Overview of Hydrologic Operations at the California Nevada River Forecast Center

California Cooperative Snow Surveys Program
Wukaschi Lodge, Sequoia-Kings N.P.

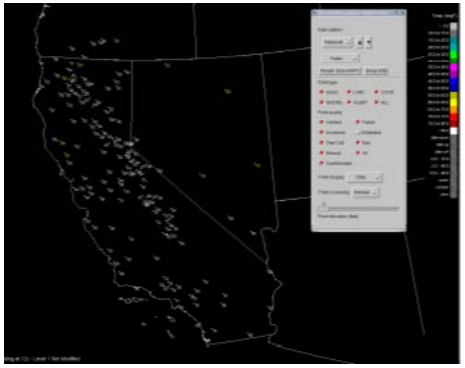
November 8th 2012

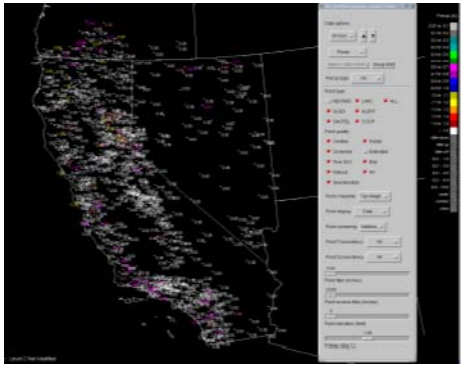
Alan Haynes – Service Coordination Hydrologist
NOAA/NWS – California Nevada River Forecast Center

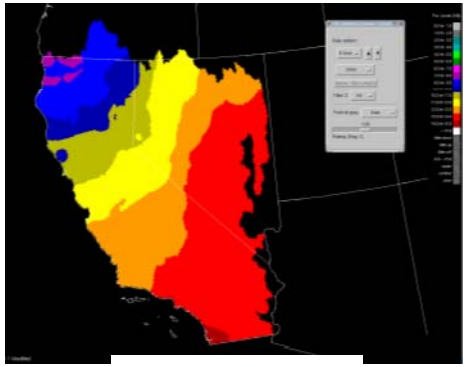
Philosophical Shift in Water Supply & Spring Snowmelt Forecasting

- CNRFC moving away from regression-based monthly forecasts focused on watersheds dominated by snowmelt (Apr-Jul volumes)
- CNRFC focusing more on daily forecasts for all locations with more flexible volumetric periods
- CNRFC generates volume forecasts every day
  - Volume forecasts are built using observed weather & hydrology, combined with ensembles that blend short-term weather forecasts with longer-term climate forcings
  - Plots available depicting volume forecasts for Apr-Jul, Water Year, and monthly periods

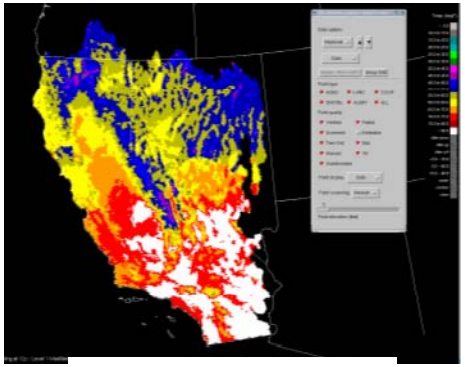
QC Observed Meteorological Fields



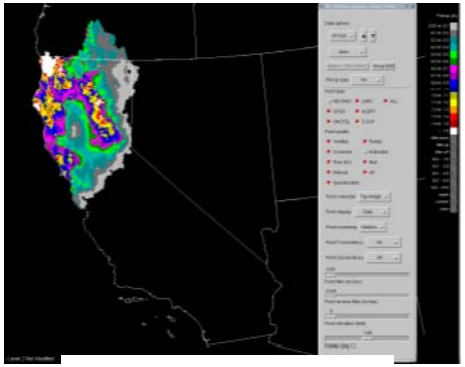




Freezing Level

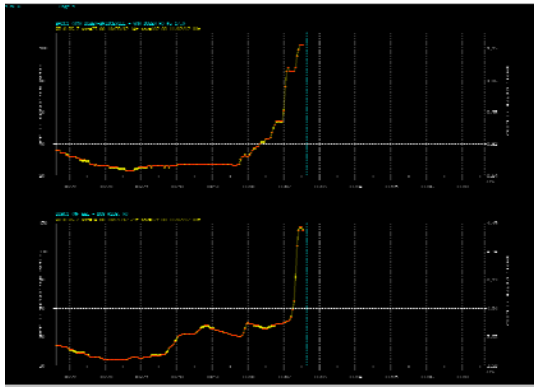


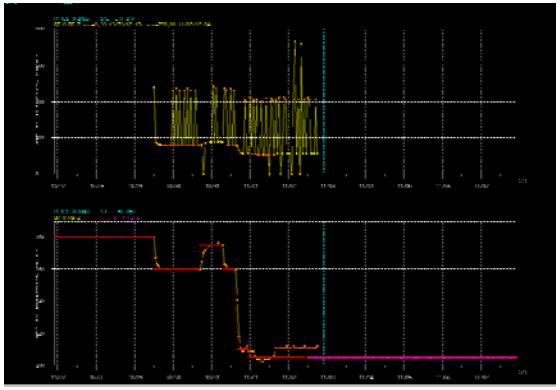
Temperature

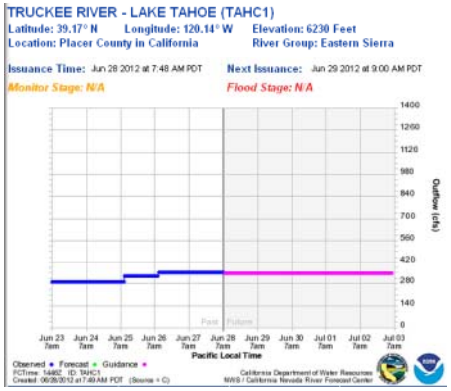


Precipitation

QC & Process Hydrological Data





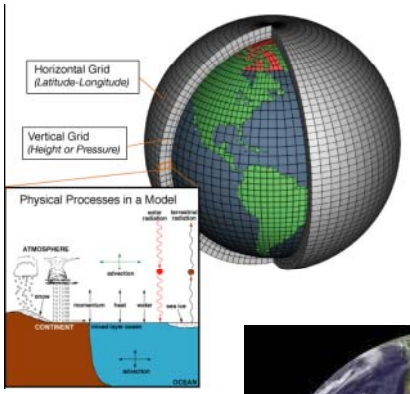


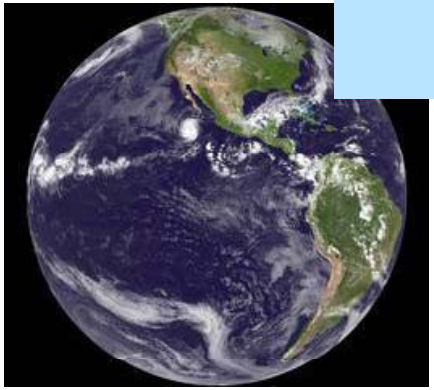
Hourly Stage & Flow

Reservoir Inflow/Outflow & Storage

Projected Reservoir Releases

Forecast Meteorology





Weather Forecasting Tools

Other Tools?

Forecast Meteorology

Forecast Meteorology

Model Run Time

Weather Forecasts

Forecaster QPF
0-5 days

Model-Based QPF
5-14 days

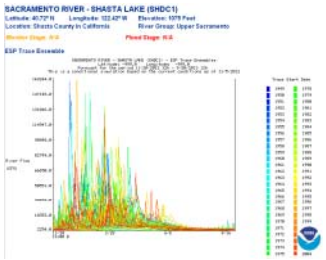
Climate-Based

Climate-Based

Temperature 0-14 days

Timeline

This period reduces uncertainty to the degree that there is skill in the human and numerical model Forecasts.



Navigating the CNRFC Web Page

Navigating the CNRFC Web Page

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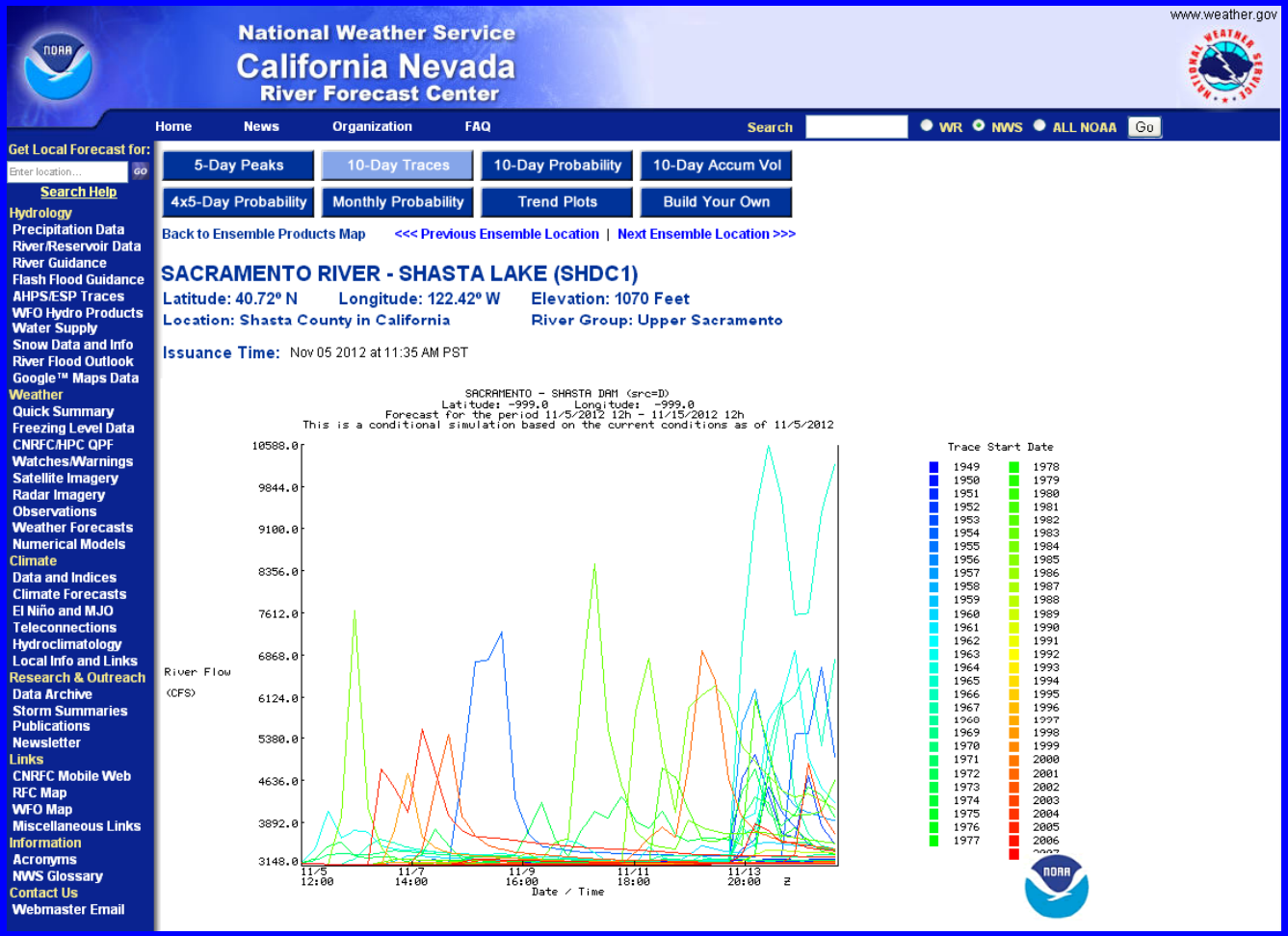
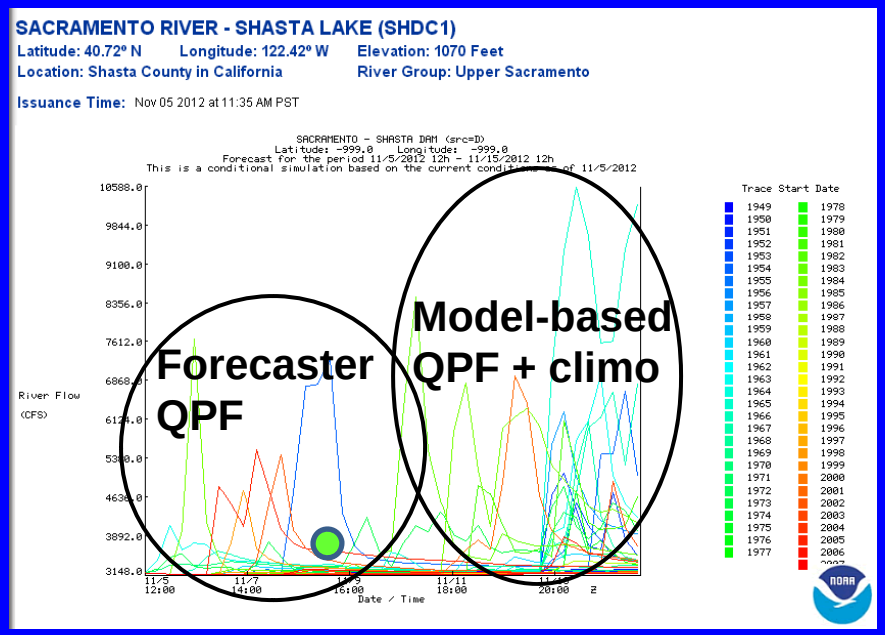
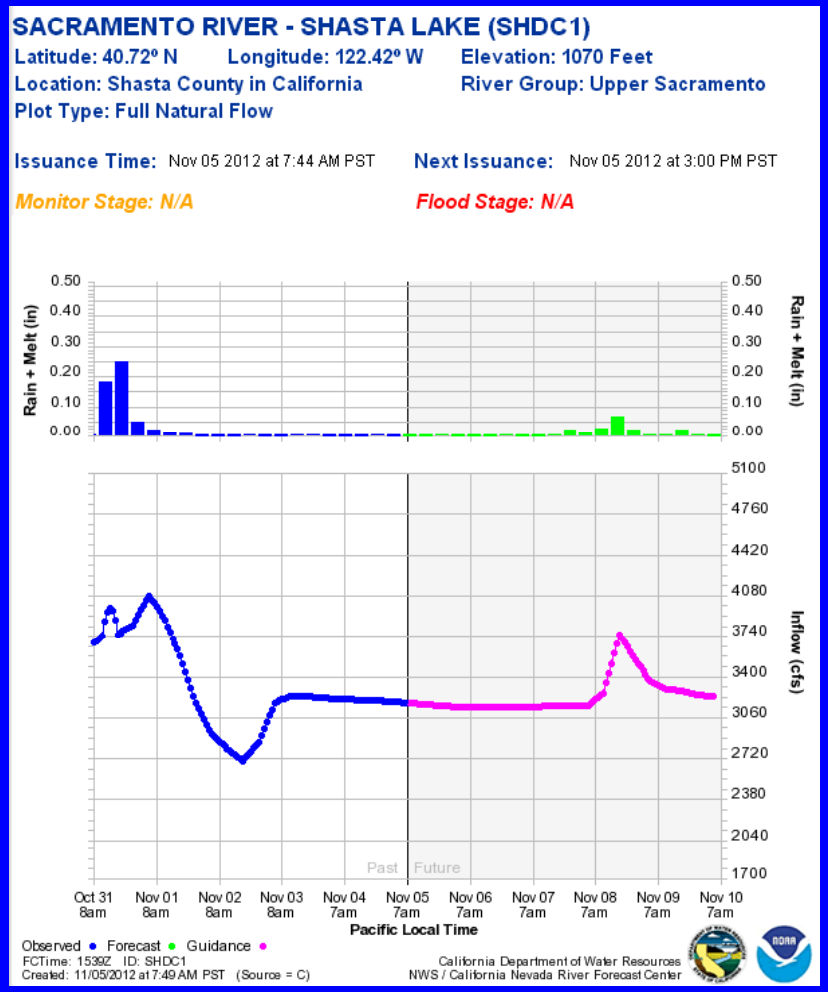
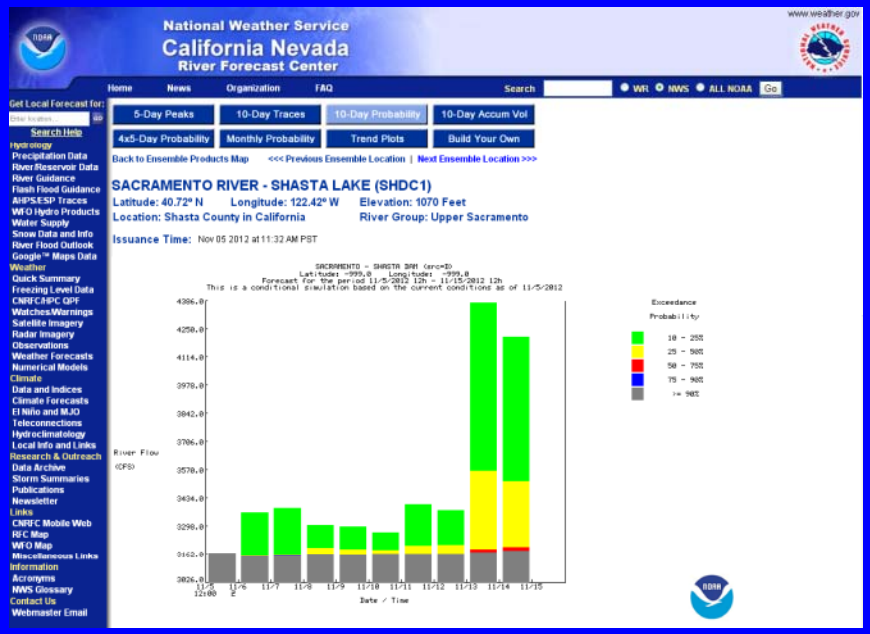


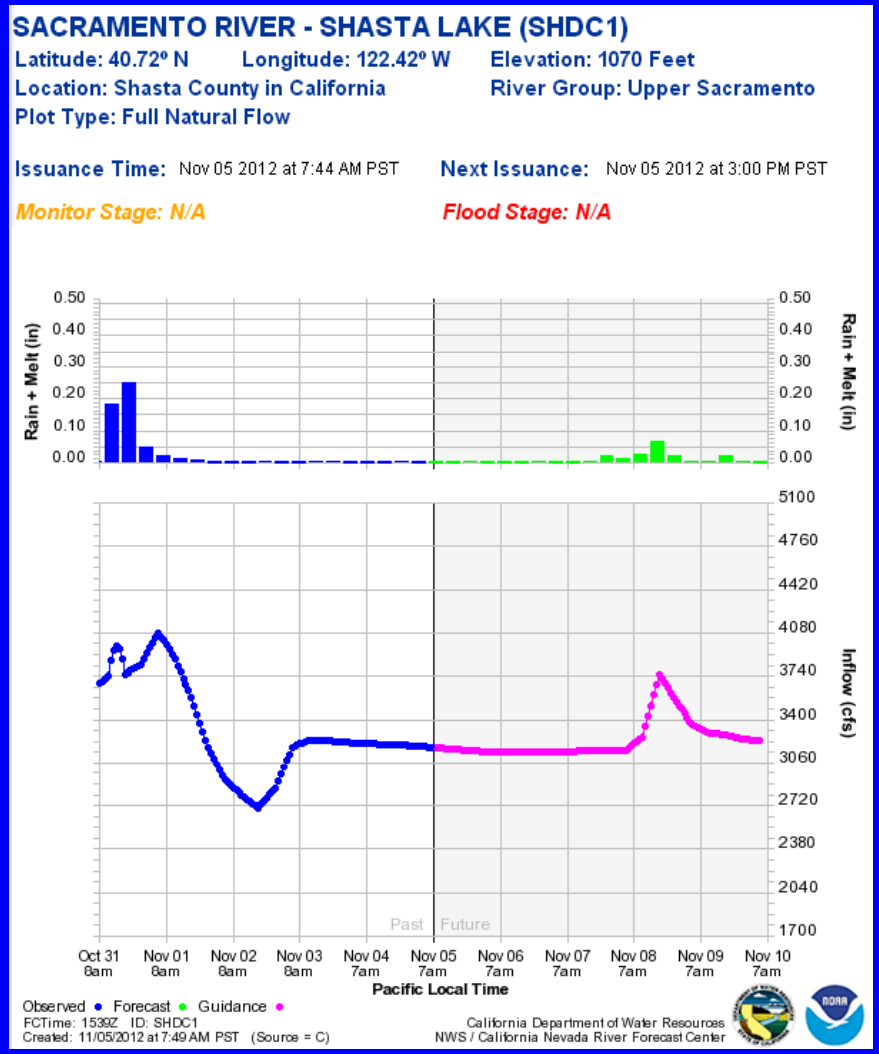
Forecast Meteorology





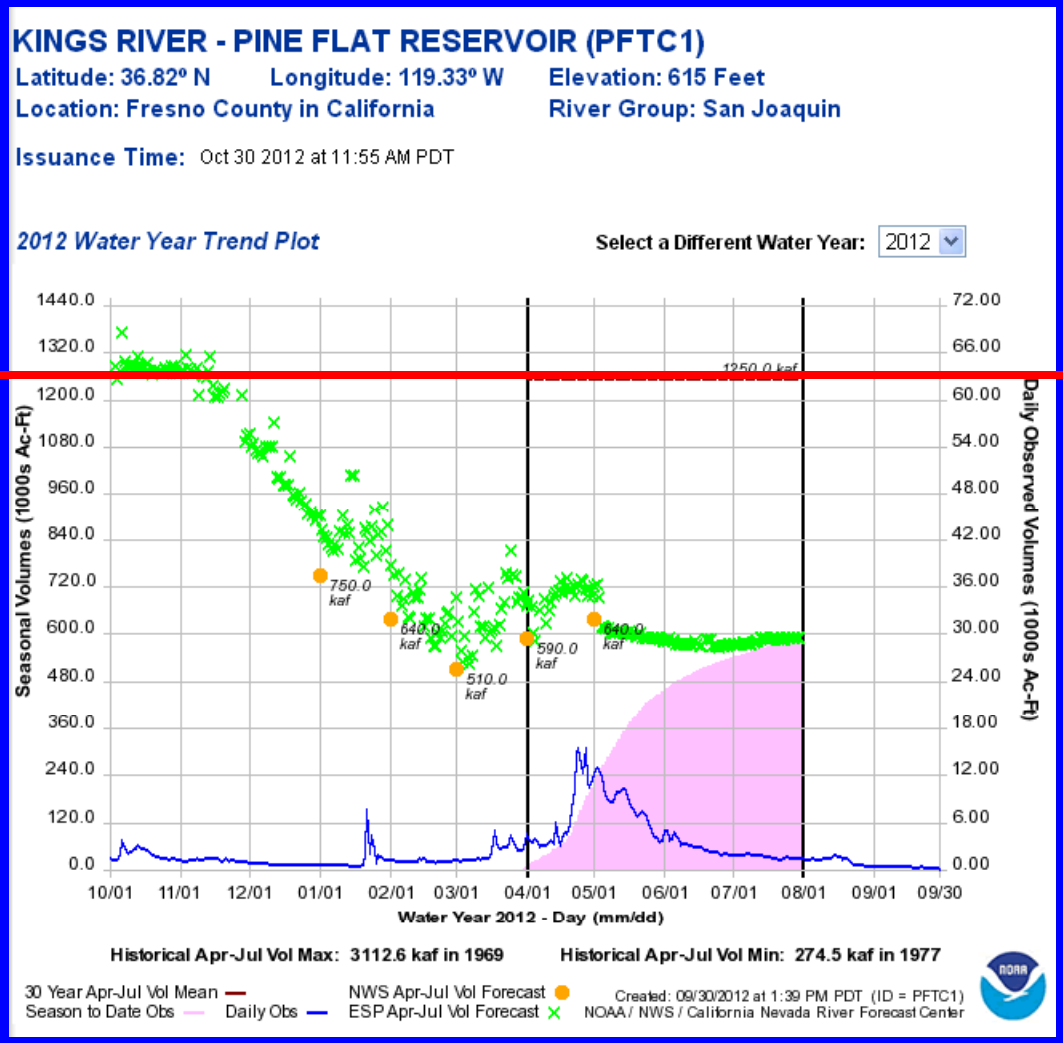
Forecast Meteorology





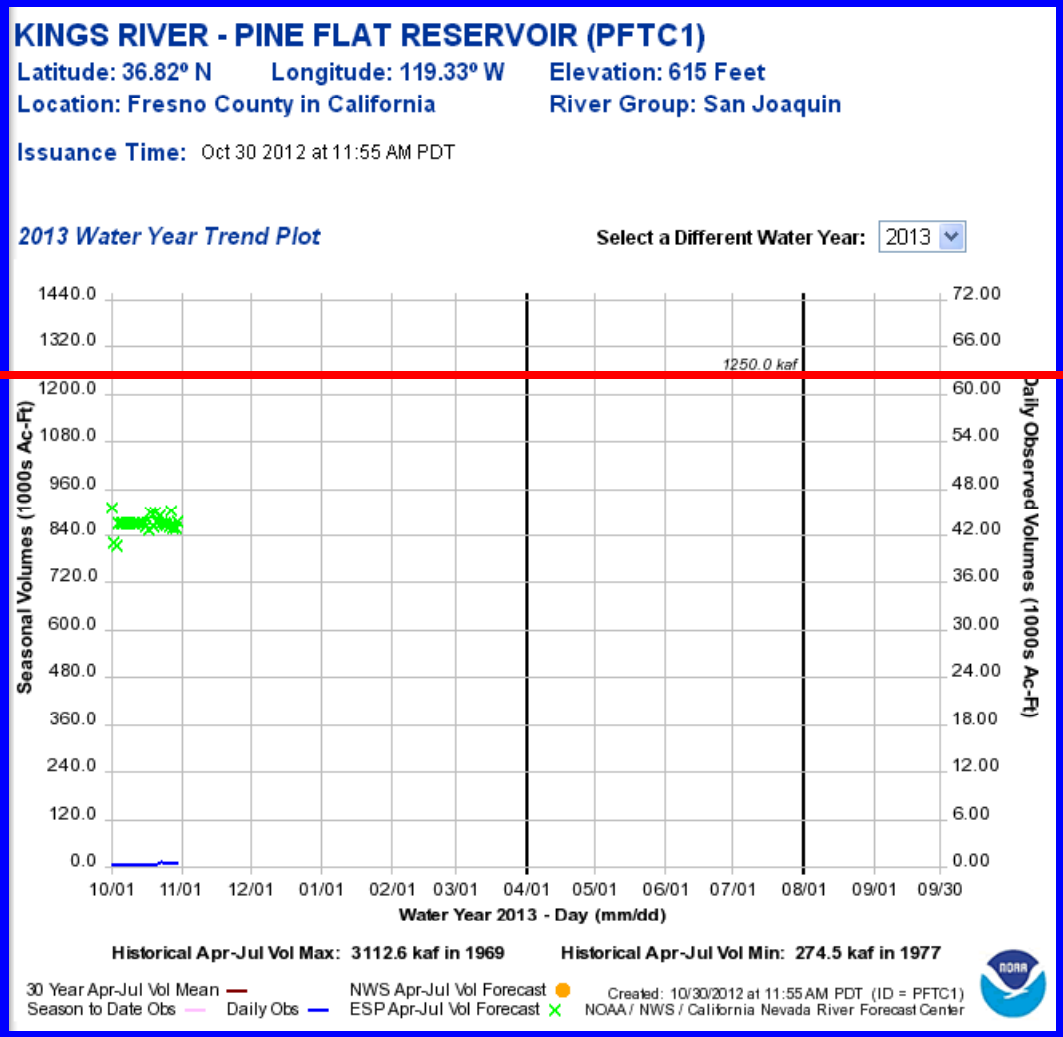
April – July Volume Forecasts

30 YR mean volume



April – July Volume Forecasts

30 YR mean volume



Monthly Volume Forecasts

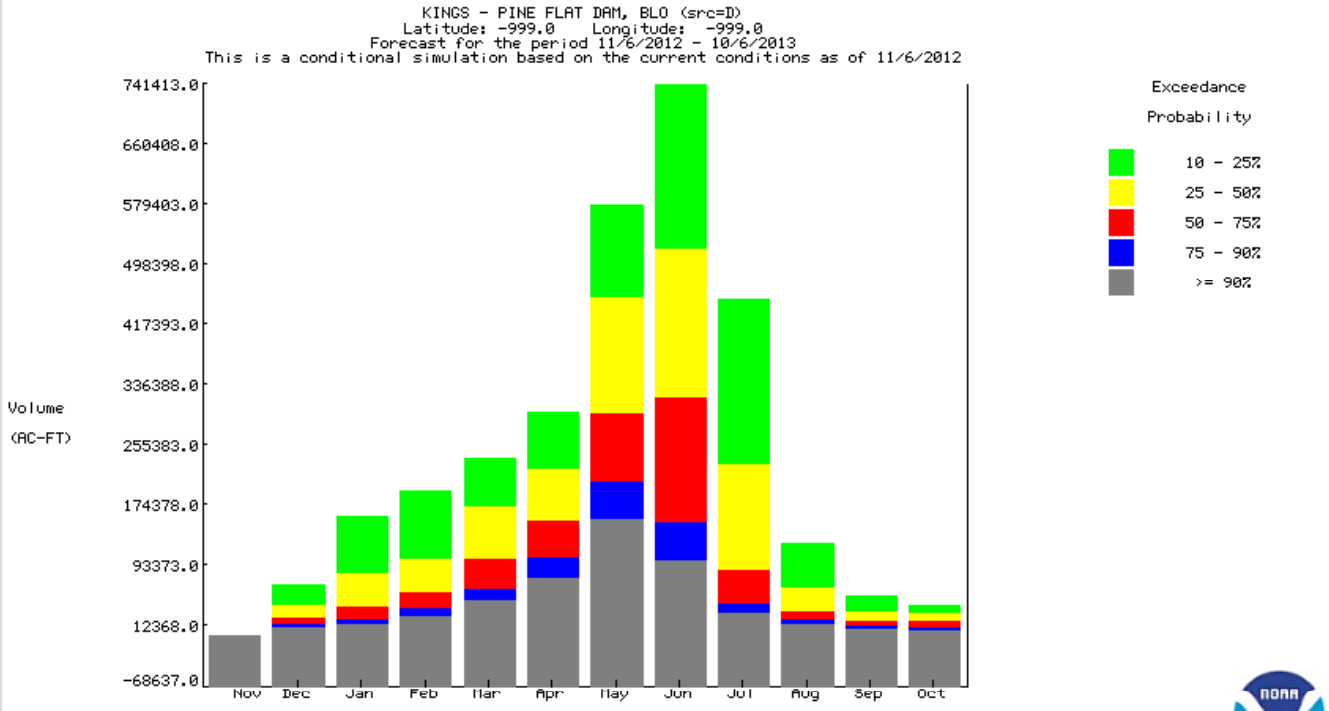
Back to Ensemble Products Map <<< Previous Ensemble Location | Next Ensemble Location >>>

KINGS RIVER - PINE FLAT RESERVOIR (PFTC1)

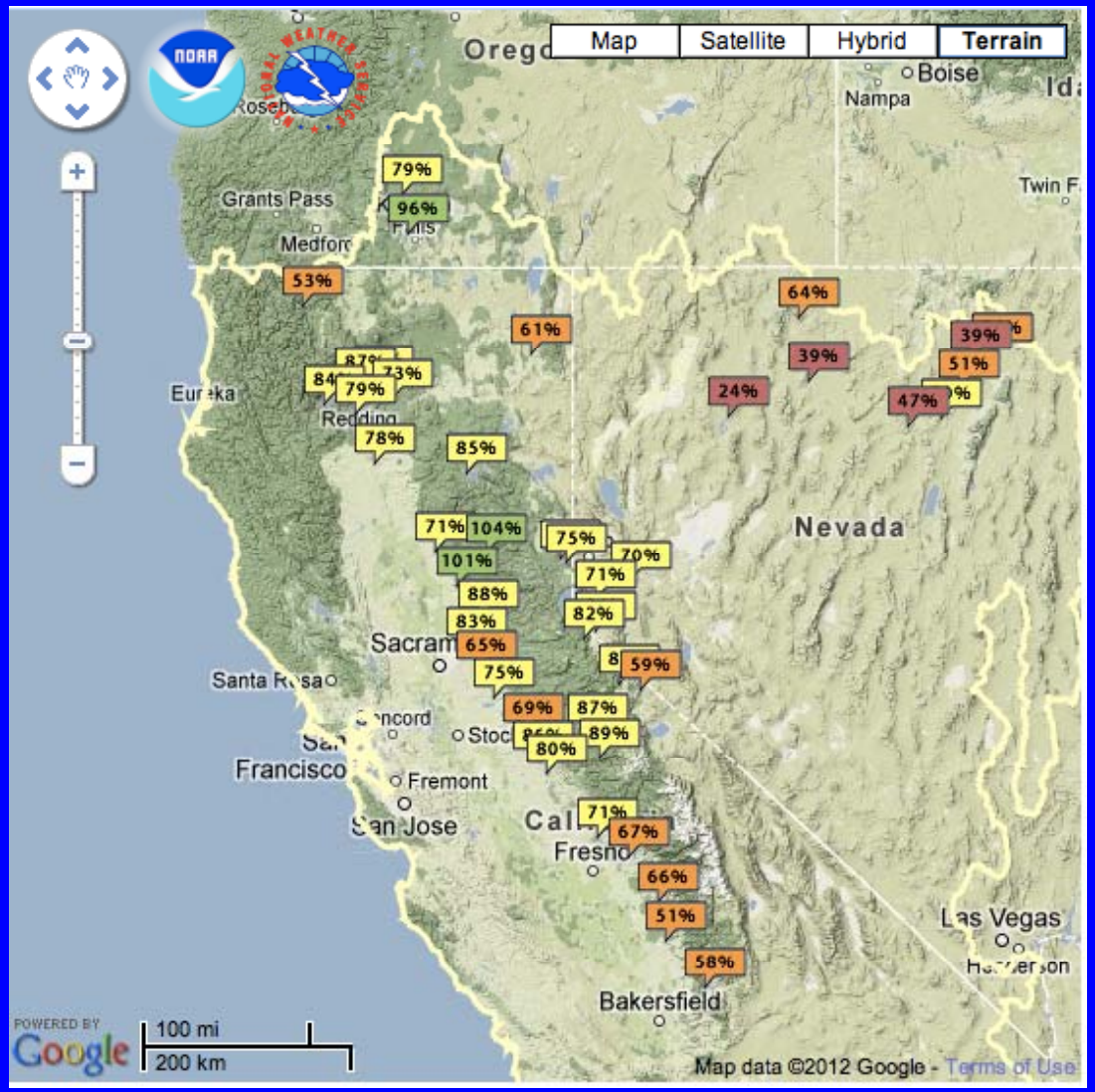
Latitude: 36.82° N Longitude: 119.33° W Elevation: 615 Feet

Location: Fresno County in California River Group: San Joaquin

Issuance Time: Nov 06 2012 at 11:28 AM PST



Seasonal Volume Forecast



ESP Daily Traces

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
1	creat	ed on 11072	12																											
2	units	#NAME?																												
3	ID	DATE	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
4	PFTC1	11/1/2012	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999
5	PFTC1	11/2/2012	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999
6	PFTC1	11/3/2012	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999
7	PFTC1	11/4/2012	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999
8	PFTC1	11/5/2012	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999
9	PFTC1	11/6/2012	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999	-999
10	PFTC1	11/7/2012	181.8	181.8	181.8	181.8	181.8	181.8	181.8	181.8	181.8	181.8	181.8	182.6	181.8	181.8	201.1	181.8	181.8	197.9	181.8	181.8	185.6	181.8	181.8	181.8	181.8	181.8	181.8	181.8
11	PFTC1	11/8/2012	184.7	185.4	185.4	184.7	183.3	184.7	185.4	185.4	183.3	185.4	185.4	188.9	185.4	185.4	199.6	184.7	184.7	231.7	185.4	183.3	193.3	183.3	184.7	183.3	185.4	184.7	185.4	185.4
12	PFTC1	11/9/2012	185.4	186.3	186.3	185.4	185.2	185.4	186.3	186.3	185.2	186.3	186.3	189.5	186.3	186.3	197.6	185.4	185.4	214.3	186.3	185.2	186	185.2	185.4	185.2	186.3	185.4	186.3	186.3
13	PFTC1	11/10/2012	252.6	186.2	186.2	186.1	186.1	186.1	186.2	187.3	186.1	186.2	186.2	187.9	186.2	186.2	196.1	230.2	186.1	211.9	186.2	186.1	186	186.1	186.1	186	186.2	186.1	186.2	186.2
14	PFTC1	11/11/2012	277.1	189.7	189.7	189.7	189.7	189.7	189.7	190.2	188.3	189.7	189.7	190.2	189.7	189.7	195.5	243	189.7	208.7	189.7	189.7	186.8	188.3	189.7	202.2	189.7	189.7	189.7	189.7
15	PFTC1	11/12/2012	225.8	190.9	190.2	190.2	190.2	325.1	190.9	190.9	188.6	190.9	190.9	219.1	190.9	190.9	195.1	293.4	192.2	206.7	190.9	213	187	206.5	658.2	400.6	250.2	190.2	190.2	190.9
16	PFTC1	11/13/2012	223.9	195	189.9	189.9	189.9	346.8	191.5	191.5	188.3	191.5	191.5	447	191.5	191.5	198	511.2	196.7	206.4	191.5	415	186.8	261.8	1300	244.9	467.5	190.6	190.6	191.5
17	PFTC1	11/14/2012	222.7	201.5	189.6	189.6	198.3	236.9	297.2	192.3	189.3	191.2	191.2	282.5	191.2	191.2	199.4	415.6	264.3	207.4	191.2	250.9	189.9	213.3	662.4	228.6	278.6	191.2	191.2	191.2
18	PFTC1	11/15/2012	218.3	249.9	189.9	248.7	307.3	228.5	305.8	192.5	193.2	234.4	190.9	243	190.9	190.9	246.8	346.7	354.9	207	190.9	258.3	191	209.5	562.2	467.8	260.4	190.9	190.9	190.9
19	PFTC1	11/16/2012	217.9	222.7	191.7	306.8	232.8	2982.9	221.9	192.3	198.1	268.4	191.8	232	191.8	191.8	409.4	330.3	316	205.3	191.8	313.2	194.5	211.3	525.2	484.6	255.8	191.8	191.8	191.8
20	PFTC1	11/17/2012	218.9	210	195	250.1	219.2	1746.2	230.9	195	201.5	220.6	195	230.6	195	195	251.4	318.6	368.3	204.5	195	247.9	195.3	212.4	492	449.7	270.7	195	195	195
21	PFTC1	11/18/2012	217.3	231.6	195.1	214.8	216.5	544.6	252.4	195.1	201.6	208.1	195.1	229.4	195.1	195.1	229.9	307.2	415.2	203.3	195.1	240.1	194.4	209.9	460.4	389.2	541.5	195.1	195.1	195.1
22	PFTC1	11/19/2012	220.8	3016.8	193.1	208.9	215.2	857	219.1	193.3	198.3	202.5	193.3	228.2	193.1	193.1	228.2	295.3	448.9	202.1	245.3	235.2	190.8	208.6	432.8	363.2	1303.5	193.3	193.3	193.3
23	PFTC1	11/20/2012	220.5	4630.2	327.5	207.5	239.1	809.7	212.3	189.7	194.6	200.9	189.7	226.9	199.7	188.3	299.4	283.4	444.2	256.4	389.6	233.6	188	207.5	407.1	344.5	707.7	189.7	189.7	189.7
24	PFTC1	11/21/2012	219.3	2037.9	531.3	206.3	247.3	769.6	229.7	186.8	193.2	199.8	186.8	221.2	519.3	186.7	497.1	274.9	387.4	335.2	254.3	233.8	186.7	206.3	384.4	329.8	665.8	186.8	186.8	186.8
25	PFTC1	11/22/2012	218.1	1511.8	473.9	205.1	214	733.9	347	183.5	190.9	198.6	185.5	218.2	309.6	185.5	412.2	265.9	365.2	263.3	219.5	231.5	185.5	201.8	365.6	315.5	667.7	369.6	185.5	185.5
26	PFTC1	11/23/2012	217	1349.8	390.3	203.9	210.5	690.8	254.7	184.3	190.4	197.4	184.3	215.9	265.1	183.2	358.8	259.4	765.5	322.6	217	228								
27	PFTC1	11/24/2012	215.8	1241	357.1	201.6	209.3	655.9	248.1	182.1	189.7	196.2	182.1	213.4	259.9	180.7	436.8	253.2	1306.1	252.9	214	223								
28	PFTC1	11/25/2012	212.7	1147.4	352.7	199.1	207	627.1	238.3	178.2	188.5	195	178.2	208.5	257.4	175.9	429.2	245.9	1532.4	234.7	209.9	243								
29	PFTC1	11/26/2012	207.4	1061.6	328.6	194.3	204.6	600.1	229.9	174.5	187.3	193.9	174.5	208.7	461.7	174.3	372	242.4	1249.6	232.2	207.1	230								
30	PFTC1	11/27/2012	205.8	980.4	309.5	192.7	201	576	225.5	173.1	185.1	191.6	173.1	428.7	450	177.3	350.5	257.2	892.7	226.3	205.8	219								
31	PFTC1	11/28/2012	204.6	908.2	294.6	191.5	198.2	553.8	222.2	171.9	181.2	187.7	171.9	333.5	375.4	187.8	331.6	234	733.7	221.3	205.5	216								
32	PFTC1	11/29/2012	203.4	844.2	281.4	190.4	196.9	526.7	216.9	169.6	177.5	184	170.8	291.8	354.2	185	317.1	229.4	668.4	337.6	227.7	210								
33	PFTC1	11/30/2012	200.3	791.6	270	189.2	195.7	507	213.5	167.3	176.1	182.6	167.8	279.2	431.8	179.1	302.9	223.7	616.6	325.1	231.9	208								
34	PFTC1	12/1/2012	194.9	1110.9	259.1	200.6	194.5	472	212.6	163.8	174.9	181.5	163.8	269.4	406.2	175	289.4	220.7	587.9	289.7	311.4	213								
35	PFTC1	12/2/2012	193.4	793.3	1043.1	281.3	196.7	444.9	445	163.7	173.8	180.3	163.7	1068.4	606.6	172.6	278.9	218.6	527.3	278	285.9	270								
36	PFTC1	12/3/2012	192.2	1158.9	601.1	248.2	191.7	542.5	514.8	162.8	172.6	177.3	162.8	894.7	1352.3	170.3	269	246	495.3	1953.1	278.7	231								
37	PFTC1	12/4/2012	19	6141.2					451.7	162.3	170.3	173.2	160.1	567	798.4	166.7	259.9	237.2	464.9	1422.6	277.3	218								
38	PFTC1	12/5/2012	187.9	2942.9	990.8	212.1	281	1166.5	390.6	170	178.9	170.4	157.3	3916							284	211								

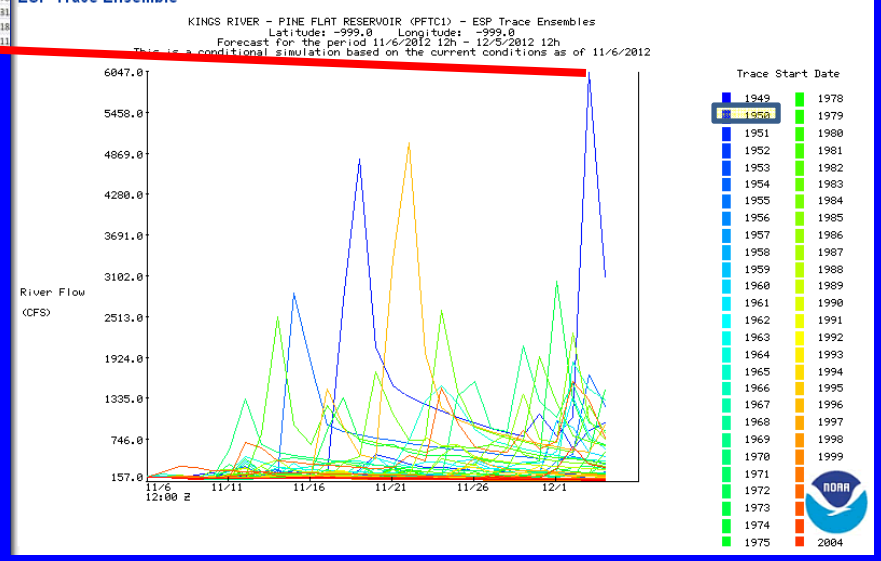
KINGS RIVER - PINE FLAT RESERVOIR (PFTC1)

Latitude: 36.82º N **Longitude: 119.34º W** **Elevation: 615 Feet**

Location: Fresno County in California **River Group: San Joaquin**

Monitor Stage: N/A *Flood Stage: N/A*

ESP Trace Ensemble

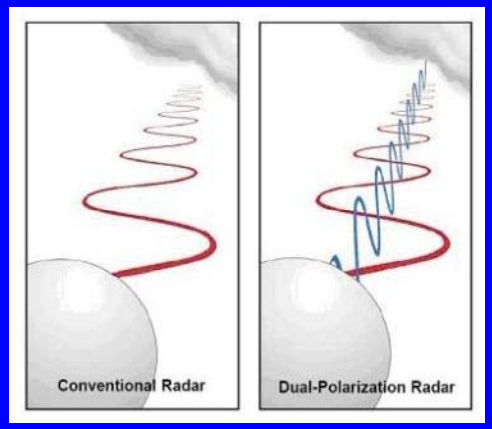


Climate Prediction

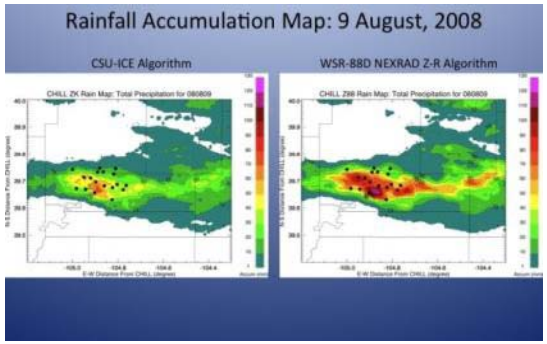
Borderline ENSO-neutral/weak El Nino conditions

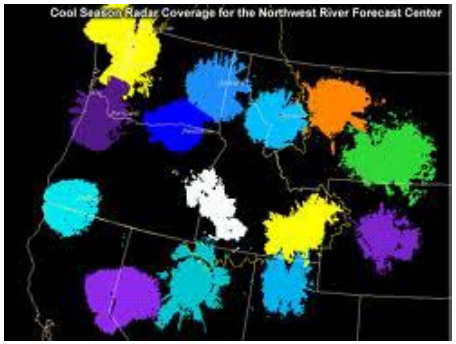
- Favors normal to above normal temperatures – especially Eastern CA & NV
- Favors below normal precipitation – Northern & Central CA
- Equal chances for below, normal, above normal Southern CA

What's New?



- NWS radars upgraded to dual polarization
- radar pulses are modulated in both horizontal and vertical directions (most significant development since early 1990s)
- Improved precipitation amounts and type id
- CNRFC mainly relies on precipitation gages





What's New?

- Development work continues on the Hydrologic Ensemble Forecast System (HEFS)
- Objectives:
  - Quantify and reduce uncertainties in ESP due to:
    - future weather and climate
    - Calibration
    - initial conditions
- Provide unbiased & skillful forecast ensembles
- Generate reforecast dataset consistent with real-time forecasts

Weather Highlights

- Turning windy and colder today and tonight
  - SW 25-35 mph gusting to 70 mph
  - Highs 45-55
  - Lows 20s
  - Up to 2 inches of snow
- Heaviest precipitation Friday
  - Snow likely – up to 3 inches
  - Highs in the 30s

Any Questions?