

ANSWERS TO QUESTIONS FROM JACK KING (MANITOWISH WATERS LAKE ASSOCIATION LTD.)

DAM OPERATION

1. The dam impounds 10 lakes not 9 (Clear Lake was omitted)-duly noted.
2. Specifically, how is the "50cfs base flow minimum" measured? I think we need to know measurements of the dam, "board" dimensions, etc. The last line, 1st paragraph, page 3 wonders about the accuracy of flow monitoring (measuring?).

An estimate of flow through the dam is based on the headwater level and the amount of stop log opening at the dam. There are 4 nine-foot stop log bays at the Rest Lake Dam, which are used to regulate downstream flows and headwater elevations. Each stop log bay has multiple stop logs that can be added or removed to adjust the discharge. A spillway-rating curve is used by the dam operator to determine the discharge flow, and is dependent upon the amount of stop log opening and the headwater elevation of the reservoir. The spillway-rating curve was developed from standard and accepted hydraulic computations of similar type spillways and is considered accurate.

There is no established gauging station (US Geological Survey) on the Manitowish River. The accuracy of the flow estimates is being worked on. Xcel has re-calculated gate curves to rate the discharge. The department has established two staff gauges downstream (Highways 51 and 47/182) and has gauged the river manually (flow meter) to develop a stage flow relationship. At the present time our gauging matches Xcel's at higher flows pretty well (~ 20 % error). Normally there is a 13-15 % acceptable error in calculating flows. Where we are having problems is at low flow estimates. Our gauging over-estimates what Xcel estimates (i.e. 24 cfs (Xcel)/76 cfs (WDNR)).

Error in flow estimates can be attributed to:

- A. Time of day flow was calculated.
 - B. Different locations of flow monitoring.
 - C. Groundwater contributions or other sources of inflow between monitoring locations.
 - D. Varying head of the flowage, ice or plants.
3. Are daily records kept of gauge readings, and if so, are they published?

Flow and headwater information is recorded daily and is available from Xcel. Since 1994 the data can be obtained electronically. Prior to that it is available as a hard copy. The dam is inspected at least once daily and sometimes more often during periods when river flows are rapidly rising or falling and changes in operation of the dam are necessary.

4. How often is the 50cfs base flow minimum missed?

About 3% of the time over the last 10 years. The only time that flows are reduced below the 50-cfs level is during some dry seasons of the year when natural inflow to the chain is less than 50 cfs. If 50 cfs were considered a true minimum flow (that has to be met at all times), flows would have to be augmented by storage to maintain the minimum.

RESOURCE ISSUES

Sturgeon Reproduction/Recruitment

1. We need to have copies of the Turtle Flambeau Master Plan (WNDR, 1995) and the Wisconsin Lake Sturgeon Management Plan (2000).
The Sturgeon Management Plan was made available at the January 7th meeting. I sent a copy of the master plan to Mary Sinkus the week of January 12th. I also sent Mary some background information about sturgeon on January 27th.

2. What would the Manitowish River flow rate be without the dam?

I cannot answer this for sure because we do not have any historical data of what the flow regime was prior to dam construction. What I can tell you is the flow in the Manitowish River would be considered run of river (outflow equivalent to natural inflow). We would see seasonal changes in river flows as we see on rivers without dams. Typically flows are high in the spring as a result of rain and snowmelt. In the summer, flows usually decline and can be low in drought conditions. In the fall, flows typically increase due to fall rains that normally occur. In winter flows are reduced (similar to summer).

3. Is the comparison with the Wisconsin and Wolf Rivers valid considering the differences in size?

Information gathered from those rivers about sturgeon would be applicable to the Manitowish River. Water temperature, flow conditions and habitat preferences are variables that can be applied to the Manitowish. The North Fork of the Flambeau River may be a better river to study and compare to the Manitowish.

4. Are the temperatures of the Wolf, Wisconsin and Manitowish rivers inherently different? How much? What temperature range is required for sturgeon spawning? Would temperature be affected if the water flow were altered? If so, can it be quantified? Has this been demonstrated? Is it a question of flow rate or depth?

I would expect the Wolf and Wisconsin Rivers to warm quicker than the Manitowish because of their geographic location (more south) and watershed size. To be sure, I would need to compare temperature data. Optimal sturgeon spawning occurs at 52.7-60.8 F. Water temperature in the Manitowish River is probably influenced by the Chain and when the ice goes off. At lower river flow (less volume) the river would probably warm quicker than at higher flows. We have collected one year worth of temperature data from the Manitowish. We can compare river flow to temperature on a given day to answer your questions. Prior to 2003, there was no continuous temperature data from the Manitowish River.

5. If "normal" spawning occurs in late April, how big is the "window"?

Prior work indicates a window of 3 weeks to a month. This is needed to provide attractant flows, proper spawning temperatures, successful egg incubation and hatching.

6. How old are sturgeons that have been caught and released?

We don't know for sure but consider them old (45-70 years). The procedure to obtain a bony structure to age the fish (like rings on a tree) is injurious to the fish so it has not been done.

7. Is there empirical evidence of natural sturgeon reproduction in the Manitowish River? Date of last recorded event?

There is no evidence of successful natural reproduction in recent time (within the last 30 years).

Possible reasons for spawning failure:

1. Late (1st two wks. in June) How many instances of this? What are other times?

I can't answer this for sure. It is probably related to water flow and temperature. My guess is that events in the first two weeks of June are related to low water years where the river is at 50 cfs. After Memorial Day (when the chain is filled) flow probably increases so the fish can move. If flows are higher (200-300 cfs) we see sturgeon moving to the spawning sites in the second week of May.

2. Water flow (less than 50 cfs). If this is mandated, why has it been less?

As indicated at the January 7th meeting, Xcel operates the dam in periods of low flow to favor water levels in the Chain. Its written that way in the 1939 Public Service Commission operating requirements. If maintaining a flow of 50 cfs causes the Chain elevation to drop below 8'. 4" in the summer months, they will reduce the flow below 50 cfs to maintain the summer pool. When outflows from the dam are reduced below the 50-cfs minimum flow requirement, it is due to the lack of natural inflow to the chain. This low flow would exist in the Manitowish River whether the dam was present or not. The question is what should the minimum flow be and if we should augment flows from storage?

3. Weather?

Weather plays a role in that colder spring weather can lead to later spawning for Lake Sturgeon and other fish species.

4. Water temp. Min./max.? Optimum?

The minimum and maximum temperature for sturgeon (Wolf/Fox River system) is 48 F and 69 F. The optimal range is 52.7-60.8 F.

5. Water level fluctuation. Any more now than dry or wet weather pre-dam, (apart from drawdown and refill)?

It can vary from year to year depending on precipitation. We have no pre-dam data. For example in some years (2002,2003) we received a lot of rain and snow runoff and the chain filled quicker. In those years we had river flows of 200-350 cfs during late April into May. In dry years (1994) the chain didn't fill until well after Memorial Day so river flow was 50 cfs from mid April into August.

I explained what typically occurs in a run of river situation in a question above. That's probably how the river behaved prior to construction of the Rest Lake dam. Presence of a dam can change normal season fluctuations (operation of dam offsets the seasonal timing of high and low flows) unless the dam is operated as run of river (pass same amount of water entering). Natural (unregulated) flow could drop below 50 cfs in some seasons, although probably not in spring. A management option that may be valid is to set target flows and adjust them depending on the water year.

The Rest Lake Dam is operated to pass run-of-river flows from the time of refill in the spring until commencement of the fall draw down in late September. During the fall draw down, river flows downstream of the dam are augmented using water stored in the chain. As soon as the chain is drawn down to its minimum level in the fall (5'. 0"), the dam is operated in a run-of-river mode until refill of the chain begins in the spring (after 75% of ice is off of Rest Lake).

6. Rusty crayfish.

Not sure how much of role they play and if they are a major predator of sturgeon eggs. They are found in the Wolf River system and have not influenced that population. Their diet is normally dominated by vegetation.

7. Redhorse (spawn same time as lake sturgeon spawning/predation?).

We will do stomach content analysis this spring to determine this. Redhorse generally eat insect larvae, mollusks, crustaceans, algae and plant material (Becker, 1983 Fishers of Wisconsin). Redhorse probably eat fish eggs incidentally when looking for other preferred items.

8. Assuming there is evidence of past sturgeon habitation in the Manitowish Chain (Les Jacobson has mentioned this), isn't it possible that sturgeon spawned in the river above the lakes. If so, is this also being marked for study?

It is likely that sturgeon spawned above the dam at one time. We have placed Sonde water quality monitors in the river above the dam to collect temperature data. The habitat looks favorable. Any suggestions? Maybe we should consider sampling for sturgeon within the chain.

Public Interest Flow

1. What is "Q7, 10 flow value"?

The public interest flow is usually set based on river observations. It is a minimum flow value that is established to protect fish and wildlife habitat requirements and to protect navigation interests (fish movement, recreational canoeing). A Q 7, 10 value is the weekly low flow that occurs once every 10 years. In complex systems a public interest flow regime is necessary to cover the temporal and spatial variability of the system.

2. What is meant by "downstream navigation concerns"?

See question above.

3. "Flow forecasting in the basin" (last line in the 1st para.), I presume has to do with weather. Bob Martini told me that Wis. Energy has weather records for the Rainbow Flowage area (rainfall, snow, and temp.) for 107 years and has had no luck forecasting for that area!

This is not true. Wisconsin Valley Improvement Company (WVIC) does monitor snow pack, precipitation, evaporation and groundwater levels in the Wisconsin River Basin. This provides them with information on what recharge or runoff they can expect each spring. What we can't predict is the amount of spring rains or how the snow pack will melt in association with the above variables (ground frost, overnight low temperatures). In many years, an accurate prediction can be made of the quantity of water that will be available for the spring season. There will also be some years where water availability forecasts will be inaccurate (like weather forecasts), and operations at the dam would need to be modified accordingly. Gathering the above data is not a guarantee of accurate predictions but it's better than operating without the data.

Manitowish Chain of Lakes

1. In reading this paragraph, you'd have to assume that DNR is at least contemplating no drawdown. If water stayed at 8'6" throughout the winter, what would be the DNR's position on water flow after "ice out" and throughout the balance of the year?

If we considered no draw down as an option, our position would probably be run of river. A no draw down recommendation would be the same as a run-of-river proposal as there will not be any available storage in the chain to manipulate river flows downstream. The Rest Lake Dam is now operated in a run-of-river mode (outflow equivalent to natural inflow) for the majority of the year with the exception of during the fall draw down and the spring refill period. In addition, the minimum flow would be maintained in a drought rather than holding the chain level constant (8' 4").

Fish Passage

1. Is there proof that spawning sturgeon moved into Rest Lake from below the dam either before the dam or after the Barr Fishway was built?

Folks in the area say the sturgeon used to spawn in the river above the dam at one time. As far as I know there is no proof that the Barr Fishway passed sturgeon. Chippewa Flambeau Improvement Company (CFIC) records from the early 1930's indicates that the Barr fish lift was successful at passing a variety of fish species including redbreast, northern pike and muskellunge. There were no documented passages of Lake Sturgeon but it is possible young sturgeon may have used the fish way or moved upstream during high flow events when gates were open and the headwater was lower than normal.