Toward a National Water Resources Outlook

Kevin Werner
Service Coordination Hydrologist, CBRFC
+ many others

Outline

- Motivations
- Current Capabilities
- Toolkit for engaging users

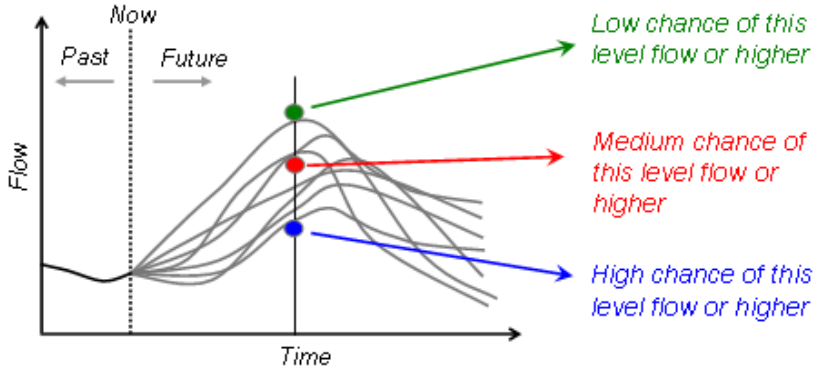
Motivations

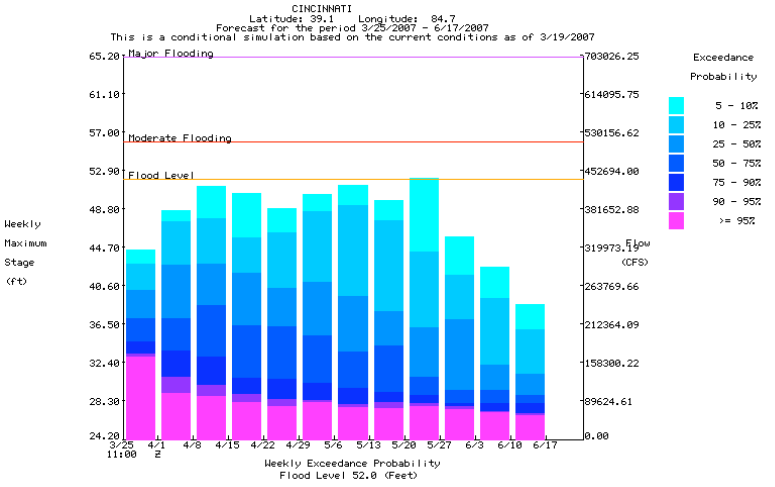
- **Water supply forecasts** in western US: Develop high quality, consistent capabilities for stakeholders and forecasters to evolve forecast program

- **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





National Weather Service
Water Resources Outlook

home | maps | forecast overview | data checkout | help

Search for a River Forecast Point

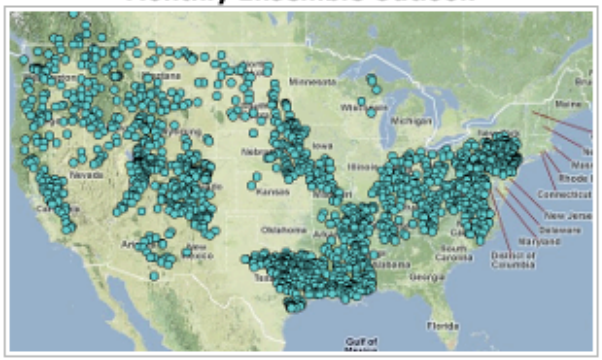
Enter a Location, River, or ID Search

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

Monthly Ensemble Outlook



Seasonal Water Supply

Click on maps to view full size, interactive version

MAPS
Seasonal Water Supply
Water Resources Outlook
Water Supply Verification

DATA AVAILABILITY
Data Checkout

DOCUMENTATION
Web Site Assistance

POINT FORECASTS
Forecast Overview
Forecast Evolution Plot
Forecast Ranking
Ensemble Forecasts
Forecast Verification
Climate Variability

SEARCH FOR A RIVER FORECAST POINT
Search

United States Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
1325 East West Highway
Silver Spring, MD 20910

VERSION 4.0

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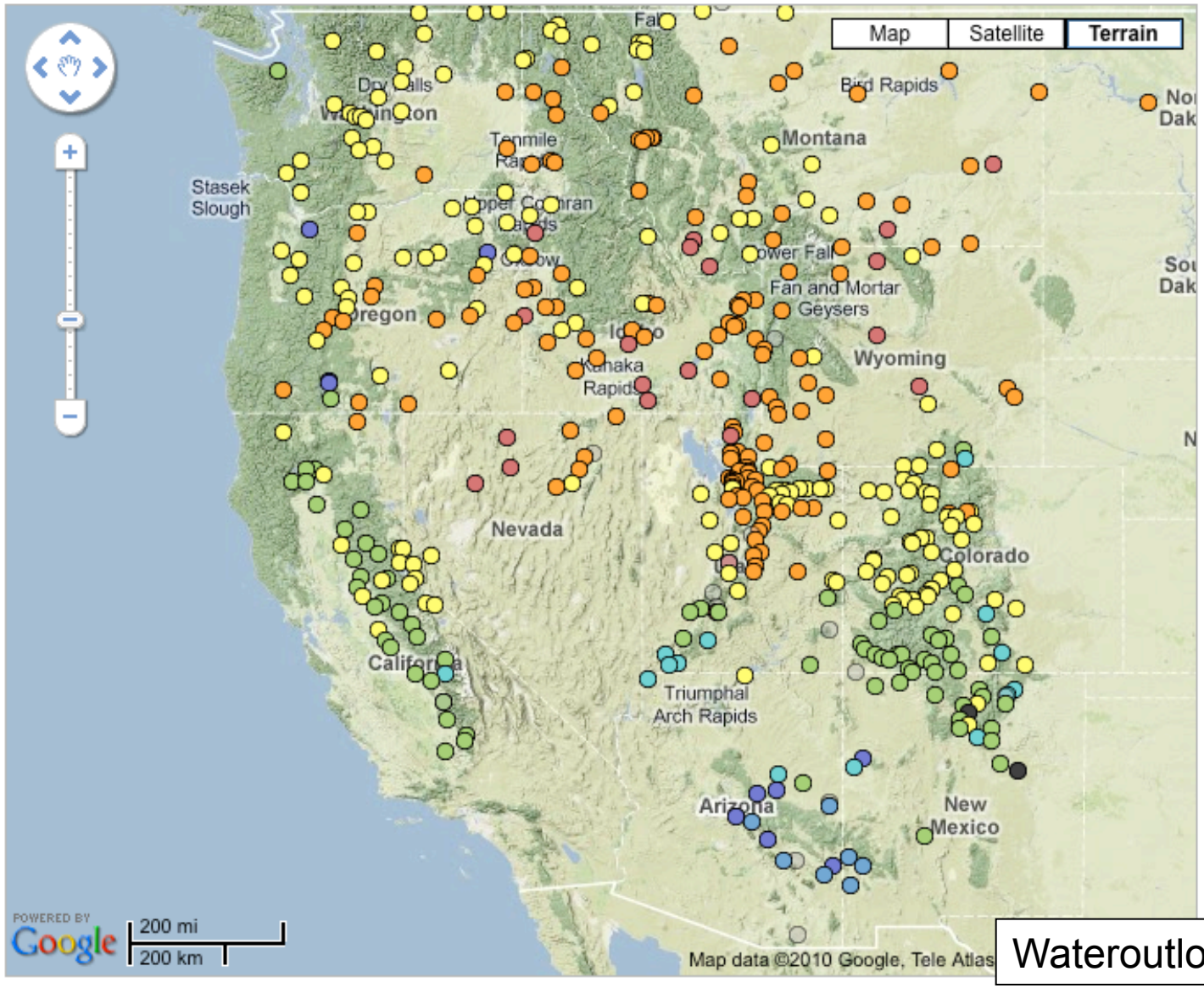
Monthly Ensemble Outlook | **Seasonal Water Supply Forecast** | Seasonal Water Supply Tabular Data

Water Supply Forecast Map from February 2010



Map Options

Point Data

Forecast Issuance Month: February 2010

Normalization: Mean

Update Map

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

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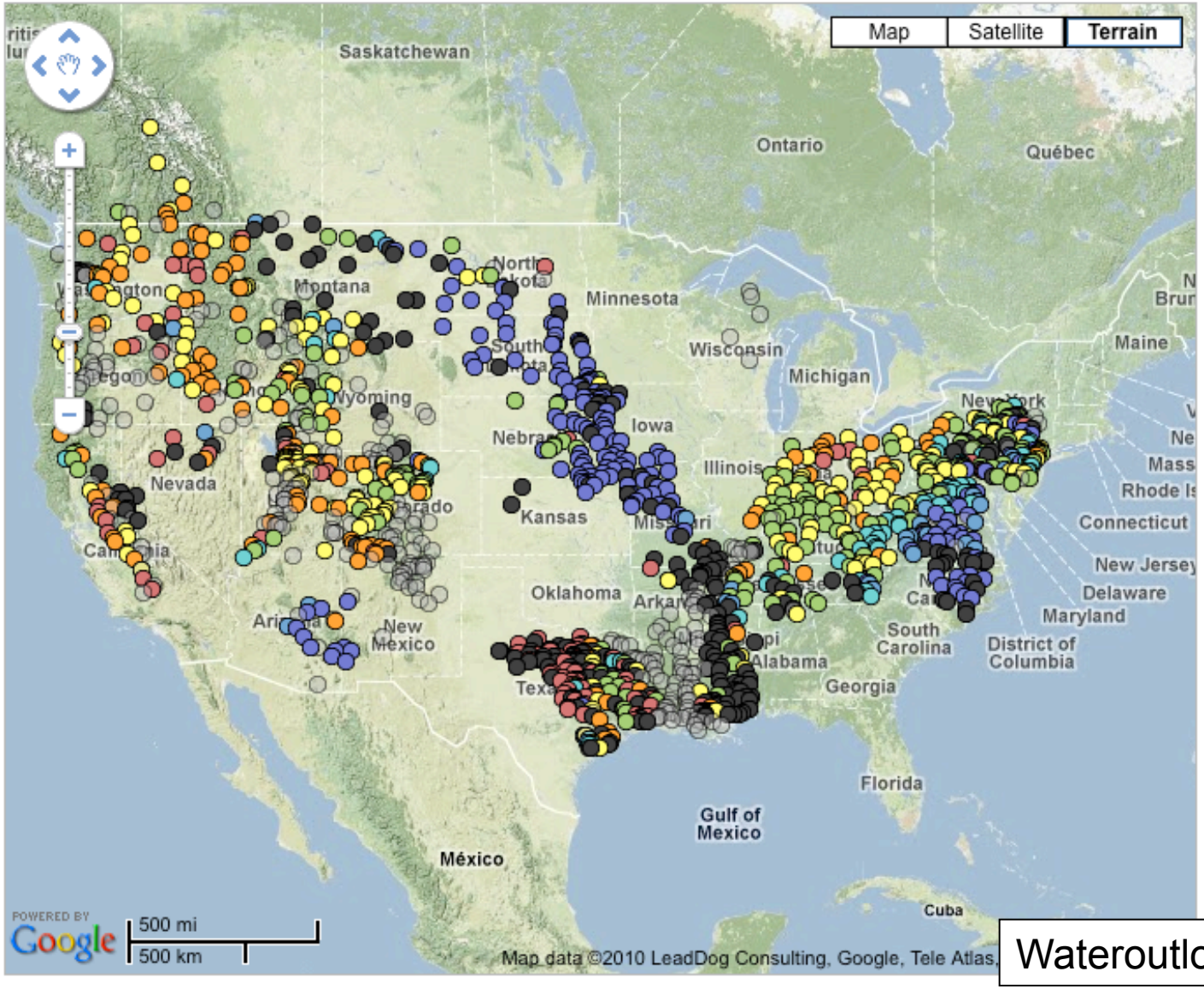
Monthly Ensemble Outlook | Seasonal Water Supply Forecast | Seasonal Water Supply Tabular Data

Monthly Ensemble Outlook Map for February



Map Options

Point Data

Time Period: February
Normalization: Mean
Update Map

Legend

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- 130% - 150% of mean
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Current Location: **Yuba River near Smartville** change location: Search

Forecast Overview | Forecast Evolution Plot | Forecast Ranking | Ensemble Forecasts | Verification | Climate Variability

HLEC1

Yuba River near Smartville

California - CNRFC

Seasonal Water Supply Forecast

Forecast Period: Apr-Jul

950 kaf	93.8%	95.5%
50% Exceedence (Official Forecast)	of Historical Median	of Historical Mean
515 kaf	**1550 kaf**	**63rd of 110**
90% Exceedence	10% Exceedence	Official Historical Flows

Forecast Issued: Feb 1 2010 — View Water Supply Forecast Plot

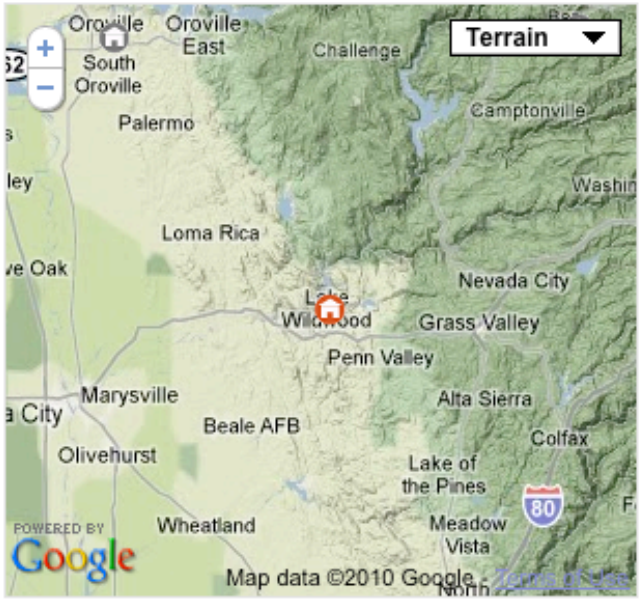
Seasonal Ensemble Outlook

Forecast Period: Apr-Jul

788 kaf	77.8%	89.4%
50% Exceedence	of Historical Median	of Historical Mean
530 kaf	**1623 kaf**	
90% Exceedence	10% Exceedence	

Forecast Issued: Feb 17 2010 — View Seasonal Ensemble Outlook Plot

Show Monthly Ensemble Outlook



Legend: Current Location | Other Locations

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Water Resources Outlook

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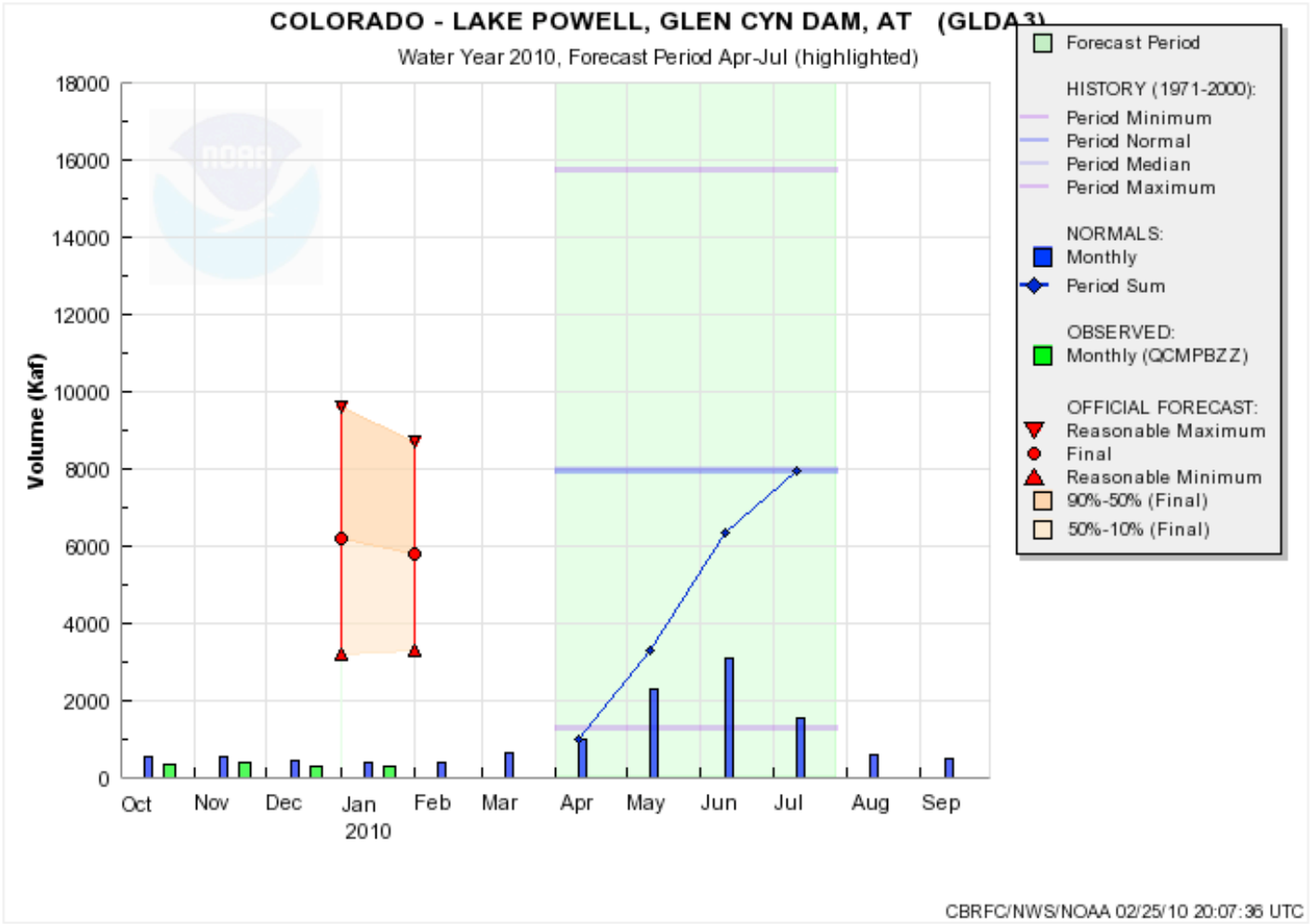
Current Location: **Colorado River at Lake Powell, Glen Cyn Dam,** change location: Search

Forecast Overview | **Forecast Evolution Plot** | Forecast Ranking | Ensemble Forecasts | Verification | Climate Variability



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Graph Options

Water Supply Forecasts

- [x] Offical Forecast
- [x] Forecast Background

Ensemble Forecasts

- [ ] ESP Background
- [ ] ESP Expected

Observations

- [x] Monthly Observed
- [x] Period Sum Observed
- [ ] Water Year Sum Observed
- [x] Monthly Normals
- [x] Period Sum Normals
- [ ] Water Year Sum Normals

Periods/Normals

Start Water Year: 2010
End Water Year: 2010
Period: Apr-July

- [x] Period Median
- [x] Period Normal
- [x] Period Maximum
- [x] Period Minimum
- [x] Forecast Period

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Water Resources Outlook

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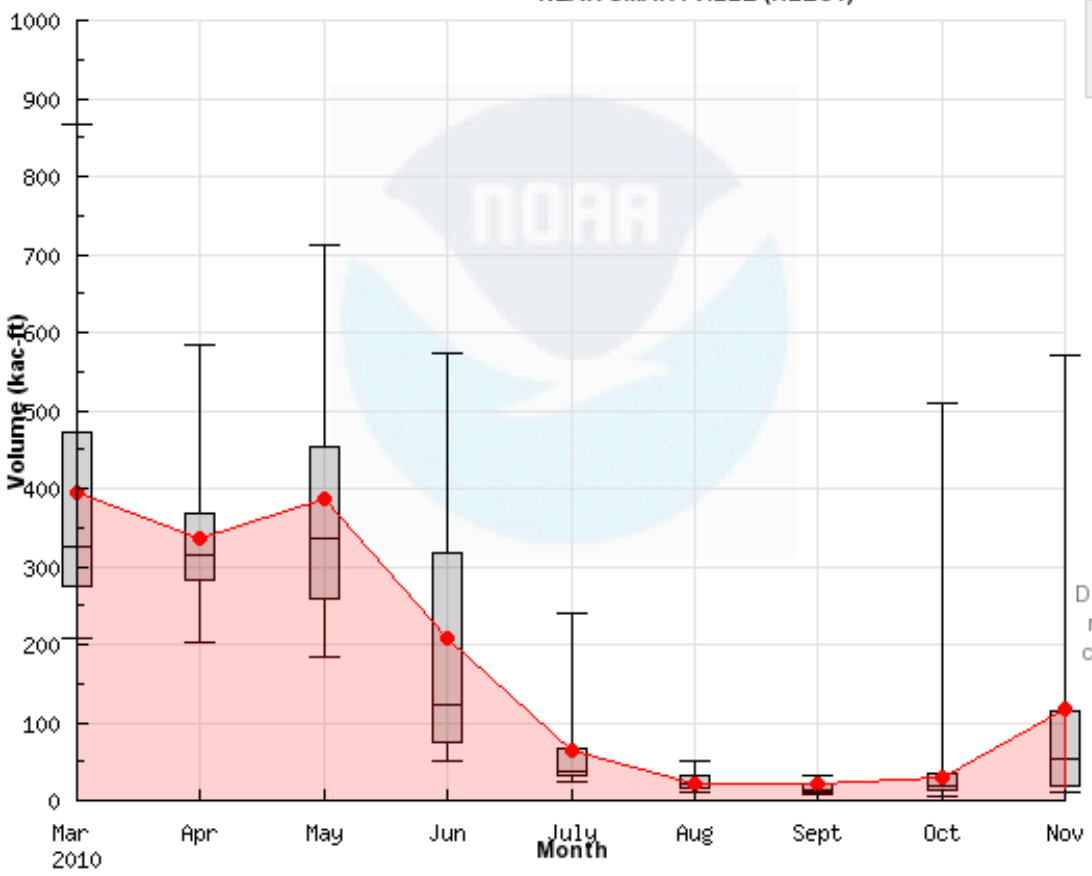
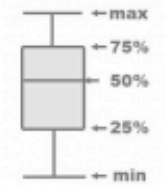
Current Location: **Yuba River near Smartville** change location: Search

Forecast Overview | Forecast Evolution Plot | Forecast Ranking | **Ensemble Forecasts** | Verification | Climate Variability

Monthly Streamflow Distribution from ESP Forecast
NEAR SMARTVILLE (HLEC1)



Disclaimer: ESP forecasts are not coordinated or manually checked by NWS forecasters.



Issued: February 24, 2010

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Graph Options

Forecasts

Current Forecast: February 24, 2010

☐ Forcing Year

☐ ENSO Conditional Forecast

Archives

☑ Average Runoff: Mean

☐ Historical Observations

Season Options

Seasonal Constraints: Mar 10 to Nov 10

◉ Monthly

○ Accumulation

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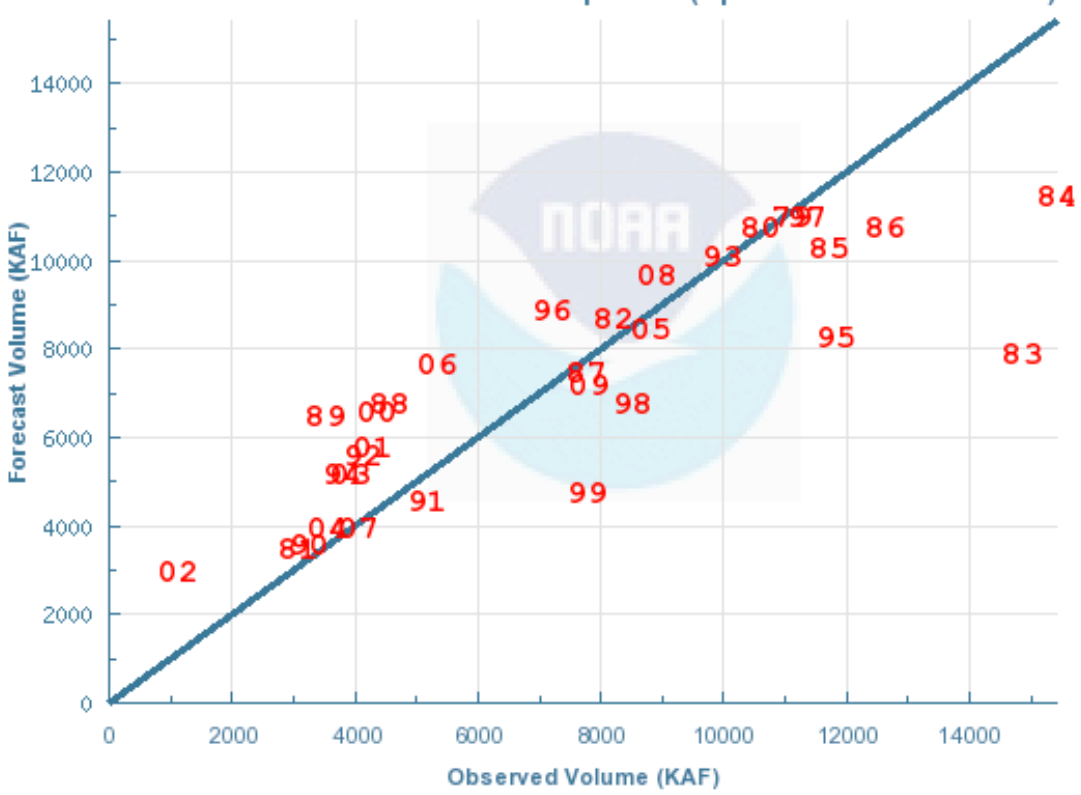
Streamflow - COLORADO - LAKE POWELL, GLEN CYN DAM, AT (GLDA3)

Forecast Period: Apr - Jul (Apr Forecast Streamflow)



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Graph Options

Statistic

Scatterplot

Data Sources

- [x] Coordinated Forecast
- [ ] National Weather Service
- [ ] Natural Resource Conservation Service
- [ ] Statistical Water Supply
- [ ] California Department of Water Resources
- [ ] Ensemble Streamflow Prediction
- [ ] ESP - Empirical
- [ ] ESP - Normal
- [ ] ESP - Lognormal
- [ ] ESP - Wakeby
- [ ] ESP - Logwiebull
- [ ] ESP - Weibull
- [ ] ESP - Loglogistic

Time Scale

Period: Apr-Jul

Years: 1979 1980 1981 ... 1985

Threshold

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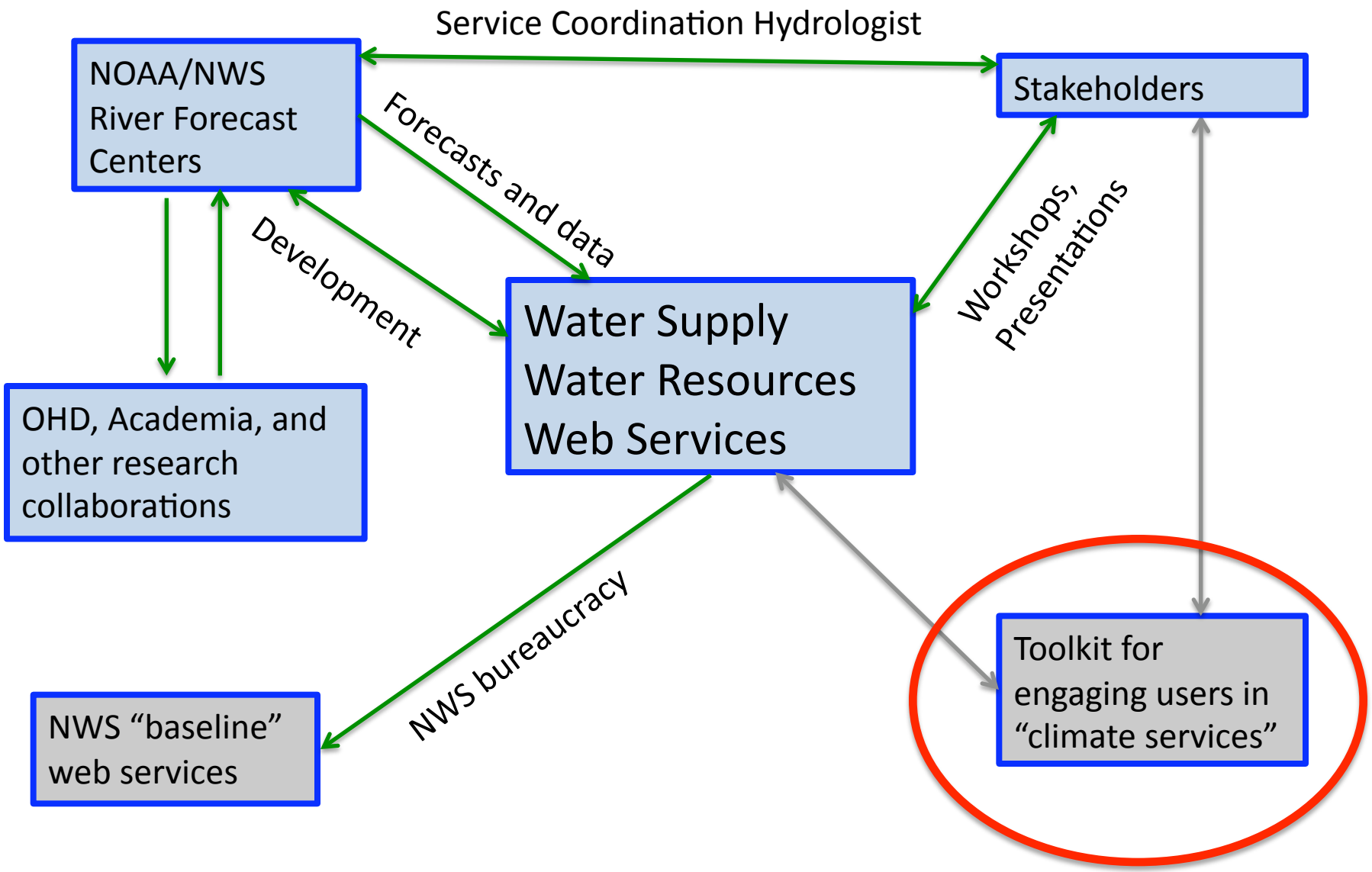
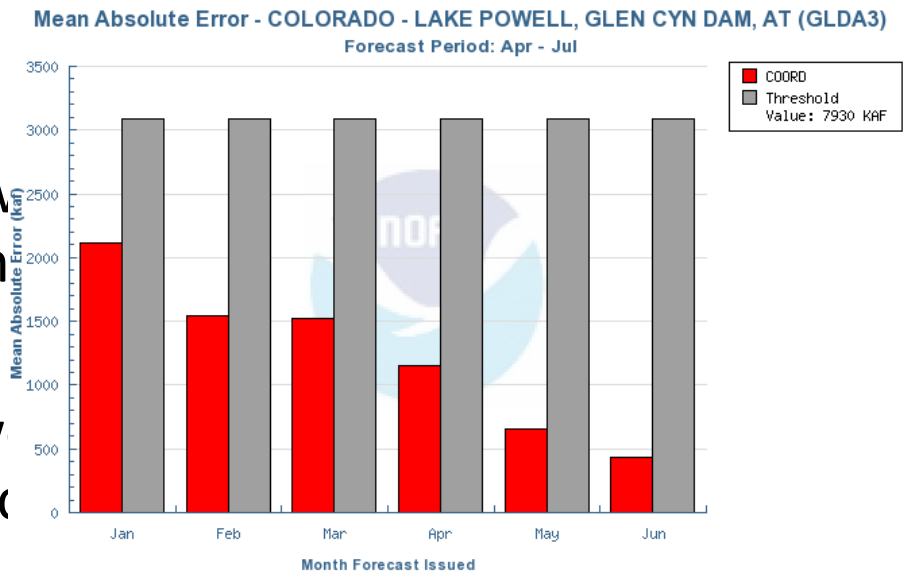
Next Steps

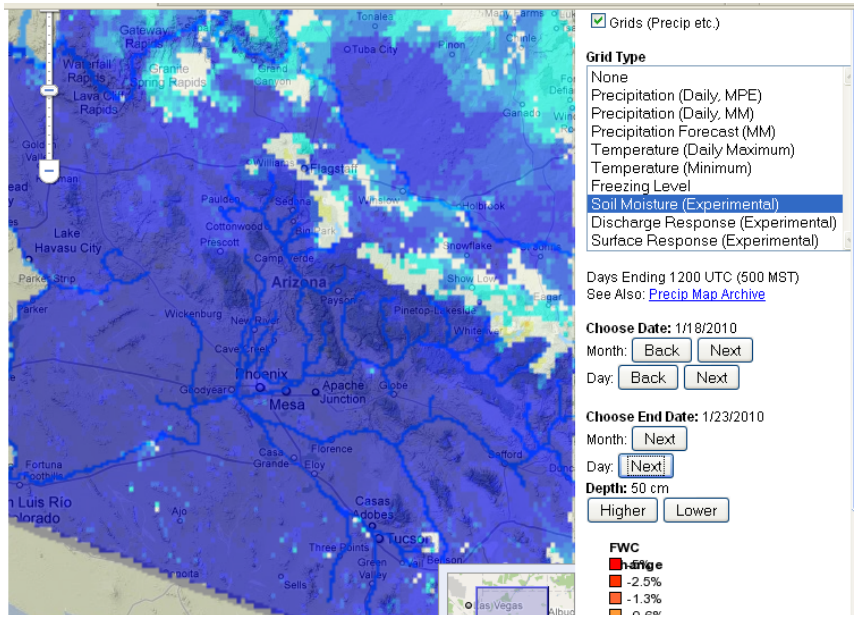

Service Coordination Hydrologist
NOAA/NWS River Forecast Centers
Stakeholders
Forecasts and data
Development
Workshops, Presentations
Water Supply
Water Resources
Web Services
OHD, Academia, and other research collaborations
NWS bureaucracy
NWS "baseline" web services
Toolkit for engaging users in "climate services"

Previous Experience

- **Forecast verification** – Large w
with hands on lab exercises an

- **Soil moisture** – Focus group w
with specific questions and soc

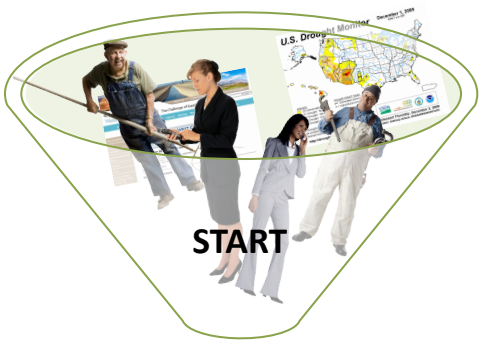




Toolkit for User Engagement

- 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.

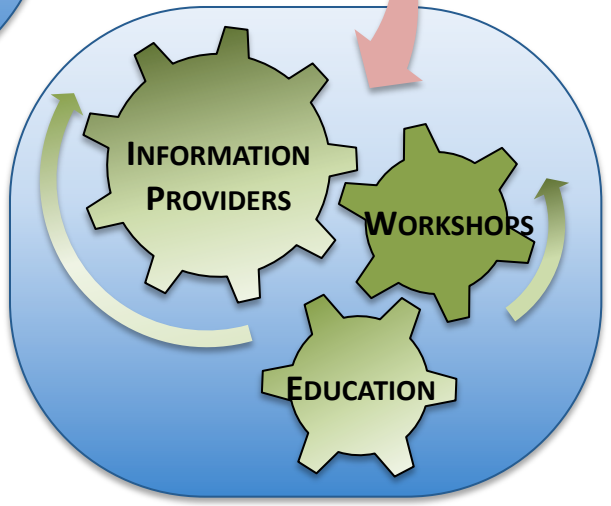
Climate Services Framework



Users & Existing Climate Information

Climate Services Machine

Better Climate Information & Informed Users

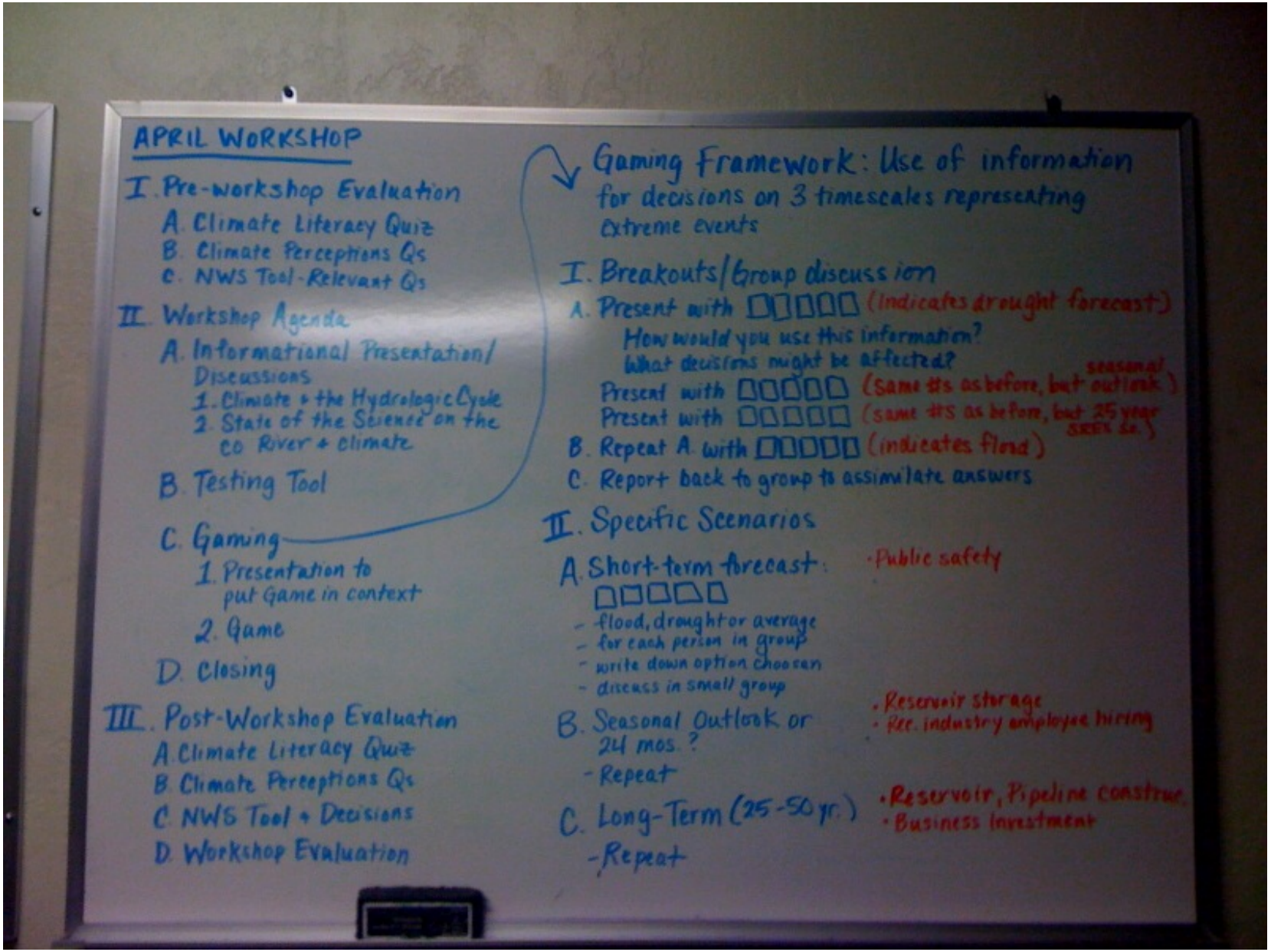


Prototyping with...

- Colorado Water Conservation Board
- USFS
- NOAA NWS RFC

Informed Users & Better Climate Information

Credit: Kristen Averyt, WWA



Credit: Kristen Averyt, WWA, Gigi Owen, CLIMAS

Discussion Section

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	Water Management Specific
Short Term	Camp site manager on a river; signage for patrons for the next month….	Obtaining sufficient water level in reservoir for July 4th recreation
Seasonal	Manager of a commercial rafting company; develop advertising campaign for the season….	Investment in urban recharge and recovery system
Long-Term	Long-term investment in a rafting operation….	Water delivery for an inter-state compact; or river restoration project planning

Credit: Kristen Averyt, WWA, Gigi Owen, CLIMAS

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