CBRFC 2011 Stakeholder Forum

Summary

The Colorado Basin River Forecast Center (CBRFC) held a stakeholder forum on November 4, 2011 in Denver, CO. The forum was organized around presentations from CBRFC and Denver Water staff on models, tools, forecast application, and projects that the RFC uses to make forecasts. Presentations included short descriptions of many elements of the CBRFC forecast process, a review of the 2011 runoff and the forecasts for it, Denver Water's application of forecasts for decision making, and discussion on various CBRFC projects including webpage development, ESP forecast improvements, and snow covered area work. As part of NOAA, the CBRFC is a service organization and strives to be as relevant to its stakeholders as possible. To that end, active discussion and participation was facilitated throughout the forum. Participants included many of the major stakeholders in the Colorado Basin (see participant list in appendix 1). The forum generated significant ideas, actions, and requests for new and improved ways the CBRFC can meet stakeholder requirements in the basin. These are described below.

Feedback from both participants and NOAA staff was generally very positive. In particular, participants appreciated the openness of CBRFC to adjust to the stakeholder requirements and the service oriented mission of NOAA generally and the CBRFC in particular. The stakeholder forum model was largely endorsed as an appropriate mechanism for engaging with stakeholders on either an annual basis. Demonstrations of forecast tools and discussion of forecast skill and post-mortem event analyses were particularly well received. In the future, many of the stakeholders would appreciate any insight beyond the officially published forecasts that the CBRFC can provide. Complete, unedited feedback is in appendix 2.

The workshop agenda is in appendix 3. Full presentations are available on the CBRFC website (www.cbrfc.noaa.gov/present/2011/forum/2011forum.htm).

Discussion topics

Discussion in the meeting and in the follow up comments yielded several important areas for improving NOAA and CBRFC services.

Forecast verification is important for stakeholders to apply forecasts. One stakeholder requested CBRFC to "please don't ever sugarcoat the error associated with these forecasts… its important for us water managers to understand the uncertainties so that we can manage around them." Other stakeholders echoed similar sentiments. During the meeting, CBRFC described its forecast performance for 2011 highlighting times and places where forecasts were less skillful than others. CBRFC has extensive verification information on its water supply forecasts available online. CBRFC recently started posting verification plots for its daily

forecasts but still needs to publish forecast verification for long lead peak flow forecasts.

Similarly, several stakeholders expressed the need for **greater real-time information about the CBRFC modeling process**. In particular, stakeholders wanted to know when state updates are made to the snow model and/or hydrologic model states, how much water is being removed or added to the model states. CBRFC's current practice is to update snow states twice per month from January through the start of the melt (~April) and to update lower zone hydrologic states once per year in the fall.

Stakeholders along the Front Range expressed a need for **forecast consistency between RFCs** they receive forecasts from. In particular, they noted that daily forecasts, access to frequently updated ESP traces, and SNOTEL time series plots are all available on the west side of the divide but not available through east side RFCs or the national NWS AHPS pages.

Most stakeholders highlighted the need for **frequent updates of all forecast products** in the springtime when reservoirs are filling and rivers are peaking. While weekly ESP updates, for example, are sufficient for most of the year, one stakeholder noted he was "looking at it every day" during the runoff period. CBRFC should consider more frequent updates for at least the spring. Similarly, the weekly updates for long lead peak flow forecasts were well received.

The new CBRFC website was largely well received but not fully used. Stakeholders embraced a **how-to-use-the-website webinar** in the January/February 2012 timeframe.

Water management agencies are increasingly **utilizing the full ensemble time series traces from ESP** to aid their decision making processes. Several agencies reported that they had recently started using these forecasts or were planning to start soon. This points to the need for CBRFC to ensure these forecasts are updated on a regular schedule and that forecasters are available to consult with water management agencies using the forecasts to explain changes in the forecasts.

Appendix 1: Participant list

Joe Busto	CWCB
Bob Steger	Denver Water
Bob Peters	Denver Water
Becky Smith	CSU
Dave Kanzer	CRD
Karen Rademacher	NCWCD
Brian Epstein	CWCB
Chuck Cullom	CAP
Linda Sullivan	AZ Power Authority
Kevin McBride	Upper Yampa WCD
Eric Gordon	WWA
Zach Margolis	Town of Silverthorne
Kevin Houck	CWCB
Erik Knight	USBR
Ryan Christianson	USBR
Wendy Ryan	CSU
James Walter	SRP
Ken Curtis	Dolores Basin WCD
Tom Maher	SNWA
Alexei Luganov	SNWA
Steve Wolff	Wyoming State Engineers Office
Nezette Rydell	NWS
Treste Huse	NWS
Aldis Strautins	NWS
Andrew Gilmore	USBR
Ron Thomasson	USBR
Tim Miller	USBR
Michelle Garrison	CWCB
Amy Volckens	RTi
Michael Lewis	USGS

Appendix 2: Participant Feedback

1. How useful was the workshop to you?

The workshop was very useful. It was great to see the range of perspectives from the Upper Basin and Lower Basin stakeholders on the CBRFC methods and research. Thanks for your effective outreach.

Very Useful

Great workshop! Thanks for putting it together. Weather and river flow prediction and associated statistics always seem so dry (sorry about that) until the flood waters are lapping at your doorstep.

Loved it! It was great to be able to put faces to names. I certainly came away with a better understanding of CBRFC's processes and capabilities. The presentation by Bob Steger of Denver Water was particularly relevant and informative.

I found the workshop very useful. Like past workshops and webinars, I learned new things. I now see the advantages of going to a 1981-2010 simulation period and I better understand how snotel measurements are used at the beginning of each new month to check and sometimes refine the model states.

The workshop is useful for me in an indirect way. The Power Authority does not interact with the operations of the rivers and reservoirs, but we are impacted by their operations, so we like to keep informed in order to anticipate any changes in the current year's forecast. We monitor the daily information, but we are ultimately concerned with the end of water year numbers.

2. Assuming it was useful, what are your thoughts on future workshops (e.g. frequency: how often should we do these?, length: is one day right?, content, location: any opinion on doing these at CBRFC in Salt Lake City vs doing them at other places?, etc)?

I think those meetings should be held annually. One day is about right to exchange information. I believe that visiting other places and learning from the variety of experiences is always beneficial.

Once per year before the start of the water supply season seems reasonable. Content was good, particularly past year in review, CBRFC development activities and plans affecting next year's forecasts, and example applications. Length of one day was good, though it might be beneficial to have the last 1/2-hr be free time for people to ask questions 1-on-1. (I'm just guessing that some people had questions they may not want to ask in front of a group?) Also, given budget circumstances, I would guess you would get a higher turnout of CO stakeholders if you offer it in Denver vs SLC. If you hold it in SLC, would be good to have a webinar option.

An annual one day workshop is probably all I can justify to my administration, The location was great for me. If you would like to have one in Silverthorne, Colorado, I can come up with the meeting space. Maybe one day of workshop, one day of touring the high Rockies?

I think a 1-day workshop is about right. I also think one workshop per year is about right. Every-other-year frequency would probably work for me as well, but with new water managers each year, it might be best to stick with annual workshops. I would vary the location so that no one agency or individual is always doing the traveling.

I thought the meeting was very useful. I would recommend staying at once per year, one day long and I prefer holding in SLC, though I understand if you move around for stakeholder convenience. DIA transport is a real pain. I think the webinars cover most things very well and only would meet in person annually, specifically when you need more feedback and interaction with the audience. I had an easier time getting to the July meeting, but would be difficult to cover the previous year. I guess move them around seasonally as the subject matter dictates.

I think varying the locations is a good idea

3. What were the most important / relevant / useful topics covered at the workshop for you?

All topics were relevant to me. Forecast application by Denver Water was useful in framing the methods of addressing unique local conditions. 30 year average update, instantaneous forecasts, integration of climate forecasts into seasonal water supply forecasts, and discussion of a new water supply coordination practice are important advancements on my list.

past year in review, CBRFC development activities and plans affecting next year's forecasts, and example applications

Capabilities and limitations of NOAA long range forecasting and the CBRFC methodology for flood forecasting.

Most relevant/useful topics: a. The benefits of going to 1981-2010 simulation period. b. Networking. c. The new CBRFC website and some of its features. d. The change from NRCS-CBRFC coordinated forecasts.

I find it useful to review the previous year, though this works well on the webinars also. I also like to continue learning about the model and how it worked in the previous year. I also appreciate hearing and discussing new programs. The long lead peak flow forecasts have not been real helpful, but they continue to evolve and improve. I think you appropriately spend more time on bigger issues like the ensemble and less on things like the website. In short, it's all useful and worth some time at the forum.

Since I am interested in the annual water from the upper basin, snow pack, snow melt and inflow into Powell are very important to me. The peak flow information is very interesting to me, but less important for what I do. I can't say what was least helpful because I think all of the information was helpful whether or not I found it useful.

4. What were the least?

Model calibration overview (but probably useful for others)

5. Are there decision points, meetings, or other avenues that you would like to have the CBRFC more involved in?

Water year 2011 has shown the importance of tracking water supply conditions well beyond the beginning of April. Variety of factors may contribute to the need for close monitoring of water supply conditions on a weekly and potentially daily basis. We greatly appreciate the ability and willingness of the CBRFC to address this need at certain critical points.

Mostly just appreciate getting CBRFC's time and input on the SCA work and water supply activities in the Rio Grande.

- Are you involved in the Colorado River Compact water availability analysis?
- Do you connect with the Colorado River Water Conservation District?
- How about the Colorado River Basin Roundtable?
- I was surprised that nobody mentioned Nolan Doesken or COCORAS.

6. Other comments?

Great workshop, I appreciated open discussion format. Thank you for timely responses to all our requests throughout the year.

The newbies (maybe I'm the only one?) could use a good Acronym Guide/Directory (AGD)

Did somebody really say you ignore sublimation?

Do you check your precipitation measurements against radar returns and extrapolate precipitation in areas without measuring equipment and verify measurements where you do have it?

It seems like there should be (so I suppose there already is but I don't know about it) an equation for calculating river flow – I'll call mine the Jake Equation: RQ=Pr+Ps-SE-GWi-ET-Ro-RLG-RE-Wd+Rfs+Rfg [Wd… repeats for each diversion above calculated RQ point, until RQ = zero (e.g. Colorado River in Mexico somewhere) or reaches a sea.]

Where:

RQ = Total river flow

Pr = Precipitation Rain

PS = Precipitation Snow

SE = Sublimation/Evaporation

GWI= Groundwater, infiltration (to)

ET = Evapotranspiration

RO = Runoff

RLG= River loss to groundwater

RE = River Evaporation

WD = Water Diversion

RFs= Return flow -Surface

RFg= Return flow -Groundwater

Water availability in the west is a $100,000,000 question (just my estimate, I don't have any facts to back that up) we should be doing much more monitoring and getting funding to improve long range forcasting.

For instance, it seems like we're on the threshold of a data availability explosion. I can imagine a network of tens of thousands of simple, inexpensive, automated, internet connected, precipitation reporting stations in the Colorado River Basin. Think COCORAS without having to go outside at 0700. A USB port would be the only connection required. Areas without internet or power could still have inexpensive Solar powered units built using "SPOT GPS" type transmit-only technology.

NASA is flying Antarctica now, getting imagery and LiDAR data. The same aircraft could get an accurate measurement of snow cover by flying the Snow Sheds in the summer then again in the spring, or more often. You don't need to cover an entire River Basin, just enough to be statistically accurate. This could also calibrate SNOTEL sites you have.

Dust on snow and the effects of pine beetles on snow hydrology are hot topics. I think it would be good for the CBRFC to stay on top of the research and participate in the research, if at all possible. (I think you are doing this, so please continue to do so.)

The CBRFC should always be looking at ways to improve its streamflow forecasts, but please don't ever sugarcoat the error associated with these forecasts. In other words, it's important for us water managers to understand the uncertainties so that we can manage around them.

Appendix 3: Agenda

8:30am – Welcome and Introductions (Kevin Werner) (ppt | pdf)

- Logistics including lunch
- Overview
- Introductions
- Participant goals, forecast challenges, etc
- New CBRFC basin focal points

9:00 – CBRFC forecast methodologies and operations

- Overview, inputs, outputs (Michelle Schmidt) (ppt | pdf)
- Models and software (John Lhotak) (ppt | pdf)
- Hydrologic Ensemble Forecasts (Brenda Alcorn) (ppt | pdf)
- Emphasis on importance of reservoir release schedules

10:30 – Break

10:45 – Forecast Application

- Denver Water example (Bob Steger)
- Discussion: How do you apply forecasts?

Noon – Lunch

1pm – 2011 Year in Review

- Overview (Kevin) (ppt | pdf)
- Water supply forecasts (Brenda) (ppt | pdf)
- Peak flow and daily forecasts (Ashley Nielson) (ppt | pdf)
- Discussion: How effective were these forecasts in meeting stakeholder needs? Were there other types of forecasts or update frequencies that would have been more effective?

2:30 – Break

2:45 – Discussion Topics

- New webpage: Forecast access, webpages, and visualizations (Kevin) (ppt | pdf)
- Future of water supply forecast coordination (Michelle) (ppt | pdf)

- ESP forecast updates (Michelle) (ppt | pdf)
- Seasonal to two year forecast development (Kevin) (ppt | pdf)
- Snow Covered Area work (Kevin) (ppt | pdf)
- Reservoirs (Brenda) (ppt | pdf)

5pm – Adjourn

6pm onwards – Optional social gathering at Rock Bottom Brewery, 1001 16th St, Denver CO 80265 (phone: 303.534.7616)