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September 28, 2016

VIA FERC E-FILING

The Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20427

Re: No. 12514-074 Norway-Oakdale Hydroelectric Project

Dear Secretary Bose:

On August 25, 2016, Shafer and Freeman Lakes Environmental Conservation Corp. ("SFLECC") advised the Commission that the licensee, Northern Indiana Public Service Company ("NIPSCO"), had circulated a draft proposal to SFLECC and the U.S. Fish and Wildlife Service ("FWS") in the above-referenced matter. The draft proposal suggested that the parties engage in a search for a consultant to review the use of linear scaling in the Technical Assistance Letter ("TAL"). The TAL presently uses the theory of linear scaling to mandate releases of water from the Project during periods of Abnormally Low Flow ("ALF"). SFLECC has advised NIPSCO that it has decided not to pursue the search for a consultant at this time. SFLECC also wishes to advise the Commission of the reasons for its decision.[1]

As an initial matter, it is SFLECC's understanding that FWS's participation in a search for and potential use of a consultant would be premised on an evaluation of linear scaling as

[1] SFLECC remains open to discussions directly with NIPSCO and FWS.

applied by FWS in the TAL. It was evident to SFLECC that FWS was not prepared to consider a recommendation that included maintaining the lake levels – the approach recommended by FERC Staff and several hydrological experts.

Even more significant to SFLECC's decision was the drought that occurred in north central Indiana between August 3 and August 15, 2016, which triggered the provisions of the TAL and resulted in a drawdown of Lake Freeman by approximately 10 inches. As discussed below, SFLECC has now had an opportunity to review the performance of the TAL during the drought and determined that application of the TAL **in practice** is fatally flawed.

A. During The ALF Event Between August 3 and August 15, 2016, Linear Scaling Did Not Work

1. Flow Rates As Measured At Gauges Below The Project Did Not Scale Linearly During The ALF Event

The validity of the TAL depends upon its ability to reliably predict what the natural rate of flow should be between two gauges on the Tippecanoe River during ALF conditions. But, during the August 2016 ALF, it simply failed to do so.

First, FWS's application of linear scaling in the TAL did not accurately predict the rate of flow during the ALF on the segment of the Tippecanoe River immediately below the Oakdale gauge. That is, 10 miles downriver from the Oakdale gauge, there is a second gauge at Delphi, Indiana. *See* Map of the lower Tippecanoe River attached hereto as Exhibit 1. There is no dam or lake located between the Oakdale and Delphi gauges and the rate of flow at the Oakdale gauge was a known quantity during the ALF event as it is mandated by the application of the TAL.

The gauge at Delphi receives not only the flow that passes at the Oakdale gauge, but also the flow from the additional area of a watershed drained below the Oakdale gauge. For FWS's application of linear scaling to have been accurate during the August 2016 ALF, the rate of flow of the Tippecanoe River at Delphi must have, if nothing else, *exceeded* the rate of flow at Oakdale. Yet, the real-world results show that this did not happen. *See* Exhibit 2. Rather, every day during the August 2016 ALF event, this segment of the Tippecanoe River which, as noted, contains no dam, or lake actually lost flow – something that is directly contrary to what linear scaling as applied in the TAL predicts ought to be the case.

2. Flow Rates As Measured At Gauges Above The Project Did Not Scale Linearly During The ALF Event

In developing the TAL, FWS claimed that flow rates as measured at two gauges on the Tippecanoe River above the Project, one gauge at Ora and the other at Winamac, Indiana, scaled to one another.[2] Because both gauges are located above the Project and, therefore, uninfluenced by it, this gauge data was critical to FWS's belief that "Linear Scaling appl[ies] to the Tippecanoe watershed." *Id.*[3]

In reality, however, at no time during the August 2016 ALF event did the two gauges actually scale to one another. As shown on the chart attached hereto as Exhibit 3, had the two

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[2] Expert Report of Bernard Engel, Docket No. P-12514-074 at 16-17 (filed May 15, 2015) (*citing* ENGEL095).

[3] Note, however, that FWS was only able to show that the Winamac and Ora gauges scaled to one another by "jettisoning" certain flow data that did not fit its predictions. *See id.* at 16. The admission was made on October 14, 2014, *i.e.*, after the TAL had been completed and NIPSCO had obtained a temporary variance incorporating the TAL into its license.

gauges scaled to one another the readings at the Winamac gauge should have been those shown on the dashed line – but they were not. Instead, the actual readings at Winamac remained higher throughout the entire ALF event than what application of linear scaling in the TAL predicted would be the case. *Id.* Because releases at the Oakdale dam during an ALF event are determined by multiplying the rate of flow at Winamac by 1.9, a higher rate of flow at Winamac generally translates to greater releases at the Oakdale dam. Had the Winamac gauge scaled to the Ora gauge, as FWS believes they do, the resulting releases required at the Oakdale dam would have been significantly lower during the August ALF event.

In sum, there is no empirical evidence that linear scaling as used in the TAL can accurately predict flow rates during ALF conditions at any place on the Tippecanoe River, let alone predict what flow rates "should" be absent the Project. Indeed, the real-world results of implementing the TAL during the August 2016 ALF, above and below the Project, are directly contrary to the results predicted by FWS's use of linear scaling.

B. FWS Misplaces Its Reliance On The Research It Cites As Support For Its Use Of Linear Scaling

FWS primarily relies on the work of Professor Joshua Galster to support its application of the theory of linear scaling in the TAL.[4] FWS's reliance is misplaced, as even Professor Galster does not believe that linear scaling can work as FWS attempts to use it in the TAL.

[4] NIPSCO Amendment to Temporary Variance Request, Technical Assistance Letter, Docket No. P-12514-000 at p. 3 (filed Aug. 14, 2014).

That is, in response to inquiries from a resident of the Indiana lakeshore community,[5] Professor Galster explained that an attempt to apply linear scaling to predict water flows during *short-term, low flow events* "would not work out" because linear scaling relies on a consistent relationship between flow rate and drainage area *over time* – not on a daily basis as FWS has applied it. *Id.* In his research, Professor Galster, who is a geologist (not a hydrologist), focused on the relationship between the largest annual discharges and the average annual discharges on rivers. *Id.* Thus, his work did not address the low flow events at issue here, let alone what natural rates of flow should be in the absence of a lake.[6]

Accordingly, not only have multiple scientists, whose reports are already part of the administrative record, rejected FWS's approach to determining the natural run-of-river using linear scaling, but the researcher whose work FWS relies upon agrees that linear scaling would not work out for the purpose of predicting flow rates on a short-term basis. Yet, this is precisely how FWS has applied linear scaling in the TAL.

Conclusion

Linear scaling as applied in the TAL is the foundation of FWS's conclusion that, even once power generation at the dams is halted during an ALF event, the mere existence of the Project still harms – *i.e.*, "takes" in the parlance of the ESA – protected mussels. As

[5] Email exchanges between Ron Shue and Joshua Galster, attached hereto as Exhibit 4.

[6] At the May 10, 2016 Technical Conference convened by FERC Staff in Monticello, Indiana, FWS representatives claimed that Professor Galster had "vetted" FWS's use of linear scaling. Professor Galster has explained, however, that he had only engaged in background conversations about linear scaling with FWS during a telephone call or two several years ago and had not discussed the application of any linear scaling calculations to a specific situation. *Id.*

demonstrated above, and throughout the record already compiled at the Commission, FWS's use of linear scaling lacks scientific validity to establish that the flow of water below the Project during an ALF event is other than the flow that the natural run-of-river would provide to the mussels. Indeed, the record evidence before the Commission establishes that maintaining the lake levels, including during an ALF event, best mimics the natural run-of-river.

For this reason, operation of the Project pursuant to the original 2007 license (with an additional provision that the generation of power cease and the lakes remain at constant levels during low flows) will not adversely affect protected mussels within the meaning of the ESA. As such, implementation of the TAL at the Project as currently provided for by the August 22, 2014 Temporary Variance should be discontinued by appropriate order of the Commission.

Respectfully submitted,

SMITH, CURRIE & HANCOCK LLP

Richard W. Goeken

RWG/bjr
Attachments

Norway-Oakdale Project (P-12514)

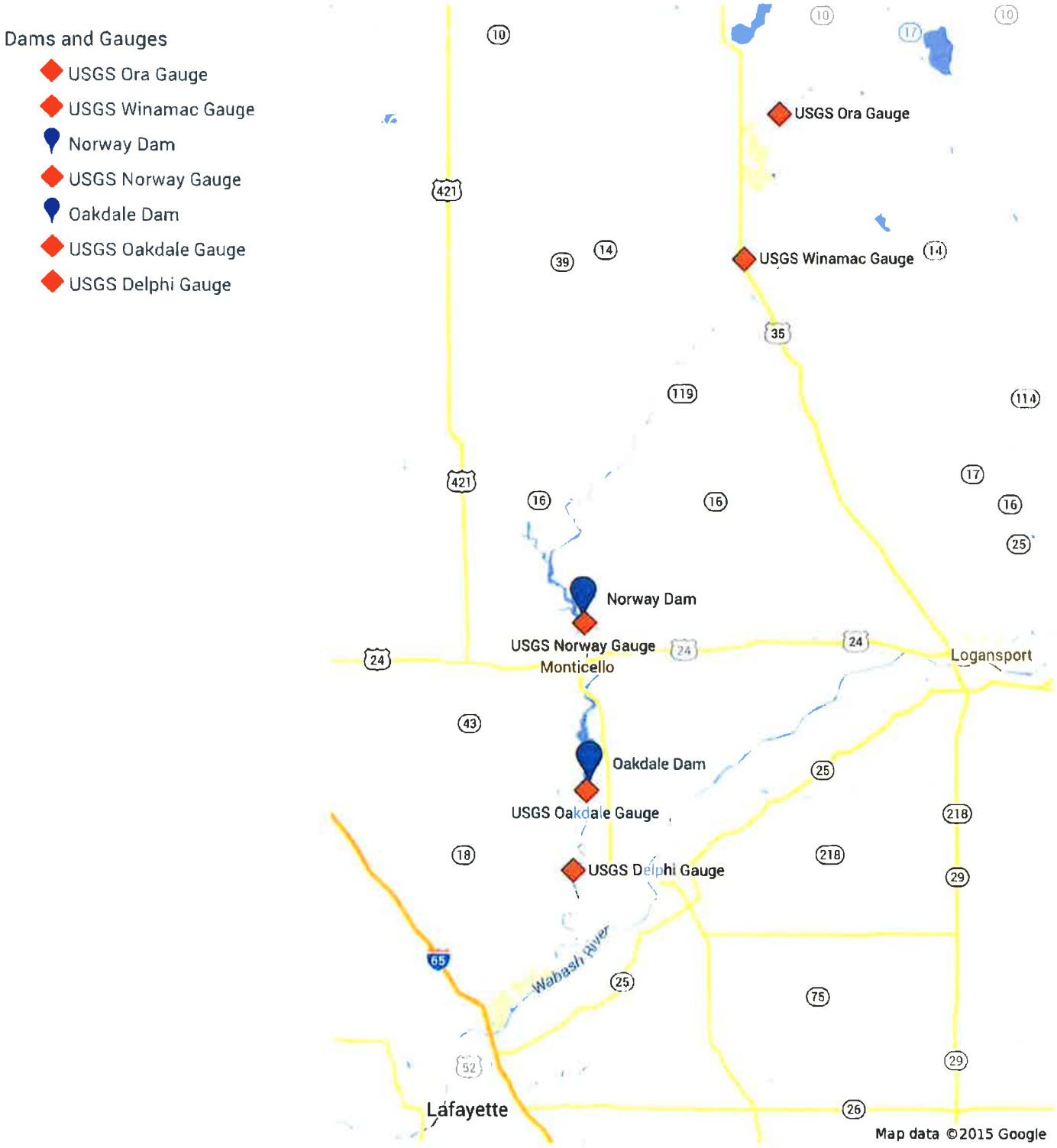

Exhibit 1

Oakdale Gauge vs. Delphi Gauge

Date	Actual Flow at Oakdale cfs (Daily Average)* A	Actual Flow at Delphi cfs (Daily Average)* B	Flow Predicted By Linear Scaling at Delphi cfs C = 1.044 x A	Linear Scaling Predicted Difference Between Oakdale & Delphi cfs D = C - A	Actual Difference in Flow at Delphi cfs E = B - A
8/3/2016	575	470	600	25	-105
8/4/2016	517	413	540	23	-104
8/5/2016	515	400	538	23	-115
8/6/2016	509	381	531	22	-128
8/7/2016	491	364	513	22	-127
8/8/2016	474	330	495	21	-144
8/9/2016	456	294	476	20	-192
8/10/2016	439	276	458	19	-163
8/11/2016	469	293	490	21	-176
8/12/2016	466	300	487	21	-166
8/13/2016	450	277	470	20	-173
8/14/2016	448	277	468	20	-171
8/15/2016	474	321	495	21	-153

* Source: United States Geological Survey Gauge Data

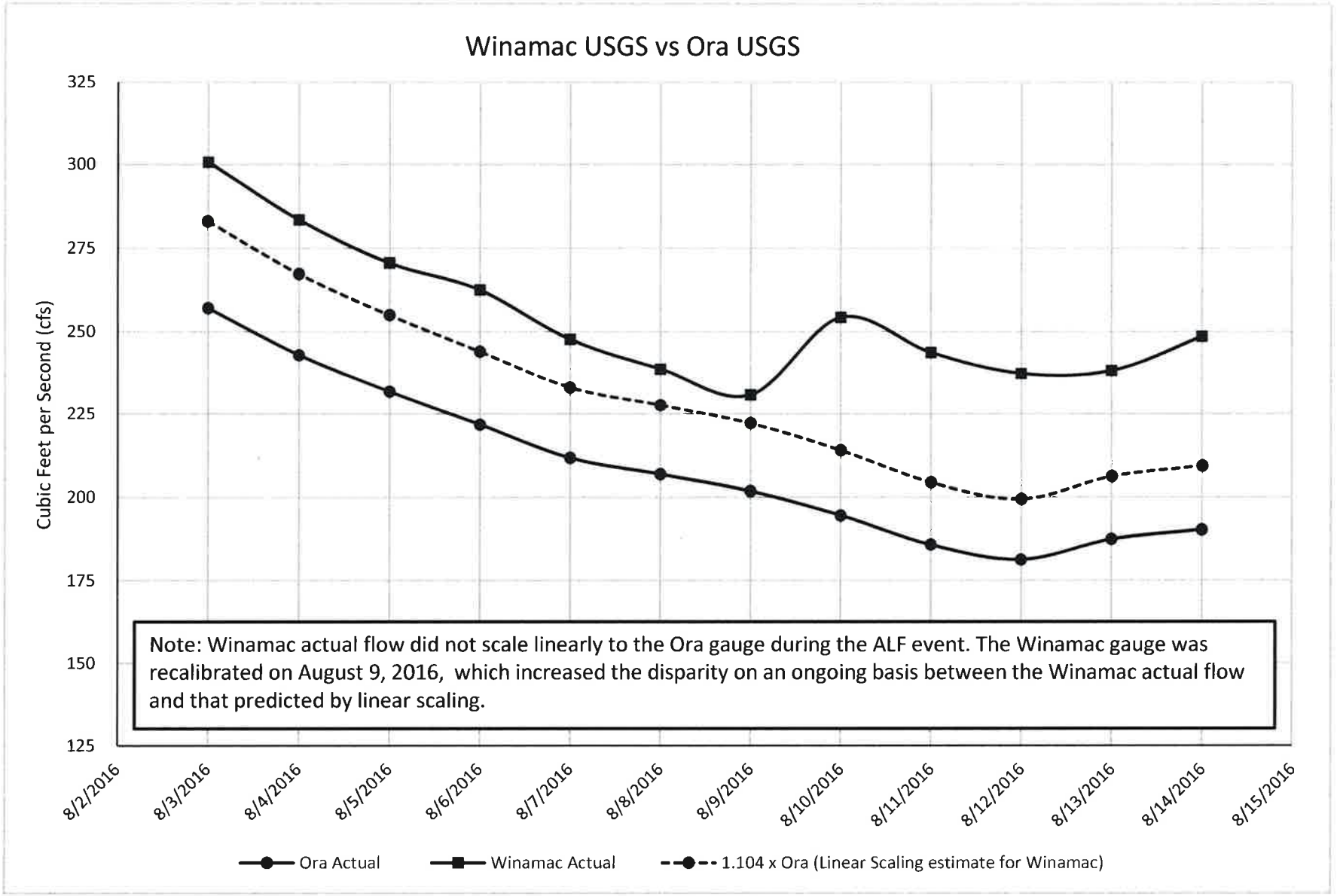
Winamac USGS vs Ora USGS
Cubic Feet per Second (cfs)
325
300
275
250
225
200
175
150
125
8/2/2016
8/3/2016
8/4/2016
8/5/2016
8/6/2016
8/7/2016
8/8/2016
8/9/2016
8/10/2016
8/11/2016
8/12/2016
8/13/2016
8/14/2016
8/15/2016
Note: Winamac actual flow did not scale linearly to the Ora gauge during the ALF event. The Winamac gauge was recalibrated on August 9, 2016, which increased the disparity on an ongoing basis between the Winamac actual flow and that predicted by linear scaling.
Ora Actual
Winamac Actual
1.104 x Ora (Linear Scaling estimate for Winamac)

Exhibit 3

On Wednesday, June 1, 2016 9:41 AM, Josh Galster <galsterj@mail.montclair.edu> wrote:

Hi Ron-

Thanks for this info and update. I've been out in the field with limited email access so I apologize for the slow response.

Yes, I definitely had a phone conversation or two with them, sometime around 5-6 years ago I'd guess. I remember talking through some numbers for river discharge which were reasonable, but that's where it was left. That's why it was odd when I got a couple emails out of the blue from people asking about it after not hearing anything for years.

Thanks too for the website. It's good to know the context, since I don't have a side in this issue but just want good science/methods to be used.

Josh

Exhibit 4

On 6/8/2016 2:40 PM, Ron Shue wrote:

Josh,

In my analysis of linear scaling, on a hour to hour basis, i just cannot get it to pan out. It can be all over the place. I think this is due to the fact the gauges i am using are giving hourly averages and are like 40 miles apart. Then the scaling is also doing a average of an average. I am trying to use this to predict the output from a dam. The dam is acting like a low level wier dam, so the output is fairly constant.

It looks like the scaling works over a period of time, but to predict water flow in real time or even a hour behind, it can be off by more than 10%.

I think a more efficient way to maintain flow over a low level wier dam, would be to park the gate at a given elevation at let the mass do the rest of the work.

this way what ever comes in from the top of the river will exit thru the gates in real time.

What do you think about that.
Ron

From: Josh Galster <galsterj@mail.montclair.edu>
Date: June 8, 2016 at 15:35:46 CDT
To: Ron Shue <rhshue@yahoo.com>
Subject: Re: Question on linear scaling

Hi Ron-

Yeah, that makes sense that on the short term linear scaling (or any consistent relationship between discharge and drainage area) would not work out. When I did the analyses I used the largest annual discharge and the average annual discharge, and only used gages that had something like 30+ years of data. I'm a geologist by training, so I tend to work with longer-term data than short.

In the following examples, imagine different parts of the watershed that area the same size, say a square mile. The actual area doesn't matter, as long as they are equal so that the comparison is fair.

1. Linear scaling (relationship): all areas of the watershed generate discharge at the same rate.
2. Exponent on area greater than 1 (exponential): Downstream areas generate MORE discharge than upstream
3. Exponent on area less than 1 (logarithmic): Downstream areas generate LESS discharge than upstream.

For a single event like you mentioned, it would be hard to be in scenario #1. For example, for a summer thunderstorm where it's raining heavily in one place but it's dry a mile away (I remember those from growing up in Ohio) the amount of discharge generated will be completely different across different parts of the watershed.

This is why I think the real-time prediction using the scaling could be problematic. When I did it with small storms I used several together to come up with my results, not just one storm. It could work for really big events (where the entire watershed gets dumped on with the same amount at the same time) and for really small events (where the river is gaining water from the groundwater at roughly the same rate) but for the events in between (like a "normal" storm that produces an inch of rain) it would be hard to use it.

Agreed that for a weir dam, most of the time what water comes in just goes out again with not much time spent in storage. It depends on the size of the gate, if any. We have several weir dams around here without any gates, and then flow goes over the entire width of the dam. Those have very little influence on the timing of discharge. The smaller the outlet/gate is the more there is the possibility there will be a delay as the water piles up behind it.

Josh