“Transient Explorer’s Report Discussion Draft, As of October 26, 2017” (PowerPoint)

Steve Malers comments, 2017-11-24

Bartholow’s comments in red

General comments:

1. The work that OWF does seeks to make data and analysis work transparent, and I’d be happy to help with this:
   1. use publicly available input data – provide links to such data
   2. publish data and results in machine-readable formats such as Excel and csv
      1. See examples of data on data.openwaterfoundation.org – using GitHub for version controlled datasets
   3. analysis should be repeatable, understandable – could do more to automate so that the work scales to more years

Thanks Steve

1. The results of the study could be archived:
   1. on the PRTI website (involves CSU IT resources, not as easy for OWF to help)
   2. OWF could host and then have a link from PRTI – see other OWF efforts such as data.openwaterfoundation.org and related pages (could be a “project”).

Thanks. Will investigate when appropriate and there is more feedback on what, if anything, really should be archived.

Slide comments (numbers correspond to slides):

1. Title slide:
   1. Is there a corresponding report? Or is the presentation considered to be the report?

For the moment, I’m leaning toward this presentation as the “report” since that is what was promised, I believe. I welcome feedback on whether something more formal would be a good idea. I am willing to help on that if so – especially if Jen will take the lead ☺

1. “Why?” slide
   1. Is the point of the images to point out specific events? If so perhaps circle those events? Some slides have many ups and downs so the reader may be confused as to what the point of the slide is.

Done!

1. “Our #1 Goal” slide:
   1. Use of word “Our” may imply more buy-in from the group than intended. Maybe just say “#1 Goal” (meaning of the study).
   2. Is it possible to identify locations on the river where the abrupt changes are more severe? The Goal focused on causes but did not mention the spatial aspect “where are fluctuations more severe?”
   3. Also, is it possible to identify when in the year fluctuations are more severe? This could be done with some automated analysis.

Done!

1. “Abrupt flow plunges” slide:
   1. In addition to stranding of fish, are there other major issues such as water temperature? OK, I see something in slide 6, but not clear whether stranding and increasing water temperature is a major concern.

I doubt that abrupt, short-lived temperature changes are a problem in the Poudre, but await any research that would shed light on this. Localized stranding should be a concern, but I have no actual evidence. I see stranding as something to guard against if possible. Ken?

* 1. Would be more comprehensive if had pictures of other concerns, such as bank failures.

I agree. It is clear that there are many unstable banks along the Poudre, but again I have no direct evidence of those where flow fluctuations are a major contributor. I see flow fluctuations as one of many factors that influence slumping, again to be avoided if and when possible. As stated in previous slide, however, some abrupt flow pulses may be beneficial in moving sediment. On balance, we need evidence. I’ll keep my eye out for a photo opportunity, but I am not sure I could responsibly attribute transients directly and exclusively to slumping.

1. “Abrupt flow increases” slide:
   1. Would be more comprehensive if had pictures for other concerns such as safety.

Yes, that would be good. Have you any such photos? I have used this clip-art before:

 How about that?

1. “Biological guidance” slide:
   1. Metrics on this slide could be converted into analysis parameters, and the results could be viewed as a heat map (raster graph). The geomorphology/substrate could be mapped to stream mile to give a more specific analysis. OWF is doing some work in this area but needs funding.

Go for it!

* 1. The slide uses some technical terms. Maybe make it a bit simpler for the layperson to understand.

I would welcome specific wording suggestions. I did add “(rates of change)” to ramping rates. Also changed one line to “i.e., Lifestage (e.g., juvenile) rather than population-level effects”

* 1. Might be good to have a diagram of stream channel cross-section showing relationship between stage and flow, in particular to emphasize channel bottom irregularities. At TriLynx Systems (flood warning systems company) I am actually interested in wetted-width for flood impact because we want a simple relationship between stage/flow/wetted width. This could have environmental use also. The ratings we use at TriLynx have an effective time because ratings change over time.

Changed text to “Substrate is coarse and gradients low, i.e., more difficult to dewater”. How’s that?

1. “Our #2 Goal” slide:
   1. See previous comment on use of “Our”.

Done!

* 1. Are there places on the river that are somewhat isolated from the conditions due to location, return flows coming back, etc.?

Good question. This level of analysis did not -- could not -- answer that.

* 1. Do physical changes also include adding low-flow channels, ponds, etc.?

I understand that low flow channels are envisioned as a NISP mitigation measure, but know little beyond that.

* 1. Seems like timing changes could involve those in the “work week” and also what to do about work/non-work days.

That is certainly a possibility to float, but could be difficult given long histories. See more below.

* 1. What about more telemetry to collect real-time data? Having a map to show those stations might be useful and could point out deficiencies in data collection.

I guess I hope this is captured in the “opportunities”. If not, please elaborate.

* 1. “Biological and physical criteria” – could spend a lot of time on this for every species or could focus on an “acceptable” wet water flow that would benefit the environment in general. I know from some project work that it is simpler to talk about an “ecosystem flow” than try to present all the species data up front.

I believe you are correct in general, though I also believe there is a place to “test” general knowledge from species- or lifestage-specific knowledge. It works both ways, actually. I suppose I am hedging when I say “relevant”. I hope Kehmeier will weigh in.

1. “Data we used” slide:
   1. This slide (and/or report) should ideally include the URLs to DWR and other web services that provide the data. Best would be a list such as spreadsheet with data source, station ID, web service URL, period of record, etc.

Yes, if there is a more formal report, I do believe this information must be there. I believe the progress reports (1-4) now have this info from Luke. Need to check.

* 1. Some data are from DWR, some from USGS, I assume, and it is not straightforward to access due to different sources.

Luke worked miracles!

1. “Data Used” slide:

I changed to “Data we used, cont.”

* 1. See previous comment, would be much better if the station ID where provided so people don’t have to look that up.

I tried putting more info on this slide, especially the maximum diversion capacity, but it just got unreadable. I think the main point is how much info is missing!

* 1. Suggest listing in stream order so people can see how unavailable are located relative to available data. OWF’s first cut at a point flow model included locations without data and we treat as a “pass through” analysis location.

Okay. See what you think.

* 1. Municipal intakes and returns are in general not easy to find… this is interesting because they probably have some of the more precise data measurements. Publishing such data would be a big help in many ways and would be one way PRTI municipal members could contribute.

Agree. Covered in Opportunities?

1. “Approach” slide:
   1. Again, good metrics here that could be analyzed in an automated way – OWF has the tools.

Go for it!

* 1. Perhaps articulate rationale more clearly for why certain gages are included and others not (period of record, data quality, importance of gage, etc.).

I thought this was clear. Please help.

* 1. Hydrographs are one tool but other visualizations such as raster graphs and cumulative values can also be helpful and counter the “cross-eyed” issue.

I’m sure the next person would welcome all the help they can get ☺

1. “Selected Findings 1” slide:
   1. Would be helpful to show the graph of the gage flows as a starting point.

Maybe. But in a way people have seen at least the Lincoln gage in the **Why** slide. What do others think?

* 1. What is the graph showing? Midnight to midnight delta? It would be helpful if the one graph was positive values and the other negative values.

It’s actually 15-minue data on the x-axis and the largest change looking out 24 hours from that point on the y-axis. One graph is positive and one is negative. I could change the scale to show negative but have added explanatory text boxes. Please see if that works. I welcome additional comments.

* 1. The rise during runoff is expected.

Perhaps to you it is expected, but I actually did not forecast that.

* 1. I deal with rainfall/duration data at TriLynx Systems, which represent rain intensity and return frequency. These data seem similar. In that analysis we look at a moving “event” that spans multiple small time intervals and summation gives the 15-minute event, 30-minute event, etc. Perhaps using that type of analysis would be appropriate to indicate magnitude and frequency of the event?

I need more info/examples to understand.

1. “Selected Findings 2” slide:
   1. Good stuff…helps focus.
   2. Might be good to know what the diurnal swing is from ET, municipal intake/return, but probably makes more sense on absolute graph.

At first I thought you were referring to the “natural” diurnal fluctuation, which is covered later. But I see your point and if we had municipal I/O we could better estimate what you are driving at.

1. “Selected Findings 3” slide:
   1. Good example.
   2. Could benefit from simple annotation such as “Larimer Weld diversions are stopped in order to increase the river flow/depth and float debris off the trash rack”.

Done!

1. “Selected Findings 4” slide:
   1. Could benefit from annotation or explanation such as “…water is released upstream from Hansen Supply Canal for delivery to ?, which leads to a short-term increase in flows in the reach from A to B before being picked up by the ditch… Because the receiving ditch did not pick up at exactly the right time, a slug of water moved past all the ditches”

Okay, I changed the normal slide text and added a text box. Please see if this works.

1. “Selected Findings 5” slide:
   1. This is interesting because storage to ditch deliveries shut down on the weekend, resulting in less flows on the weekend, just when recreators might appreciate the higher delivery flows. This might be particularly evident flowing through Fort Collins, right?

At least to some ditches, yes. I had not been thinking about recreators, but that’s true. I have made no changes. Needed?

1. “Selected Findings 6” slide:
   1. It would be helpful to know what he diurnals are attributed to. Are withdrawals such as for municipal supply for outdoor lawn irrigation changing so smoothly? I doubt it but we could ask Fort Collins Utilities. Is that variation due to vegetation ET and evaporation? It would be good to quantify the components that make up the diurnal variation.

I am sure that this is 99% snowmelt-driven and have added “snowmelt” to the text.

1. “Selected Findings 7” slide:
   1. Often? Would be good to categorize as much as possible.

Yes it would. Since I just sampled the various abrupt changes, I cannot really say how often.

* 1. Bad data? Gage issue (check data flags)?
  2. Bridge construction?
  3. Weather has not been discussed yet. Could be storms or ice effect on gage.

Have added text.

1. “Selected Findings 9” slide:
   1. Skipped selected findings 8?

Good catch – corrected.

* 1. OK, you mention weather here
  2. “as C-BT deliveries decline” … what is meant by this? Clarify.

Changed text to read “Even with no action, there will likely be fewer large transients in the future as C‑BT deliveries decline due to conversion from downstream ag deliveries to upstream municipal withdrawals” Fair? Accurate?

1. “Opportunities: Lowest Hanging Fruit” slide:
   1. I’m guessing this is a slide that Northern wants to give more input on.

I look forward to receiving all comments. To me, it’s a matter of large inputs and large outputs. No need to name names, I suppose, if that would be better? The NISP Fish and Wildlife Mitigation plan already talks about this, I believe. Again, I welcome input here. Other possibilities?

* 1. Evaluate whether there is enough real-time data to support the opportunities. The parties could probably share data without making the data public, but public data would be nice. More data is discussed in the next slide.

No particular comment.

* 1. Maybe schedule some weekend deliveries every once in a while as a multi-benefit flow?

Personally, I don’t think this would be a good first step. I’d rather parties look for mutually agreeable possibilities. Weekends could be one option, but I suspect this would feed into the “see -- I told you that that \*^%#@ kayak park would cause trouble” meme.

1. “Opportunities: Medium Hanging Fruit – 1” slide:
   1. Good slide.
2. “Opportunities: Medium Hanging Fruit – 2” slide:
   1. OWF would be up for this but we need to make sure there is no liability issue. Perhaps someone could determine “good” levels for tubing, etc. and indicate as a horizontal line on hydrographs. Then it is just a matter of overlaying that on a typical hydrograph.

I aree that liability needs to be considered and have added text to that effect.

* 1. Including forecasts would be much more difficult.

Maybe *forecast* is not the right word. Just a “heads up” when certain conditions arise, e.g., recent large abrupt changes in the I/O data. Yes?

* 1. Maybe after some prototyping the City would do something, for example in conjunction with the kayak park.

I got the idea from Jen that Fort Collins is wary of this, presumably because of liability. Needs to be sorted out.

* 1. OWF is also interested in publishing data to show where there are diversion dams and which ones have fish passage. This is a bigger interest tied into statewide CWCB projects.

Added “App could present other geo-referenced data too.”

1. “Opportunities: Higher/Longer-term Hanging Fruit” slide:
   1. What happens to the debris that is flushed from one headgate? Does it end up sticking at the next one down?

Don’t know.

* 1. Also, OWF is interested in a public version of point flow model. We took a cut but it is messy. Northern’s version is not publicly available on a daily basis and it would be nice to see the “code” in that model. See: https://github.com/OpenWaterFoundation/owf-model-pointflow-co-poudre

1. “Caveats & Limitations” slide:
   1. I suspect that the benefits of historical exchanges are threatened by changes in water ownership, operations, and infrastructure changes. Will the system continue to function? For example, how are operations at Fossil Creek Reservoir changing?

I don’t know. Need to say anything?

* 1. More data would be good….not sure if looking at HydroBase historical diversions would help or if more real-time data is really what is needed. The Poudre was omitted from the SPDSS modeling in order to let EIS finish.
  2. Much data is very place-based (biological criteria, channel form, etc.). Having more integrated on-line datasets would be helpful. OWF is doing work in that area in the next year and might be able to demonstrate a framework for data sharing.

Got to start somewhere – can’t let perfection be the enemy of the good, as they say.

1. “2016 Unrepresentative?” slide:
   1. I agree, probably need to look at more years.
   2. One issue is some of the gages have only been installed in recent years.

Changed text to read “More years of more complete data as they become available may reveal other phenomena and other opportunities”

* 1. Need to define how the flashiness index is calculated… provide reference? Thinking of rainfall event frequency/duration approach there are multiple measures.

I added the index equation, but frankly it may be a bit much. Bob now has a “paper” that I can send you if you wish. Let me know.

* 1. Maybe it would be good to look at the flashiness of the natural system as a baseline… would require some hydrology or ability to use simulation model to back out human impacts to get natural flow. Given the noise in the basin’s data, the latter might not be trivial for daily or sub-daily model. Most water supply planning models are monthly.

If memory serves, Bob’s paper does compare the (“natural”) Canyon with the more manipulated Lincoln gages. I too did some of this analysis in the paper I wrote. There’s a big difference as you might imagine.

Thanks!!