Northwest River Forecast Center

Updates to Techniques, Products, and Services for WY2020

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Overview of WY2020 NWRFC Changes

- **Changes to water supply (ensemble) forecast techniques**
- Update to weather forecast models used by NWRFC
- Rollout of NWS Hydrologic Ensemble Forecast Service
- Recalibration of NWRFC models using historical gridded dataset
- Enhancements to NWRFC products and services

21st Century Forecasting Trends

The Rise of Grids

- Gridded weather models to force water models
- Gridded weather observations to force water models
- Historical gridded weather to calibrate water models

The Rise of Ensemble Techniques

- Deterministic models don't communicate confidence
- Ensembles help understand risk

The Rise of Automated Methods

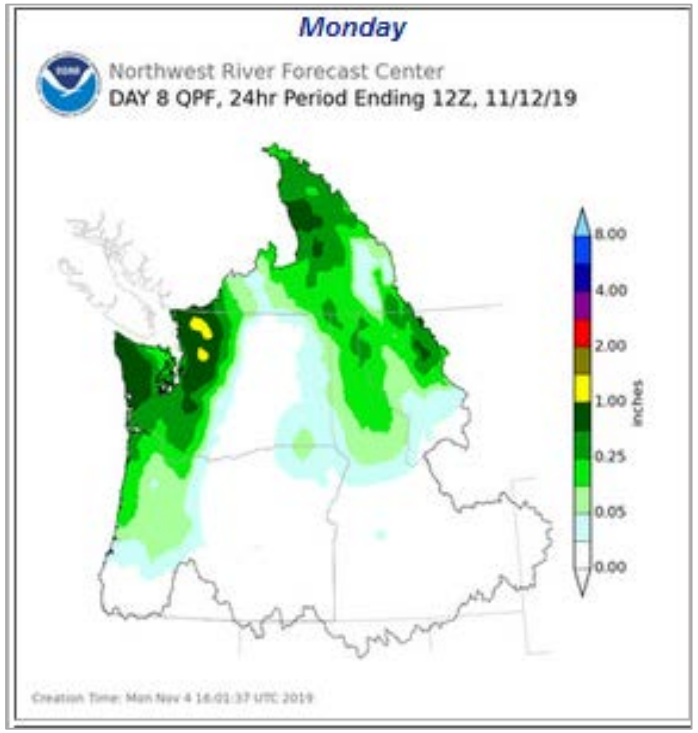
- Weather models continue to improve
- Leverage strengths of computers (and humans)

...we are riding a wave of progress!

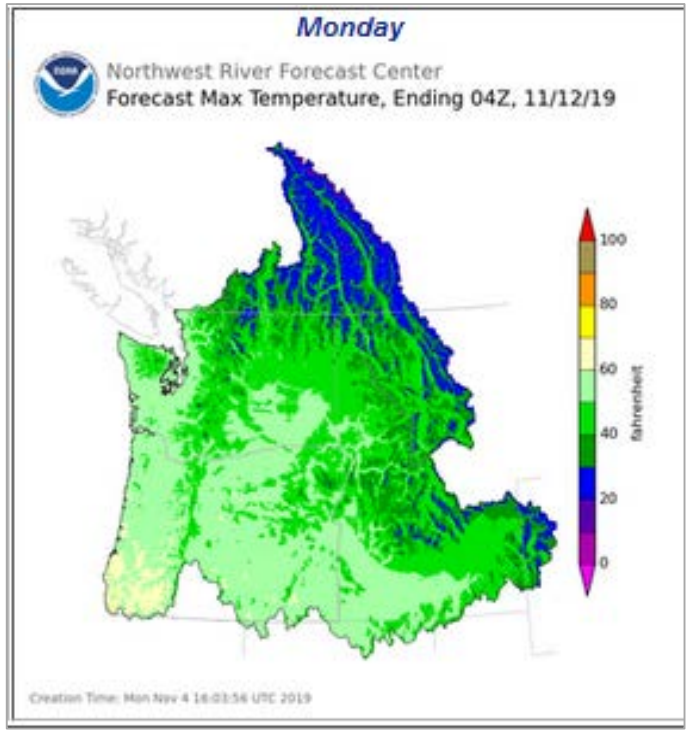
Increased use of NWS National Blend of Models (NBM)

10 Day Weather Forcing Elements for NWRFC Hydrology Model

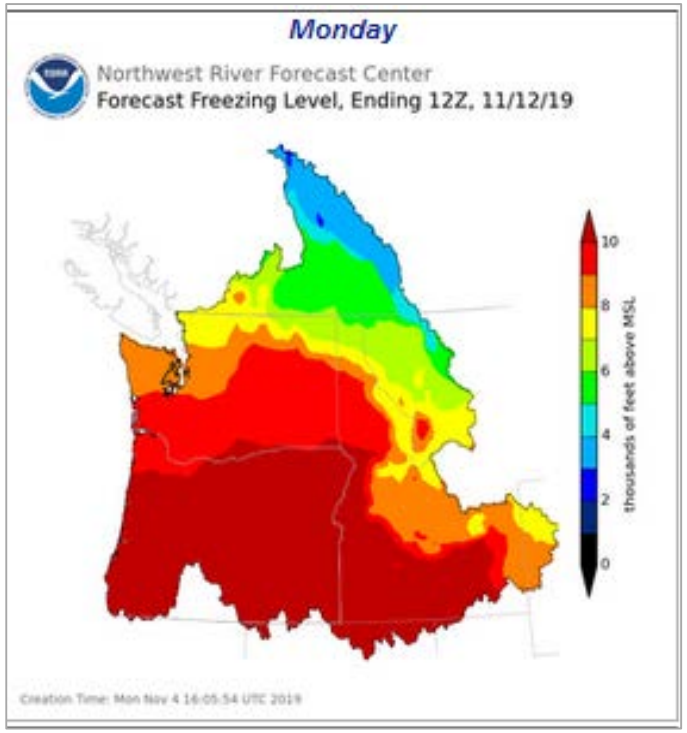
Precipitation (Fall 2019)
- National Blend (NBM)
- NWS Weather Offices



Temperature (Fall 2018)
- National Blend (NBM)



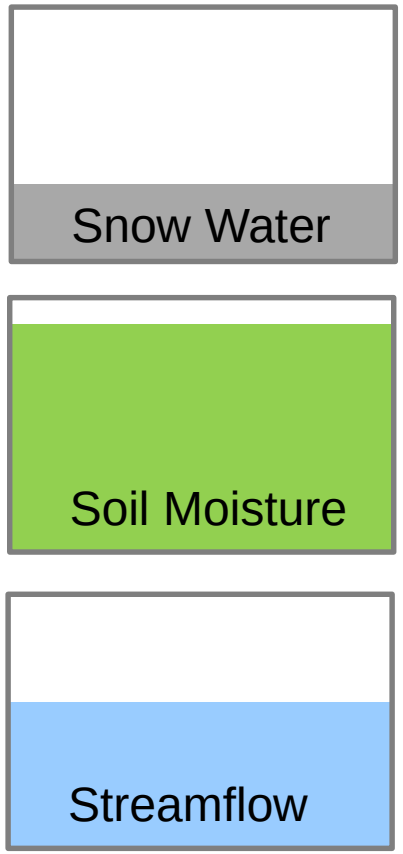
Snow Level** (Date TBD)
- National Blend (NBM)



**Freezing Level web products will be replaced with snow level

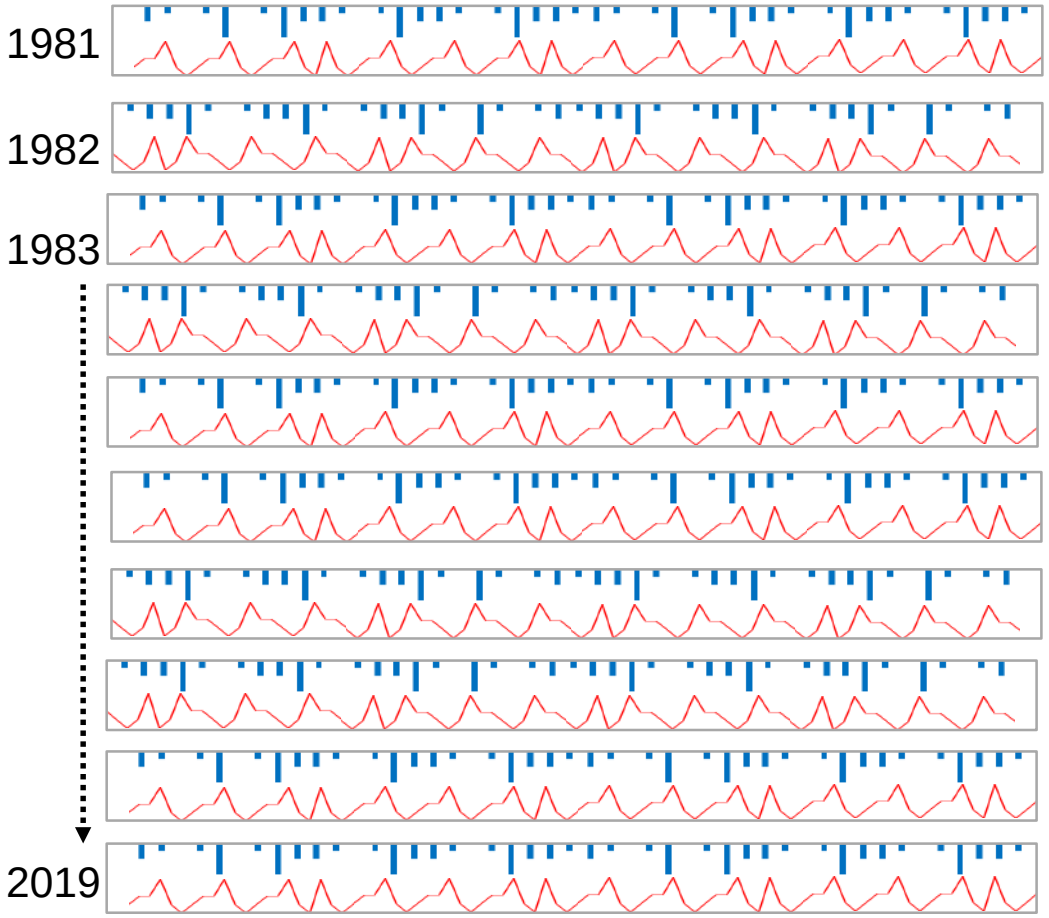
Overview of Ensemble Streamflow Prediction

Current Model States



Antecedent Conditions

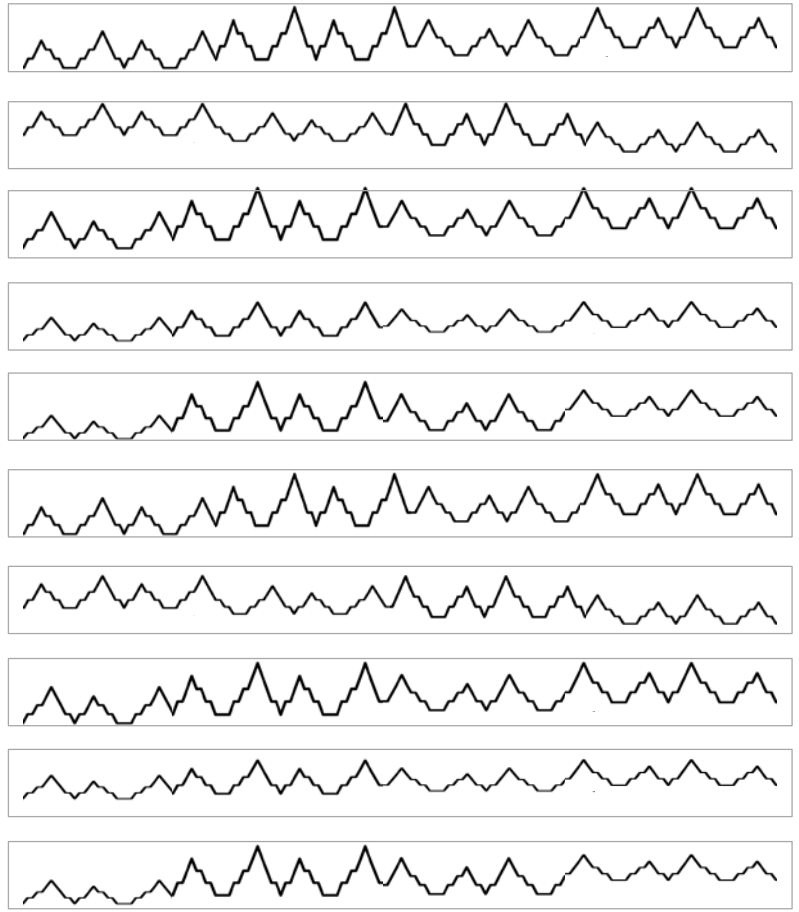
Combined with Historical Weather Forcings



Precipitation & Temperature 'Forecasts'

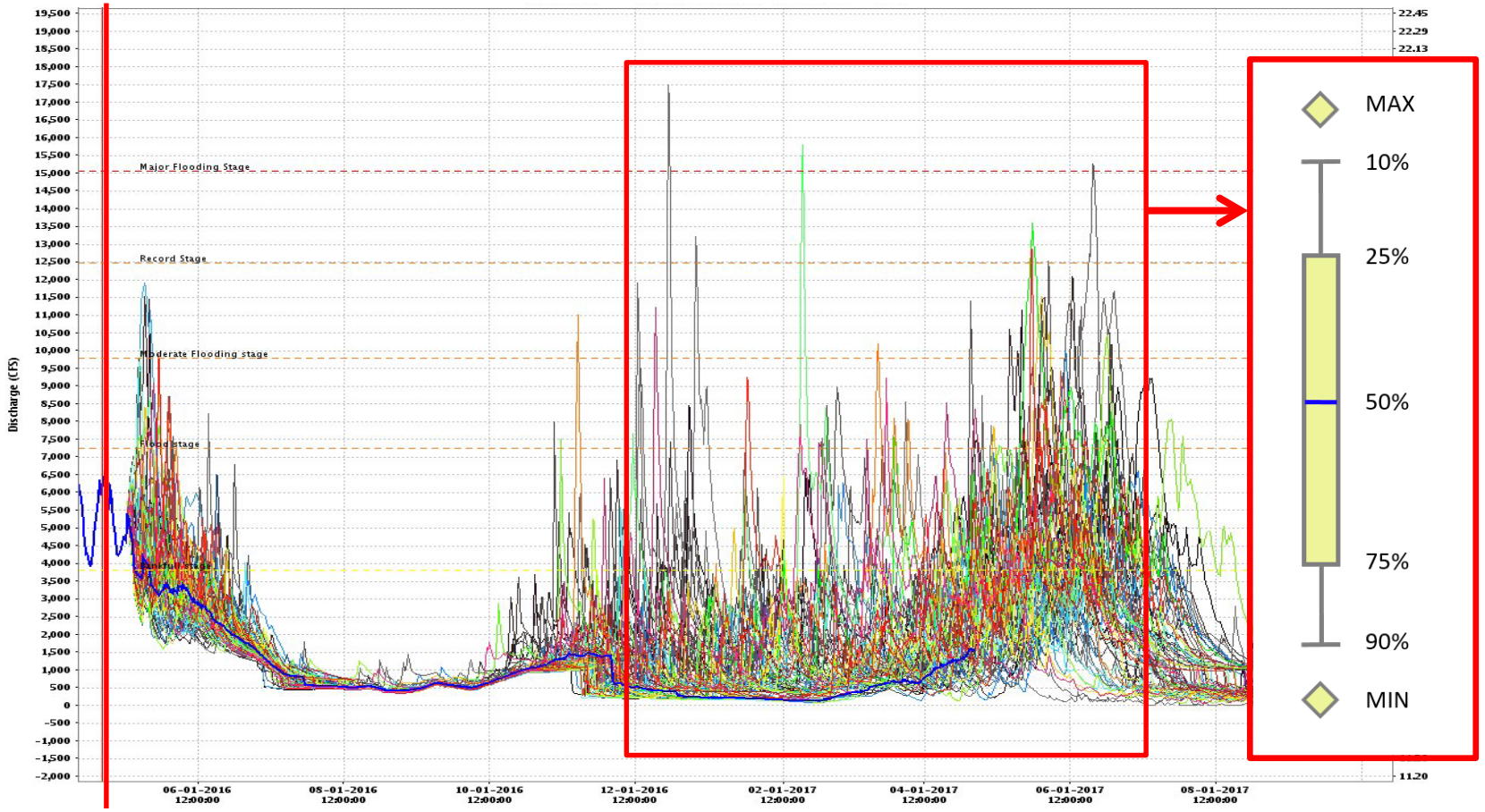
Assumes past and future distributions are equal

Produces River Forecast Ensemble



Equally Likely River Outcomes

ESP Communicated as Exceedance Probabilities



Forecast Creation Time

Forecast Period (e.g. Jan - Jul)

Boxplot Summary

Each ensemble outcome is a hydrograph

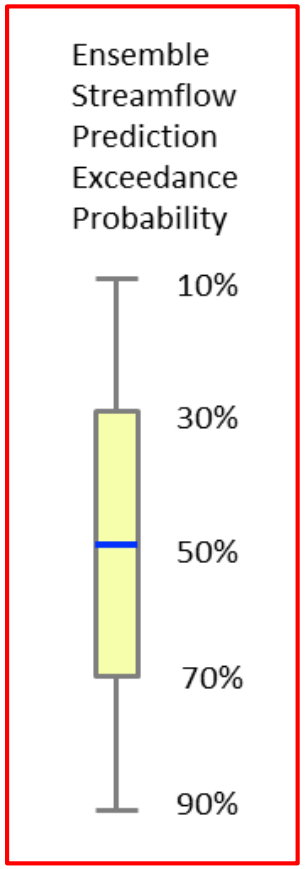
Each hydrograph has a volume (area under trace)

The 50% exceedance value represents the median of the ranked ensemble volumes

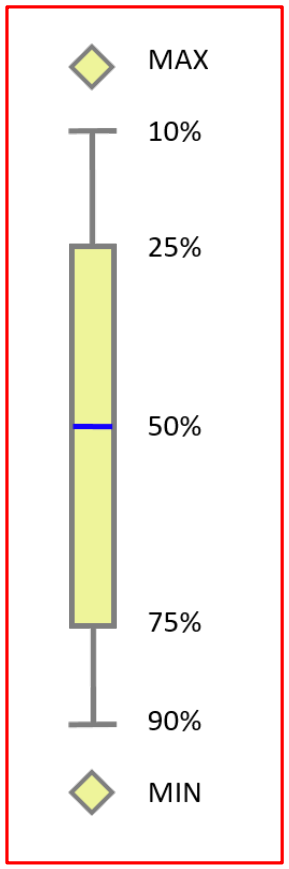
WY2020: Update to ESP Summary Statistics

NWRFC Box Plot Construction

old



new



Replaced 30/70 with 25/75:
50% of outcomes represented
by Interquartile Range (25-75%)

Added Max and Min:
Max and Min equal largest/smallest
volumes of the ensemble

For 39 year Ensemble (1981-2019)

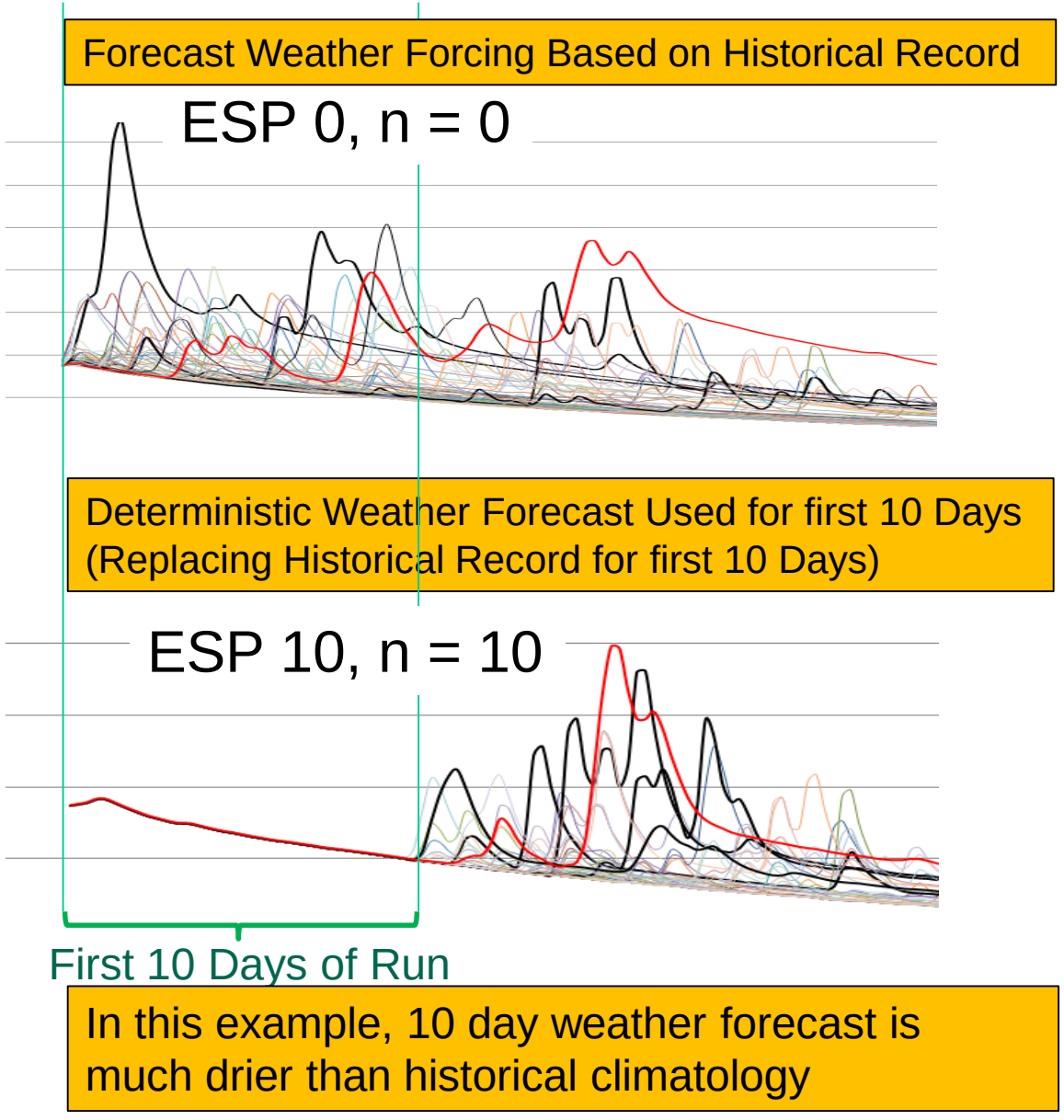
- Max = 2.5% Exceedance
- Min = 97.5% Exceedance

WY2020: Retiring of ESP 5 Flavor

n days of short term weather forecasts can be combined with a given historical weather year.

Previously NWRFC offered 3 flavors of ESP
(n = 10, 5, 0)

- ESP10 = NWS Official Water Supply
- ESP 0 = Reference
- ESP 5 previously used to set flood control targets for Columbia River Treaty
  - CRT member agencies have adapted ESP10
  - ESP5 Removed from NWRFC Product Suite



Rollout of Hydrologic Ensemble Forecast Service

Next Generation ESP = HEFS

Similar to ESP, but with big advantages including a more sophisticated accounting of weather forecast uncertainty

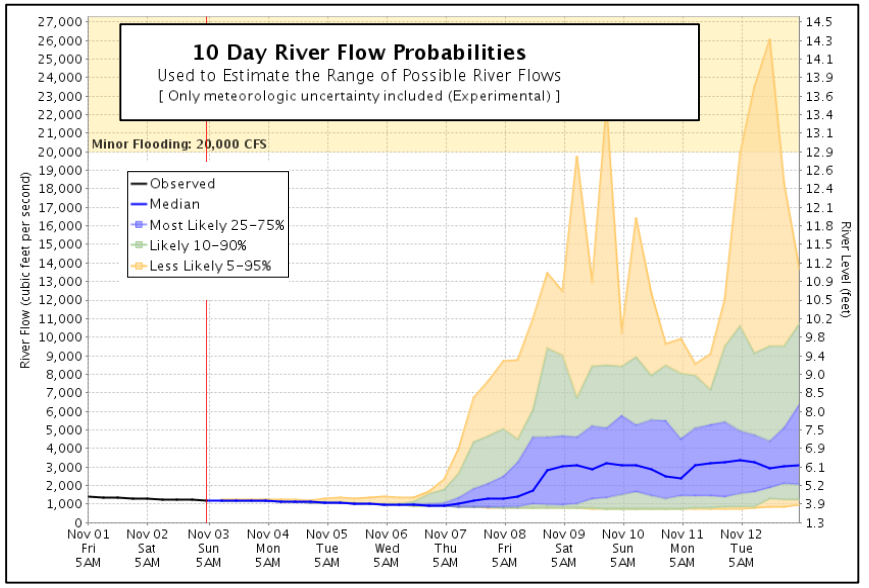
First 15 days of HEFS forced with weather ensembles based on downscaled Global Ensemble Forecast System (GEFS)

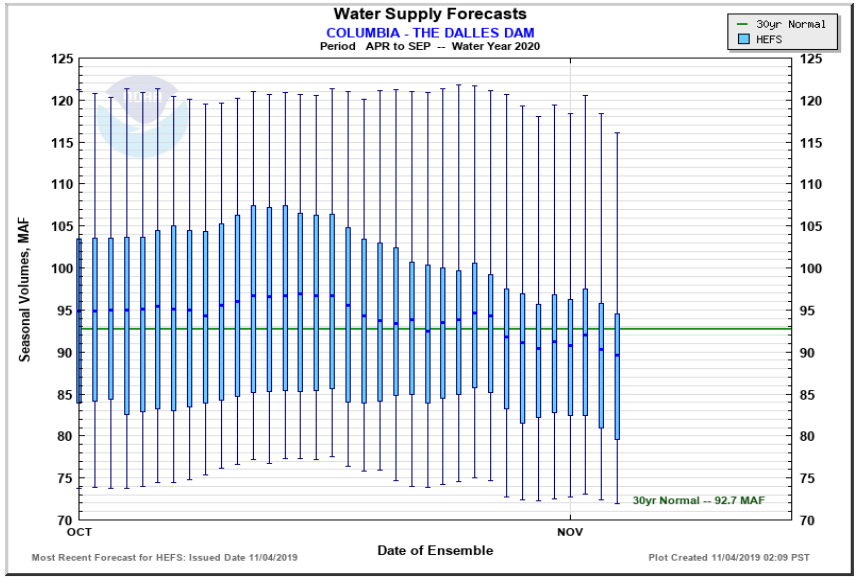
Capabilities (experimental):

- Probabilistic River Forecasts (short-term)
- Monthly and seasonal forecasts

Postured for future enhancements

- Leverages weather model improvements
- Hydrologic Bias Correction
- Climate Forecast Skill





WY2020 Update to ESP Weather Forcing Years

For WY2020:

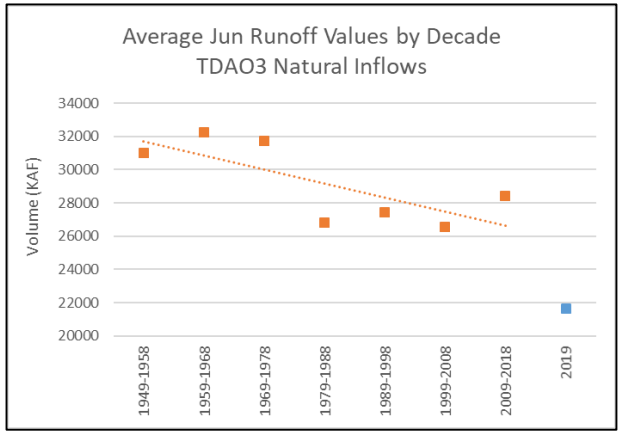
Weather years1981-2019 used in ESP

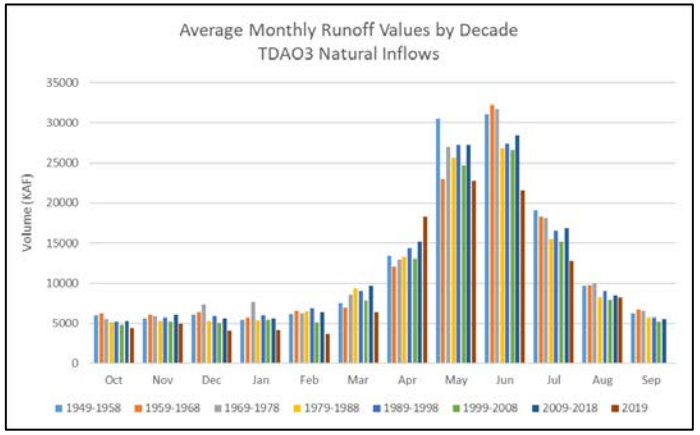
Compares favorably to 30yr Normals:

- 1981-2010
- 1991-2020

More accurate representation of:

- Current state of climate
- Weather forecast for upcoming year
- Better characterization of spring temperature

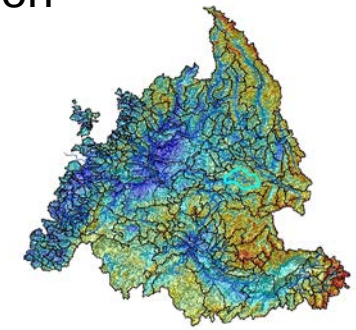




Update paves way for NWRFC model recalibration using new high-resolution, gridded weather dataset

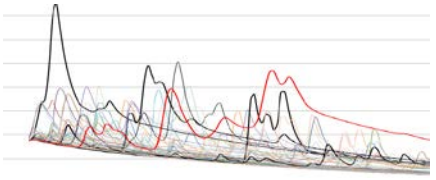
Gridded Weather Forcings

- Hourly time step
- 1 km^2 resolution
- 1980-present



NWRFC Use:

- Calibration Dataset
- ESP Weather Forcings



WY2020 Updates to NWRFC Webpage

New Water Supply Labels:

- ESP10 = Official Water Supply
- HEFS = Experimental
- ESP0 = Reference

COLUMBIA - THE DALLES DAM (TDAO3)
Forecasts for Water Year 2020

Official Water Supply

ESP with 10 Days QPF ***Ensemble:*** 2019-11-02 ***Issued:*** 2019-11-02

Forecast Period	Forecasts Are in KAF				30 Year Average (1981-2010)
	90 %	50 %	% Average	10 %	
APR-SEP	75720	93863	101	122313	92704
APR-JUL	64091	80491	101	103325	79855
APR-AUG	69957	88138	101	115405	87532
JAN-SEP	94245	114153	100	147943	114216
JAN-JUL	82588	99856	99	129489	101368
OCT-SEP	108252	129361	99	166607	130518

Experimental Water Supply

HEFS with 15 days EQPF ***Ensemble:*** 2019-11-02 ***Issued:*** 2019-11-02

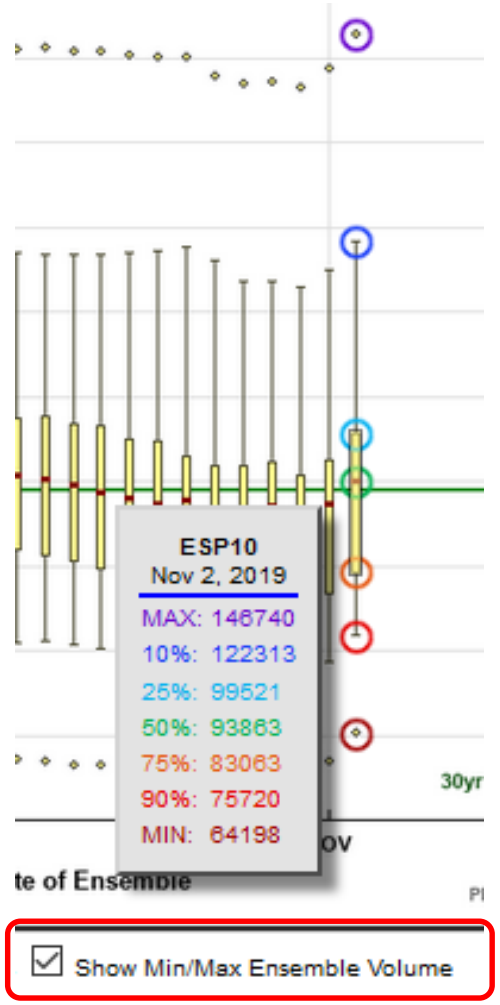
APR-SEP	73117	91999	99	120564	92704
APR-JUL	62775	79633	100	102342	79855
APR-AUG	68776	87272	100	113223	87532
JAN-SEP	89764	113268	99	147224	114216
JAN-JUL	78264	100200	99	128690	101368
OCT-SEP	104607	129823	99	163132	130518

Reference

ESP with 0 Days QPF ***Ensemble:*** 2019-11-02 ***Issued:*** 2019-11-02

APR-SEP	74405	93426	101	120533	92704
APR-JUL	62782	80870	101	102050	79855
APR-AUG	68732	88230	101	112889	87532
JAN-SEP	91642	112280	98	146377	114216
JAN-JUL	79315	100476	99	127894	101368
OCT-SEP	106153	130992	100	162638	130518

Plot Updates



WY2020 NWRFC Water Supply Webinar Dates

2020 Schedule for *Live* Water Supply Briefings					
Jan	Feb	Mar	Apr	May	June
9	*6*	*5*	*2*	*7*	*TBD*
All presentations held at 10:00am PDT/PST, unless noted otherwise					

www.nwrfc.noaa.gov/water_supply/ws_schd.cgi

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Thank you!

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