Toward a National Water Resources Outlook

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+ many others
Outline

• Motivations
• Current Capabilities
• Toolkit for engaging users
Motivations

• **Water supply forecasts** in western US: Develop high quality, consistent capabilities for stakeholders and forecasters to evolve forecast program

• **Water resource outlook**: Leverage existing River Forecast Center forecasts to provide a consistent picture of water outlook across the country.
RFC Ensemble Streamflow Prediction (ESP)

• ESP forecasts based on:
  – Current model states for soil moisture and snow
  – Future weather / climate scenarios (typically historical time series)

• Issued routinely at every RFC to support:
  – AHPS flood outlook products nationwide
  – Water supply forecasts in western USA
Water is an important resource for agriculture, industry, cities, and people all across America. The National Weather Service forecasts streamflow for many rivers around the country to support decision making related to water management. In times of excess, flooding can be planned for or mitigated based on forecasts. In times of scarcity, water can be managed to maximize its value based on forecasts. This site provides access to river forecasts and a variety of visualization tools. Suggestions and comments on this website and NWS water resources forecast services are always welcome.

Water Resources Outlook Highlights
- View maps of ensemble averages for the entire United States
- Obtain an overview of information
- Follow forecast progression
- View raw forecast and observed data
- Rank forecasts with historical flows

Click on maps to view full size, interactive version
Monthly Ensemble Outlook Map for February

Map Options

Point Data
- Time Period: February
- Normalization: Mean

Legend
- > 150% of mean
- 130% - 150% of mean
- 110% - 130% of mean
- 90% - 110% of mean
- 70% - 90% of mean
- 50% - 70% of mean
- < 50% of mean
- No mean
- No Forecast

Wateroutlook.nwrfc.noaa.gov
HLEC1

Yuba River near Smartville
California - CNRFC

Seasonal Water Supply Forecast

<table>
<thead>
<tr>
<th>950 kaf</th>
<th>93.8% of Historical Median</th>
<th>95.5% of Historical Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>50% Exceedence (Official Forecast)</td>
<td>515 kaf</td>
<td>1550 kaf</td>
</tr>
<tr>
<td>90% Exceedence</td>
<td>10% Exceedence</td>
<td></td>
</tr>
<tr>
<td>Official Historical Flows</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Forecast Issued: Feb 1 2010

View Water Supply Forecast Plot

Seasonal Ensemble Outlook

<table>
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<tr>
<th>788 kaf</th>
<th>77.8% of Historical Median</th>
<th>89.4% of Historical Mean</th>
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</thead>
<tbody>
<tr>
<td>50% Exceedence</td>
<td>530 kaf</td>
<td>1623 kaf</td>
</tr>
<tr>
<td>90% Exceedence</td>
<td>10% Exceedence</td>
<td></td>
</tr>
</tbody>
</table>

Forecast Issued: Feb 17 2010

View Seasonal Ensemble Outlook Plot

Show Monthly Ensemble Outlook
Next Steps

NOAA/NWS River Forecast Centers

OHD, Academia, and other research collaborations

NWS “baseline” web services

Water Supply Water Resources Web Services

Service Coordination Hydrologist

Forecasts and data

Development

Stakeholders

Workshops, presentations

Toolkit for engaging users in “climate services”
Previous Experience

• **Forecast verification** – Large workshop in Boulder, CO in 2008 with hands on lab exercises and presentations.

• **Soil moisture** – Focus group workshop in Tucson, AZ in 2009 with specific questions and social science techniques.
Toolkit for User Engagement

• Need a systematic toolset to maximize stakeholder input over time in a consistent, meaningful way
• Engaged with WWA (Kristen Averyt) and CLIMAS (Gigi Owen) to develop toolkit
• Dry run in Salt Lake March 2010 with NWS personnel
• First test of toolkit in April 2010 in Grand Junction, CO
• Follow on testings in Utah and SE USA.
Climate Services Framework

Users & Existing Climate Information

Prototyping with...
- Colorado Water Conservation Board
- USFS
- NOAA NWS RFC

START

Climate Services Machine

- OUTREACH
- INFORMATION PROVIDERS
- EVALUATION

Better Climate Information & Informed Users

Informed Users & Better Climate Information

Credit: Kristen Averyt, WWA
APRIL WORKSHOP

I. Pre-workshop Evaluation
   A. Climate Literacy Quiz
   B. Climate Perceptions Qs
   C. NWS Tool-Relevant Qs

II. Workshop Agenda
   A. Informational Presentation/Discussions
      1. Climate & the Hydrologic Cycle
      2. State of the Science on the CO River & Climate
   B. Testing Tool
   C. Gaming
      1. Presentation to put Game in context
      2. Game
   D. Closing

III. Post-Workshop Evaluation
   A. Climate Literacy Quiz
   B. Climate Perceptions Qs
   C. NWS Tool & Decisions
   D. Workshop Evaluation

- Gaming Framework: Use of information for decisions on 3 timescales representing extreme events

I. Breakouts/Group Discussion
   A. Present with ☐ ☐ ☐ ☐ (indicates drought forecast)
      How would you use this information?
      What decisions might be affected?
      Present with ☐ ☐ ☐ ☐ (same data as before, but outlook)
      Present with ☐ ☐ ☐ ☐ (same data as before, but 25 year SFRR data)
   B. Repeat A. with ☐ ☐ ☐ ☐ (indicates flood)
   C. Report back to group to assimilate answers

II. Specific Scenarios
   A. Short-term Forecast: Public safety
      ☐ ☐ ☐ ☐
      - flood, drought or average
      - for each person in group
      - write down option chosen
      - discuss in small group
   B. Seasonal Outlook or 24 mos.?
      - Repeat
   C. Long-Term (25-50 yr.)
      - Repeat
      - Reservoir, Pipeline construction
      - Business investment

Credit: Kristen Averyt, WWA, Gigi Owen, CLIMAS
For what types of decision would you foresee the following information being useful?

- DROUGHT CONDITIONS
- FLOOD CONDITIONS

Credit: Kristen Averyt, WWA, Gigi Owen, CLIMAS
Gaming Section: Test 6 Scenarios

**Recreation Specific**
- Camp site manager on a river; signage for patrons for the next month....
- Manager of a commercial rafting company; develop advertising campaign for the season....
- Long-term investment in a rafting operation....

**Water Management Specific**
- Obtaining sufficient water level in reservoir for July 4th recreation
- Investment in urban recharge and recovery system
- Water delivery for an inter-state compact; or river restoration project planning

Credit: Kristen Averyt, WWA, Gigi Owen, CLIMAS
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