Is there any correlation between December 1st volume and volume at maximum drawdown?



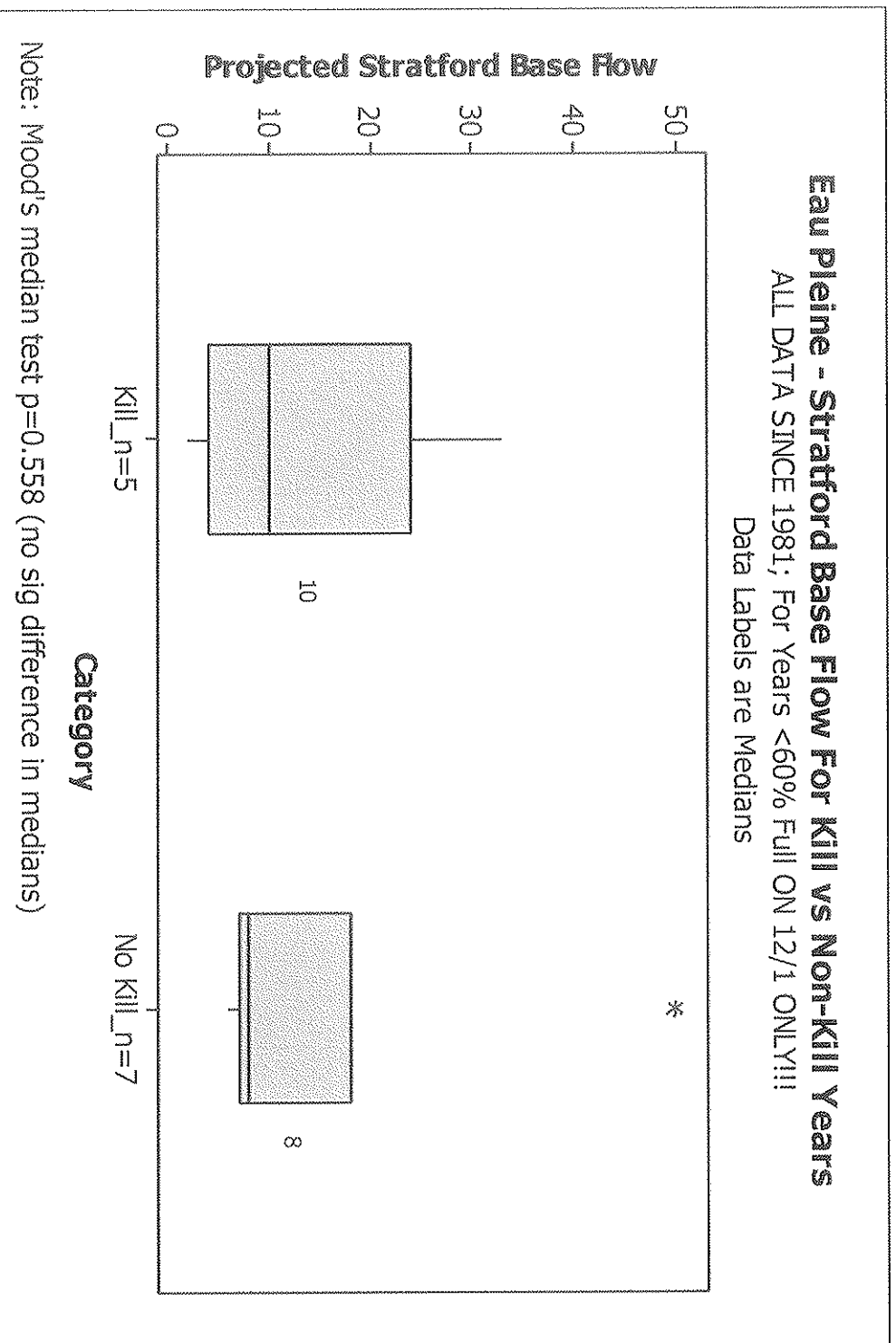
This is basically the same scatterplot as the one on the last page of the 2010 study. There is correlation ($p=0.012$) but it is weak.

If we focus only on the 13 years where the 12/1 reservoir level was <60%, roughly half the time there were fish kills, and half no fish kills. Was there a difference in reservoir levels for “kill” vs “no kill” years?



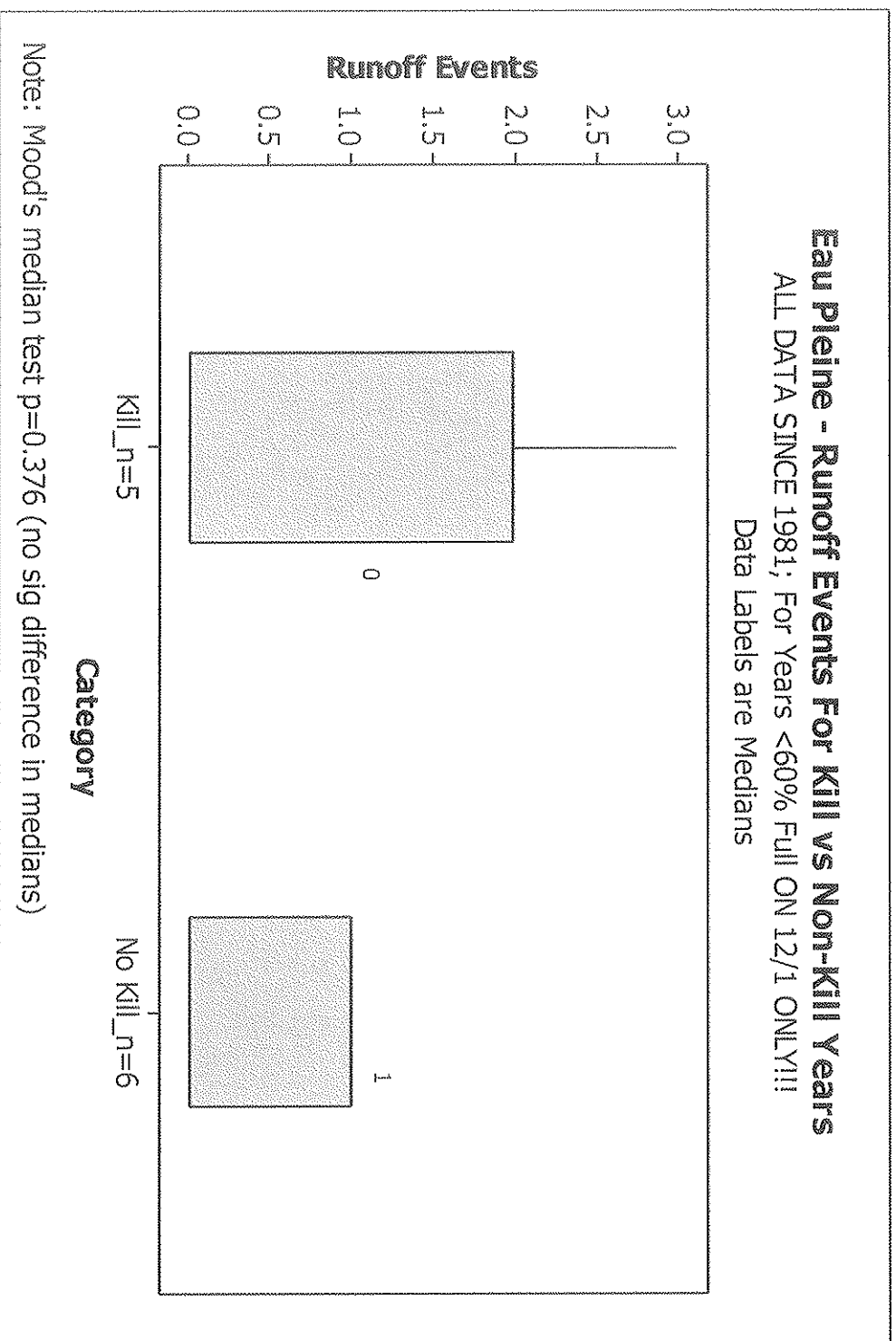
No...there is no significant difference in means, or variation.
What about for the remaining X's?

Focusing only on years where the 12/1 reservoir level was <60%, roughly half the time there were fish kills, and half no fish kills. Was there a difference flows for “kill” vs “no kill” years?



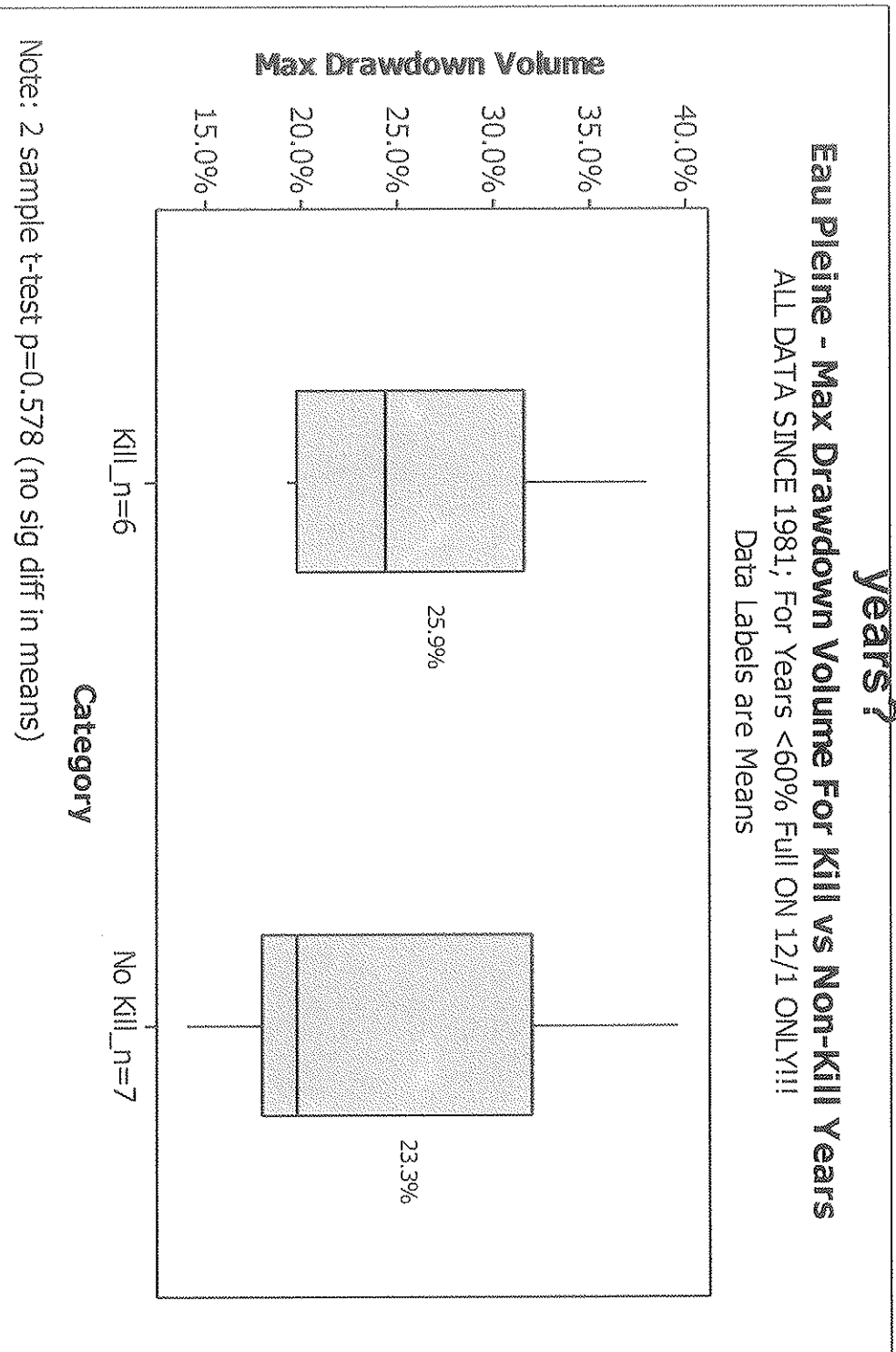
No...there is no significant difference in medians.

Focusing only on years where the 12/1 reservoir level was <60%, roughly half the time there were fish kills, and half no fish kills. Was there a difference in runoff events for “kill” vs “no kill” years?



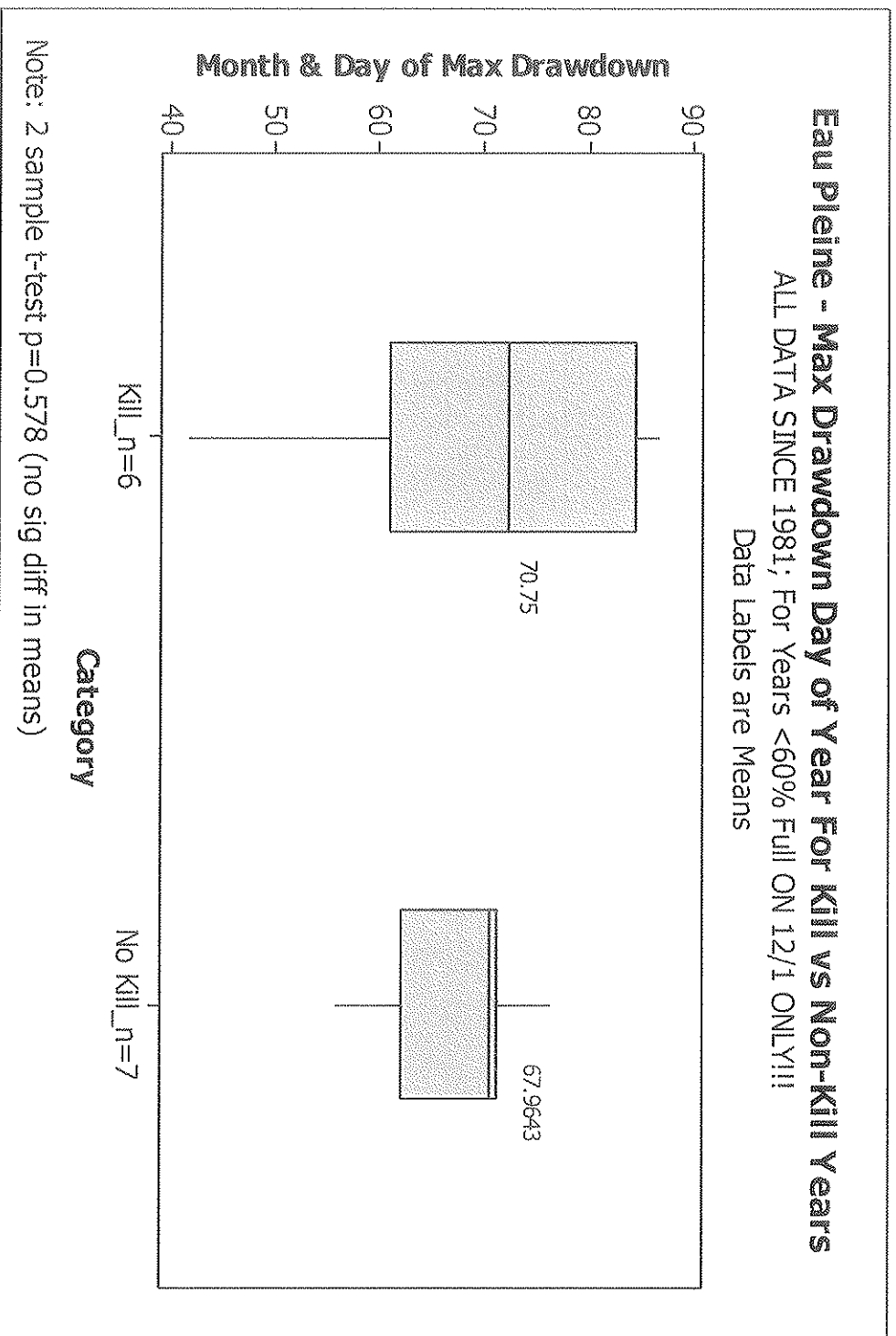
No...there is no significant difference in medians.

Focusing only on years where the 12/1 reservoir level was <60%, roughly half the time there were fish kills, and half no fish kills. Was there a difference in max drawdown volume for "kill" vs "no kill" years?



No...there is no significant difference in means.

Focusing only on years where the 12/1 reservoir level was <60%, roughly half the time there were fish kills, and half no fish kills. Was there a difference in day of year when max drawdown volume was reached, for "kill" vs "no kill" years?



No...there is no significant difference in means.

Attachment 2

36 YEARS OF BIG EAU PLEINE OPERATING HISTORY SINCE THE AERATOR WAS FIRST STARTED

