Colorado Basin Stakeholder Meeting

June 1, 1-3pm
Glenwood Springs Community Center

NOTES

Participants

In person
- Kim Albertson, Colorado Basin Roundtable
- Lindsay Murdoch, Tamarisk Coalition
- Ken Neubecker, American Rivers (Steering Committee member)
- Angie Fowler, SGM
- Brendon Langenhuizen, SGM
- Heather Tattersall-Lewin, Roaring Fork Conservancy
- Richard VanGytenbeek, Trout Unlimited (Steering Committee member)
- Laurie Rink, Middle Colorado Watershed Council (Steering Committee member)
- Nate Higginson, Middle Colorado Watershed Council
- Andrew Kirsh, Eagle River Water & Sanitation District
- Maureen Egan, Eagle River Water & Sanitation District
- Paul Bruchez, Reeder Creek Ranch & ILVK (Steering Committee member)
- Doug Winter, Carbondale Resident
- Mark Fuller, Ruedi Water & Power Authority
- Bill Fales, Colorado Mountain Ranch
- Gigi Richard, Hutchins Water Center at Colorado Mesa University (Project Administrator)
- Bill Hoblitzell, Lotic Hydrological (Contractor/ Presenter)
- Seth Mason, Lotic Hydrological (Contractor/ Presenter)

Via phone/ internet
- Julie Knudson, Tamarisk Coalition board
- Nicole Seltzer, River Network
- Mike Wagek, Winter Park Water & Sanitation
- Steve Acquafresca, Colorado Basin Roundtable (Steering Committee member)
- Sarah Andrews, Senator Michael Bennett's office
- David Graf, Colorado Parks & Wildlife (Steering Committee member)
- Oni Butterfly, passionate about water
- Hannah Holm, Hutchins Water Center at Colorado Mesa University (Project Administrator)

Overview of Project

Gigi Richard, Director of the Hutchins Water Center at Colorado Mesa University, introduced the Integrated Water Management Planning Framework Project, which is intended to develop informational and procedural tools to facilitated integrated water management planning in the Colorado River Basin in Colorado.

Bill Hoblitzell of Lotic Hydrological, then presented the data visualization tools Lotic is developing as the contractor for Task 2 of the project, "Information Synthesis."

Bill noted that Task 2 builds on task 1, in which Hutchins Water Center staff and students collected data and studies and explained how the approach to Task 2 has changed from how it was originally envisioned. While Task 2 was initially envisioned as mapping the information from the studies and data sources collected in Task 1, several challenges prompted a change in approach:
- Variability in spatial and temporal coverage of data and studies
- Variable resolution of data
- Variety in methods and purposes of studies

As a result, Lotic proposed, and the project steering committee accepted, changing the approach to Task 2 to developing a set of "data dashboards" as a visual communication tool to help communities discuss and address what's going on in their streams. These data dashboards have the following themes:
- Hydrology
- Hydrologic alteration
- Water use
- Water quality – data
- Water quality – regulatory
- Literature search

Bill explained that this tool is not a traditional GIS system, but more usable dashboard for user interface. He explained that it is very information centered and highlights patterns in data. Lotic chose Tableau for the interface because it:
- Can manipulate data quickly
- Can generate graphics quickly on the fly
- Drawback – doesn't have the customization of traditional GIS- missing the traditional cartography advantages.
- BUT the data/info forward nature is more important than the mapping.

Bill then demonstrated the Stream Health Dashboards. Links to the prototypes are provided in these notes.

Dashboard Demonstrations

Colorado River Headwaters Studies Library Dashboard

Prototype viewable here:
https://public.tableau.com/profile/publish/SearchableStudiesLibrary/Studiesdash#!/publish-confirm

Bill showed the dashboard and explained that:
- The term "studies" is used loosely
- It provides a very inclusive dataset
- There is a list at top of titles and dates of publication
- There is a sidebar – keywords by topic, subregion, HUC8, stream name, date of publication, wildcard title search
- Graphs show titles by subregion and completion timeline

Water Quality Regulation Dashboard

Prototype viewable here:
https://public.tableau.com/profile/publish/Reg_Status/Reg_93_dash#!/publish-confirm

Bill showed the dashboard and explained that:
- This dashboard is built largely around regulation 93 because it provides a uniform framework around the state
- The 303d list and 305b assessment list are tied to Clean Water Act reporting every other year
- Streams color coded by 305b category – on the 2018 list, because Lotic has been working with WQQC to use the 2018 data, so it might not match with what people are familiar with in their basins right now if they are using the 2016 list
- There are many filters to select what data to see:
  - stream type
  - county
  - WQ parameter group
  - Analyte – only those that the state has made a listing for – has to have been a regulatory problem
  - Subregion
- Tool will help to see geographic patterns in water quality data and listed stream segments.
- When filtering by analyte, you get a graph of miles of stream per county that are listed for that analyte.

Water Quality Data

Prototype viewable here:
https://public.tableau.com/profile/publish/WaterQuality_6/WQDash#!/publish-confirm

Bill showed the dashboard and explained that data are from Water Quality Portal – USGS NWIS and EPA's storet.
- Data are QA/QC'd (quality assurance/ quality controlled)
- Uses data that others have collected.

In response to a question about the CDSN – Colorado data sharing network – Bill explained that:
- Some CDSN data shows up in Storet, so would result in duplicated data
- We want the database to be dynamically updated – can't do that with CDSN – we don't have the staff for maintenance.

Bill then asked if there was any direction from group, and the following comments were made:
- One option would be to include a snapshot of say 2017 data, and it would be static. This would require someone to download the data each year and massage it so that it fits into the database and doesn't duplicate other data.
- An option would be to generate a list of data that goes into this that are static; this would help future subcommittees
- But the 303d list changes every two years
    - Seth Mason responded that Lotic will provide documentation at the end, with a clear description of how to update the data layers – they are trying to make that as simple as possible.

Bill resumed his demonstration and explanation of the dashboard:
- It includes anything anybody has tested for in last five years
    - Limiting the time-frame to five years makes dataset more manageable. Recent data is more important for current decision-making
- More than 300 different analytes are included, including many that are not tested for very frequently
- Example - Map with metals & trace elements filter + dissolved copper
- Can filter by Collector Name and Sample Site ID
    - E.g., Riverwatch program run by CPW
    - Size of circle is number of samples
    - Color is median value
    - Units are in a pop-up – can't add the units of measure to the legend
    - Selecting a site
        - Seasonal box plot and time series
    - Lotic is working on the units issue: different agencies report different constituents in different units

- Page is pretty high level – really just a big picture of what data are available and a view of seasonal patterns.

In response to a question, Bill stated that the page doesn't do a standards assessment, but it can be used to compare data to the standard:
- If you want that, then you probably have the ability to go have someone do that for you.
- Lotic wanted to avoid these data being used for people to demand that a stream segment be listed. For listing there are additional considerations, including duration of excedence.
- You can add a reference line on a graph, if you know the standard. Data points above your reference line get highlighted.

A question was asked about if Lotic had identified data gaps where more data would be useful?
- The answer was no, the tool is intended so that someone can answer that question by about their local area.
- There are also local datasets that are not included in this database.

In response to another question, Bill responded that time series data are not included! For example, temperature data….every five minutes for five years would be a lot of data.

Water Use Dashboard

Prototype viewable here:
https://public.tableau.com/profile/publish/Use_0/UseDash#!/publish-confirm

Bill explained that StateMod outputs are the foundation for the dashboard, and are used for approximating existing streamflows and projecting future streamflows. StateMod uses stream gauges, water rights and diversion records as inputs. It takes Colorado's prior appropriation system and has points that represent a stream or diversion and it pushes water through the system using these nodes.
- The match for reality is strong where data is strong
- On ungauged streams, high up in watersheds, it is less accurate.

One issue is whether to show a monthly or daily time step. The State Engineer's office uses monthly time step for basin wide planning and water planning

Bill explained that for each station you can look at total incoming flow, what is available to that water right, how much in ditch, how much is going downstream.
- Available Flow – mouse over nodes – pop-up tells you about the structures – average monthly flow
  - Gives you a graph of average monthly flow at that node, and total annual acre-feet per year for time series of years

- Diversions
    - Matches w/ how computer model uses the data
    - Colorado Division of Water Resources diversion records and water rights = paper rights
- Definitely a simulation and modeling exercise
- Total Shortage = difference between demand (paper right) and available
    - When there's not a shortage for a year, then there's nothing to graph, so there's a gap in the graph.

Bill pointed out that there is a slider so you can view different months.

Bill noted that some rivers have a lot of simulation nodes while smaller tributaries get aggregated into a single node
- There are opportunities to break out the aggregated simulation nodes where people are interested in that.
    - Someone asked how this would happen. Would the CWCB need to do this? Is it a challenging process?
        - The response was that there is opportunity to inform future updates of the planning model by notifying CWCB staff of the need. The models are continually updated and upgraded and those updates are based on data needs.

Concern was expressed about how people might use or misuse the data, and a desire to be very clear what the data are – appropriate annotation is critical.
- Lotic staff said they would continue to make it clear what is presented in maps and charts and what users shouldn't take away. The dashboard presents a high-level picture of how flows and water use have changed in both time and space. Where are the big water rights? Where have there been shortages?
- They'll want people to review and provide edits.
- StateMod data has been vetted by the state, so it should be less prone to responses that the watershed flow evaluation tool was.

Issues with daily time steps were noted and are discussed further in the explanation of the Hydrology dashboard below.

Hydrology Dashboard

Prototype viewable here:
https://public.tableau.com/profile/publish/Daily3/HydrologyDash#!/publish-confirm

Bill explained that this dashboard is also using StateMod outputs – but not focused on water usage, like last section.

He noted that this section is still in progress, and Lotic needs feedback.

- Lots of data
- 1.5 GB of data underlie this page! So there's a lot going on and can get bogged down with slow internet connections. Maybe do more pre-processing to speed things up.
- It includes of the outputs for entire upper basin, with several filters.
  - Natural vs. existing flows
    - Natural = model run with all of the water rights turned off.
    - Existing = river network w/ diversions turned on
  - There is a time slider by month
  - Can also filter by: Type, Subregion, and County

Selecting a node pulls up graphs

- Daily regime statistics – max modeled flow (model runs from 1975-2014)
  - Gives range of conditions at that node
  - Can mouse over graph – gives you min and max and median
  - NOT actual measured streamflow! It's modeled data. This caveat needs to be made clear.
- Annual max and min – graph by year
- Contribution of return flows
  - Log scale on y-axis
  - It's a budget or water balance. They are working on a graphic that will really clearly explain what all of these are
    - Takes gauge record (or precipitation if no stream gauge), and runs water down system and when it hits a node, then the model parcels it out between rights and some water that flows over the land comes back into river as return flows
      - Model can be tinkered with. This version is the one that the state uses for planning.
      - Very simple assumptions were made for the return flows. Important to show that there are some return flow, but these modeled flows are not super reliable and there is risk of misinterpretation - Important caveat to add!
      - State engineer's office does not use this. They will do a much more focused assessment if they need return flow data. This is okay for basin-scale planning, but not for water rights
      - One problem: you lose the signal as you move downstream, which can be a bit misleading. If return flows are accounted for at one node, they don't show up in the next downstream node.
      - Log scale is misleading and make return flows look a lot bigger than they are modeled to be.
      - In response to a question about the confidence level, the response was that it is variable. Closer to gauges and locations w/ good calibration, the model is better. Far away from gauges it's

less. Uncertainty in return flow routing is high. This is a coarse basin-scale model
- There was a discussion about whether we want this information displayed, or is it too unreliable/ problematic? The following comments were made.
  - Return flows are the "ghost in the room" and nobody knows how to talk about it, so even with a lot of disclaimers it might be valuable to still include them
  - One potential problem is that people will latch on to the results as gospel

There was more discussion about the value of including data and modeling results that have a lot of uncertainty in this tool, with the following comments made.
- Visualization can help expose the uncertainty and what's missing. Exposing the details of the underlying model
- Seth noted that this relates to the Roundtable's role – can provide visualization tools and actively engage groups with an interpreter.
- It can help encourage more data collection and better modeling

More discussion ensued about where to put a disclaimer.
- Popups? Dialogue box requiring a click? Footnotes?
- Around the sides
- On popups
- When it's embedded in an actual website?
- Seth suggested that Lotic could pull return flows out into a separate page with a lot more caveats. And, they can tell people how the model works, displaying the state's assumptions.
- Bill commented that they could maybe just pull out the locations that have return flows on a separate page, so that there's not a visual tendency to be misleading.
- Bill noted that the return flow modeling is very coarse and there are only about five categories around the state that are used in the model.

Bill explained that with the dashboard, you can filter on and off different stream types.

On instream flows, Bill explained that there are errors in this dataset right now. Many nodes don't have a geographic assignment, but had a narrative description, so may be in the wrong place, especially instream flows. Lotic will work through this as well as they can. It's an artifact of the dataset and not really an error in the data. Lotic is working with the Division of Water Resources to resolve this.

Hydrologic Alteration Dashboard

Bill explained that Lotic doesn't have the hydrologic alteration dashboard ready yet, because of some challenges with managing the StateMod outputs.

- When you take the StateMod simulation and take it to the daily time step, problems emerge.
- In some places, results are good, but in other places it can be problematic.
- One possibility is that daily data will need to be removed for hydrologic alteration and only use monthly similar to the flow alteration tool.

Bill showed examples – Colorado above grand junction and Castle Creek above Aspen

- In May, you can see a strange discontinuity

Bill explained that Lotic is working with Wilson Water Group to determine the root cause. If left unresolved and presented in this format on this dashboard, it can be very confusing. It would be better to just not use these data and only use monthly.

Bill asked if people had thoughts about including these data? He noted that the State has embraced these data, but not used them for anything. The graphs are of the typical annual hydrograph. The following comments and questions were stated.

- The graphs with this discontinuity are too misleading
- Could IHA analysis be performed on real gage data instead of StateMod data?
  - Yes, or possibly from flow alteration tool
    - Could use a subset of location where there's good gauge record.
- Would be better to have more accurate and less precise data. More accurate monthly data is better than less accurate daily data.
- There is the same issue with these data as with the return flow data. The quality of the data is important. Want data that are as reliable and as defensible as possible.
- If we do go with daily data, we shouldn't use it in this form.
- It would be good to know how much it would cost to have Lotic do the fix, and see if the roundtable would pay for it.
- SNOTEL sites provide chart of daily data up to the day. Could that same model be applied? USGS does it w/ streamflow gages.

In response to a question about what model data adds that stream gauge data doesn't bring in, Lotic staff provided the following responses.

- Spatial resolution: Model is more precise, but less accurate.
- Example on Crystal River – lots going on – inflows and outflow - if you only have data from the two gauges, then you don't get the whole story and very difficult to resolve issues and challenges
- Models are key to understanding what happens between points where we have hard, real data.

Where you can trust the numbers or not is where they're giving gross order of magnitude flows

- The big dogs in the system are caught in the StateMod system but the little diversions are not as accurate and can't be trusted with high precision.

NEXT STEPS

- Please provide feedback as soon as possible to hholm@coloradomesa.edu
- The next basinwide stakeholder meeting on this project is tentatively scheduled for July 31, 1-3 in Glenwood Springs (specific location to be announced).

The agenda at the next stakeholder meeting will include the final presentation of Lotic's completed dashboards and a discussion about what elements should go into the completed Integrated Water Management Planning Framework document, which will address how to use the dashboards and stakeholder engagement to develop integrated water management plans.