**Ecological Research Partners LLC**
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December 21, 2012

Duffy Dillon | Attorney
Brennan Steil S.C.
1 E. Milwaukee St.
Janesville, WI 53545

Re: Review Comments on WDNR Environmental Assessment for Proposed New Operation Order for Rest Lake Dam, Manitowish Waters, WI

Dear Mr. Dillon:

This letter contains the overall conclusions and specific comments of Dr. Timothy Ehlinger and Dr. Neal O'Reilly concerning the Environmental Assessment (EA) for Proposed New Operation Order for Rest Lake Dam, Manitowish Waters, WI.

Overall Conclusions:

It is our conclusion that the EA dated September 11, 2012 does not provide an adequate consideration of the potential consequences of the proposed change in management of the water level regime for the Manitowish Waters Chain of Lakes, nor does it provide sufficient scientific analysis to support many of the conclusions reached. The proposed action is a significant and complex issue, and must be evaluated in light of a balanced and critically considered test that weighs both the benefits and negative impacts. The EA under Wisconsin Administrative Code NR 150 is the document that should provide to the public the information used in the balance test and should explain the reasoning for how the issues were balanced. The balance test must weigh the potential benefits to the natural resources with respect to the potential negative impacts to the area residents. The EA does not meet this standard.

First, we feel the EA does not adequately identify and address the potential impacts to riparian residents on the Chain. Our field surveys and examination of aerial photos indicate that the number of piers, boathouses and shoreline structures that will be impacted by the proposed action are underestimated in the EA. As such, the potential costs to the local community to replace these existing shoreline structures are not addressed, and we feel are dismissed by the EA as insignificant when they could actually be in the range of tens of millions of dollars.

Second, the EA appears to be based on the premise that Xcel Energy is unnecessarily holding back water and routinely discharging at the minimum flow required by the current dam order. However, our analysis of the discharge data does not support this claim and in fact during most

months and years since 1973, Xcel is discharging water near the natural flow regime as established by the USGS study used in the EA to determine natural flows.

Third, with respect to ecological benefits we believe that the flows identified in the EA as necessary and sufficient to enhance sturgeon and redhorse populations and other benefits of the project are based on perfunctory science and cursory analysis of limited data. More rigorous tools for modeling flow-dependent habitat quality and quantity are readily available, and given the magnitude and complexity of potential impacts of changes in flow-regime management, they should be applied. The EA is weighted heavily towards benefits of a few target species and does not address impacts to non-target species or the public. The current EA raises more questions than it answers. Before any regulatory decision is made we feel the EA needs to provide a better documentation of all the benefits and impacts of the proposed project. It needs to do a better job of balancing the interests of management for a few select species with the interest of the local residents.

While we agree with the fundamental goals of flow-regime restoration and endorse the underlying principles behind the desire to restore the ecological integrity of Wisconsin's rivers, the Manitowish Waters Chain of Lakes is today a heavy developed artificial waterway; the balance test needs to recognize both the needs of the natural resource with those of the public who are now part of the system. While a pure natural flow-regime makes a lot of sense in an undeveloped watershed, managed flow-regimes needs to be based on both the needs of the resource and the public; the WDNR proposed regime is currently too biased towards the downstream resources. We feel with more rigorously applied science and better data, a balance of both needs could be reached. Unfortunately the EA does not provide the analyses necessary to determine if the proposed action achieves this balance.

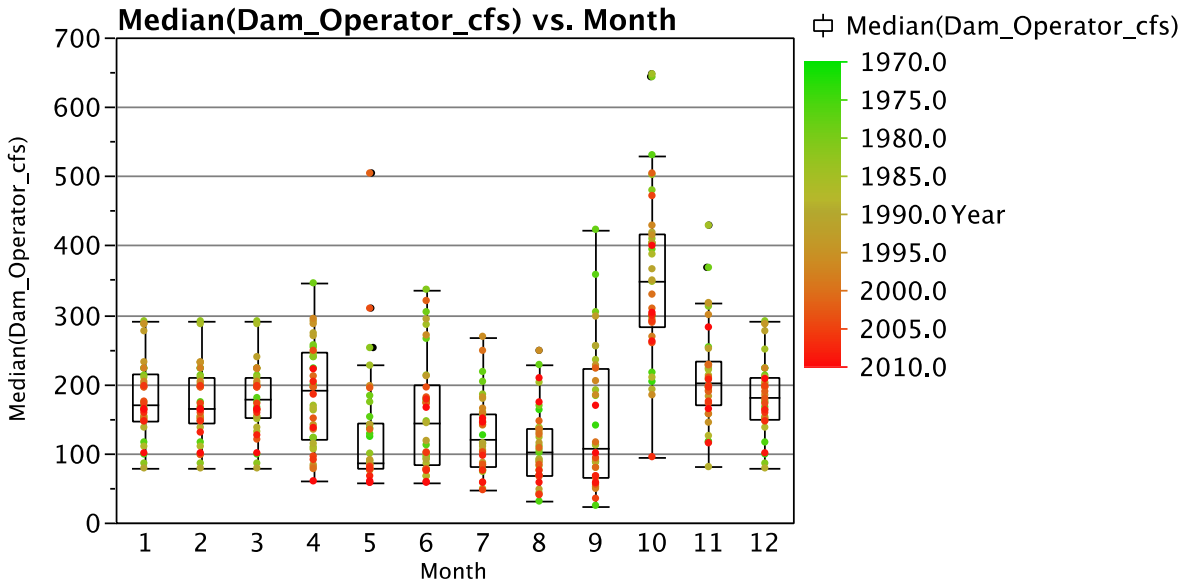
Specific Comments:

The following comments are organized by page number as presented in the EA dated September 11, 2012.

1. Page 3, last paragraph: The second sentence states, "*As the timber resources in the area were depleted, the water stored in the reservoir above the Rest Lake dam began to be utilized for other uses including flood control, navigation, and hydropower generation.*" The paragraph should also state that recreation, such as fishing, boating, sightseeing and swimming, also are important activities that take place on the chain of lakes.

2. Page 7, first paragraph: The EA states, "*When water levels drop below 8' 4", flows over the dam are quickly reduced to minimum flows.*" This entire paragraph and this sentence imply that during the summer season the minimum flow of 40 cfs is routine. However, a review of the data provided by Xcel Energy on historic discharges from December 1973 through November 2011, illustrated in the following figure, show that during most years this drop to 40 cfs does not take place. Of the record of 13,879 days of flows, on only 108 days did flows drop below 40 cfs (0.078% of the time). Fifty six of those days

(52%) were in the drought of 1976 and 48 (44%) were during the drought of 2005. The data does not support this accusation.




3. Page 11, second paragraph: The EA states that the, "*The current maximum water elevation upstream of the dam is measured as 8' 6" on a gage at the Rest Lake Dam which corresponds to an elevation of 1601.0 NGVD (National Geodetic Vertical Datum).*" The USGS report, *Estimation of Natural Historical Flows for the Manitowish River near Manitowish Waters, Wisconsin*, states that the maximum stage is "*1,601.4 ft above NAVD 88*". Which value is correct?

4. Page 19, third paragraph: The text states, "*The one foot contour maps of the lakes on the Chain along with aerial photos taken at a range of water levels provide useful information to show the extent, location, and type of open water aquatic habitat.*" However, the DNR lake survey maps only show 5-foot contours, is this a typo or does WDNR have more specific lake bathometric maps other than those provided?

5. Page 25: The EA states, "*Historic aerial photos and observations made by local people that are familiar with the river suggest that over the last 50 or 60 years, the wetland plant community downstream of the dam has gradually changed from a wetland dominated almost entirely by wet meadows to a wetland dominated with scrub/shrub species in many areas.*" With this statement WDNR is implying that the cause of increase shrub densities is the change in water regime. Invasion of shrubs into sedge meadows is a problem statewide, even in wetlands that do have not experienced water level changes.

6. Page 43 last paragraph: the EA states, "*Detailed habitat models have been developed to quantify the water velocity, depth, and substrate needed for suitable spawning habitat (figure 29).*" On page

74 WDNR discusses the use of Habitat Suitability Index (HSI) models for sturgeon and greater redhorse but do not show the modeling results or the conditions under which the simulations were run. We feel that a more detailed habitat assessment is warranted for a project of this scope. We feel a more robust model such as the program RHABSIM or RHABSIM (Habitat Modeling and Weighted Usable Area) is needed to determine the potential weighed useable areas of existing or potential habitat.

7. Page 46, Table 8: A study by Ecological Research Partners, LLC has surveyed the structures on the entire Manitowish Waters Chain. The inventory has identified the following number of structures:

| | | | |
|---|---|---|---|
| a. | Winter lake bed structures (piers, decks, and boat lifts) | = | 1,195 |
| b. | Wet boathouses | = | 126 |
| c. | Dry boathouses | = | 65 |

The estimates made by DNR in the EA significantly under counts the number of structures and boathouses.

8. Page 47, paragraphs 2 through 4: This section of the EA discusses shoreline stability and the issues of wind and ice on shore stability. Other factors that influence shore stability are the soils and shoreline slope. The soils around the Manitowish Waters Chain are predominately Rubicon sand, which is moderately erodible. The slopes at the shoreline are generally steep and due to the artificial water level on the chain the shorelines are very erodible. The high degree of erosion is evident in the number of properties that have shore protection. Based on a survey by Ecological Research Partners, approximately 790 (65%) of the 1,226 parcels on the lakes have some form of shore protection. A discussion about soils, and slopes on the potential of increased shoreline erosion should be added to the discussion.

9. Page 47, Shore Stability: While this section discusses “ice jacking” caused by expansion of ice sheets, it does not discuss other winter erosion activities such as "Breaks up" in the spring when large sheets of ice can be blown around by the wind or “Freeze-thaw cycles” in un-vegetated lakeshore soils which can cause displacement of soil particles (called ice heaving). The EA write-up attempts to make the point that winter shoreline damage only takes place on large lakes like Lake Winnebago, however ice damage can take place on just about any lake. Most lake shorelines are protected by natural armoring that has taken place over hundreds to thousands of year of erosion and natural sorting of materials. On lakes with artificial elevations the shorelines have not had enough time to reach stability. The discussion in the EA does not provide a balanced discussion that allows the reader the ability to balance the impacts of the proposed project against the benefits. The cost to redo or enhance shore protection on the Manitowish Waters Chain under the proposed water changes could be in the tens of millions of dollars.

10. Page 49 Section 10: The EA discusses that higher proposed water levels in the winter will require "*more piers would need to be taken out of the water in the fall. For structures that cannot be moved, it is likely that aeration systems, physical ice deflectors, or other methods would need to be installed to protect against possible ice damage.*" However, the EA does not discuss the cost of the recommended actions. On other lakes that don't drawdown in the winter, residents have designed their shore structures to be easily removable. With the history of winter drawdown on the Manitowish Waters Chain most residents have taken advantage of the situation and designed their piers, boat lifts and shore stations to be permanently left out all winter. Many of these residents will have to completely replace their shore structures. Based on our analysis there are approximately 1,195 piers and associated structures on the bed of the Chain in the winter. Cost of a new pier can range from a few thousand dollars to tens of thousands of dollars depending on size and design. On the Manitowish Waters Chain this cost could range from $2,500,000 to as much as $20,000,000 depending on pier design. Cost of structure replacement should be included in the EA.

11. Page 51: This page outlines four alternatives:

    a. Alternative I. Current operations
    b. Alternative II. The 1939 operating order
    c. Alternative III. Public Interest River Flow and Lake Stage
    d. Alternative IV. Passing inflows

    However a 5th alternative, a hybrid of these alternatives may exist, which would allow partial drawdown in the winter to protect shorelines, but would increase the minimum flow downstream on a scale that would enhance downstream aquatic habitats. This additional alternative would be based on a HABSIM modeling of downstream river reaches and flow regime for the lake.

12. Page 52, second paragraph: The EA states that, "*With current operations, spring refill does not begin until ice is 75% off of Rest Lake to avoid potential ice damage to permanent piers and boat houses. On average, refill begins on April 20th which is often after most of the high spring runoff events have passed through the dam.*" The first question is over what period is this average calculated? Recent climatic data and modeling done by the Wisconsin Initiative on Climate Change Impacts (WICCI) and Center for Climatic Research at the University of Wisconsin-Madison have indicated that spring temperatures are increasing due to global climatic change. John Magnuson, an aquatic ecologist and limnologist at the University of Wisconsin-Madison Center for Limnology, has predicted earlier ice off for lakes in the upper mid-west. Climate change may result in changes as to when the spring re-fill will happen at Rest Lake and this likely effect should be discussed in the EA.

13. Page 61, paragraph 3: The EA states *"…both the current operation and the 1939 order would often pass 40 cfs during the spring. This minimum flow would continue to limit the spawning success of*

*lake sturgeon*." While it is likely that 40 cfs of flow is too low to provide sufficient suitable habitat for lake sturgeon, what flow regime would be optimum given the slopes, cross-sections and substrate available? As shown in the figure on Page 2 flows above 40 cfs in the spring are frequent. The EA indicates that a natural flow regime would be beneficial. But the question still remains - Is all of the spring flow required in order to support a successful sturgeon fishery, or could a compromise flow regime be determined? We feel that additional habitat modeling is needed before a spring flow regime is determined. We also need to point out that as show in the Figure with comment 2 above, during most springs flows are well above 40 cfs under the current dam operation.

14. Page 61, last paragraph: The EA states, "*If changes in operation would potentially cause erosion at an archaeological site, bank stabilization and shoreline protection techniques could be installed to prevent damage to these sites. Special techniques to protect archaeological sites have been developed for reservoirs.*" But at what cost and who would be responsible for these costs? This should be addressed in the EA.

15. Page 62, paragraph 2: The EA states, "*Cranberry producers have indicated that pumping is difficult when water levels are low on the Chain because of the shallow water depths and the increased amount of plant material and other debris that is sucked into the pumps.*" However, the EA does not address the issue that with a water level regime change there will likely be more aquatic plants in the chain lakes, and that this will in turn impact pumping operations. This should be addressed on page 76 so as to provide a balanced picture of the potential impacts.

16. Page 65: The EA discusses the impacts of lower winter water levels on navigation and the issue of shallow water depth. One issue that is not addressed is the issue of stumps. Many shallow areas of the Chain have stumps that are close to the surface during the drawdown causing navigation hazards. To be balanced the EA should include a discussion on this issue.

17. Page 67, first paragraph: the EA states "*Once the Chain reaches that level, the owner of the dam would either need to consult with DNR to determine the required flow or a minimum flow would be specified in the order.*" Dam operation is a complex process of evaluation current water levels, predicted rainfall and downstream conditions. Requiring the dam operator to contact WDNR every time they need to open or close the gates would be a tedious process that could cause delays and potentially serious impacts to upstream or downstream properties. The daily operation of the dam needs to be in the hands of a trained operator based on pre-described flow conditions. Dams operations cannot be handled by a committee, who could take days to weeks to assemble.

18. Page 67, second paragraph: The EA states, "*The target flows identified in this alternative were based on field studies conducted in important types of habitat downstream of the dam. These studies are described in greater detail in the anticipated impacts section below.*" Below this statement the EA

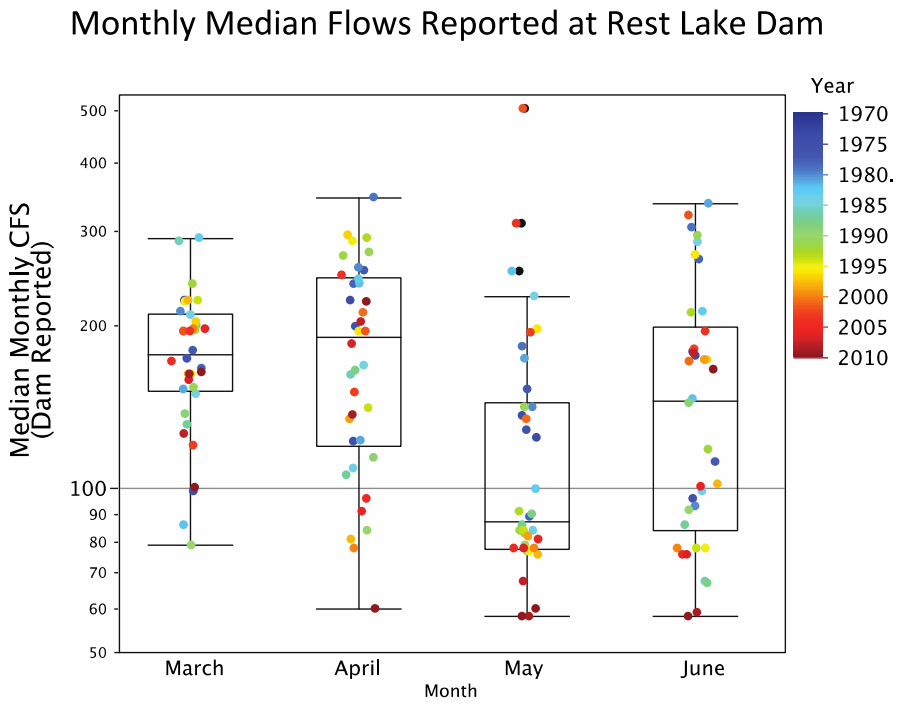
reviews a study by the USGS that estimates the natural flow regime for the Manitowish River if the Rest Dam was not in place. The target flows recommended by WDNR are based of frequency of natural flow, not habitat requirements of the downstream aquatic resource. It is our opinion that flow regime should be based on habitat needs using habitat suitability models and not simply on restoring natural hydrology. We feel this would provide better and ecologically-based science to support the decision making process.

19. Page 68, third paragraph: The EA states, "*If passing gaged inflows, measuring the inflow to the Rest Lake Chain upstream of the cranberry pumping locations would be needed (Figures 5 & 9), and the dam discharge would match the sum of the measured inflows.*" A problem with this method is that it does not account for losses in the Rest Lake Chain. Losses such as evaporation during the summer can be significant. One inch of evaporation per day off the 4,392 acre Chain would result in 366 ac-ft/day or 185 cfs of loss. Between 0.5-inch and 1-inch of evaporation off a lake surface is not unusual during dry hot summer days. The calculation of volume of water to discharge downstream should be based on a detailed water budget, not simply on incoming flows.

20. Page 70, first paragraph: The EA, "*Additionally, increased organic matter accumulation would likely occur in the near shore zone and over time, a greater density of aquatic plants would likely become established. More vegetation in these areas would provide additional food and cover for a wide range of fish and wildlife species.*" While we agree that more vegetation will provide additional food and cover, the EA does not address the issues of what types of vegetation will be established and at what density. While we are sure WDNR's goal would be for the newly vegetated areas to be dominated by native vegetation, disturbed areas are often re-vegetated by pioneer species that include several exotics such as Eurasian watermilfoil (*Myriophyllum spicatum*), and Curly-leaf pondweed (*Potamogeton crispus*). These exotic species are already in the chain and could easily spread in the disturbed areas. In some areas vegetation could reach levels that management of nuisance conditions may be warranted. These issues and their cost of control should be addressed in the EA.

21. Page 70, last paragraph: The EA states, "*Through this study, it has been determined that a flow of 200 cfs or higher is needed to flood the entire study area and allow for a natural flood pulse in the associated riparian wetlands.*" This statement assumes that the flooding of the entire floodplain valley is necessary for wetland health and that the valley should be flooded every year. Natural wetlands experience a variety of flows from floods to droughts. It's this variability of flow that helps different species stay healthy. One option would be to do a soil survey of the valley and determine what plants communities historically inhabited each reach. This would require a soil scientist that specializes in wetland soil formation. Using the habitat requirements of the desired vegetation would be a better method to determine the depth, frequency and duration of flooding during different times of the year than just flooding the valley every year.

22. Page 74 paragraph 1: The EA states, "*Suitable habitat for sturgeon and greater redhorse spawning was identified in the 800 foot section of rocky riffle stretch of river just below the Highway 51 bridge. To determine the flow needs for both of these species, a river stage flow relationship was developed by measuring velocities and depths at five transects under various flow scenarios (figure 46). This information was used in habitat suitability models for each species and the following flow needs were developed. For sturgeon, river flows of 125 cfs begin to provide adequate depth in a limited portion of the spawning area. At flows of 200 cfs or more, almost the entire area of potential habitat provides conditions adequate for spawning. […] The abundance and productivity of the both lake sturgeon and greater redhorse (state threatened) would be expected to increase with both the public interest and passing inflow alternatives since they are both expected to provide sufficient river flows downstream of the dam during the spawning period for both of these species.*" There are several well-established methods and models available for Flow-dependent habitat suitability modeling, which could be used for evaluating necessary and sufficient flows to protect and promote sturgeon and redhorse populations. This paragraph provides an inadequate summary of what analyses were conducted; too little information on what results were found, and raises more questions than it purports to answer. Models such as RHABSIM™ or PHABSIM are designed specifically to address the question as to what incremental increase in weighted-useable-area (WUA) for a given fish species in given river reach can be expected with incremental increases in river flow. At minimum, suitable fish habitat in river systems is produced by a complex interaction among water depth, velocity, temperature, and substrate composition. Using a stage-flow relationship to determine the areal extent of water of sufficient depth for spawning is only one step in the process, and not sufficient for justifying the conclusions drawn in the EA. The EA should include a more thorough discussion of flow-dependent habitat parameters and how they interact with substrate and velocity profiles. Spatially-explicit models exist for Lake Sturgeon in Wisconsin [e.g. Daugherty, D., Sutton, T., & Elliot, R. (2009). Suitability Modeling of Lake Sturgeon Habitat in Five Northern Lake Michigan Tributaries: Implications for Population Rehabilitation. *Restoration Ecology*, *17*(2), 245–257.], and should be applied and analyzed in order to provide a better estimate for the expected improvement in sturgeon populations. These models also incorporate the consideration of other life-history stages (larvae & juveniles) which are essential to population success. We suspect that it is likely that there are other issues involved in limiting fish populations in addition to flow-related habitat. For example, an analysis of flows released from the Rest Lake Dam since the early 1970's (monthly medians calculated from daily flows recorded by the Dam Operator) show that river flows regularly are at or above the 125-200 cfs levels suggested in the EA (see figure below). A more rigorous study of habitat suitability and analysis of limitations on sturgeon populations beyond spawning season appear to be warranted.




23. Page 75, last paragraph: The EA states, "*One potential impact to property would be the increased possibility of ice action to cause damage to permanent piers, wet boat houses, and other structures…. excessive damage would not be expected since the shorelines on the Chain are considered "low energy" shorelines for ice action due to the relatively small sizes of the lakes and limited fetch for wind to push the ice sheet.*" This statement assumes that most shoreline damage by ice is from wind movement of the ice. Ice can also damage shorelines by expansion of the ice sheet, by ice that has frozen into the shore and pulls away as the ice sheet pulls away from the shoreline, or by frost heaving as water within the soil expands and loosens the soil material. Just because a lake has a "low energy" classification based on a wave height index is not a good indicator of potential ice damage.

24. Page 77, Part 15 (a): This section addresses the long-term or short-term environmental consequences of the proposed project. The current write-up outlines the positive long-term benefits of the project in the eyes of WDNR. However, the flow regime on the Manitowish Waters Chain of Lakes has been in place for almost 100-year. During that time many species have adopted to the new system. In any major ecological change their will be winners and losers. This section of the EA addresses the potential winners but to be balanced should also identify those species that may be impacted by the proposed action. For example some wetland plant species will be enhanced by new flow condition others may be lost from the system. The EA needs to identify these winners and losers so a value judgment can be made as to the impacts.

25. Page 78, Part 18: The EA states that the, "*The proposal to write a new operating order for the dam is not expected to influence future decisions or foreclose options that may additionally affect the quality of the environment.*." However, only a few dams are operated to maintain a "Public Interest River Flow" or natural flow regime and almost all of these are dams that have a FERC license for power generation. This project could be used by the WDNR to justify re-opening dam operation orders on other lakes in the state. I do not agree that the proposed action from a legal standpoint will not set a precedent for actions on other lakes.

We hope you find the above comments helpful. We would be available to discuss our opinions with you at your convenience.

Sincerely;

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