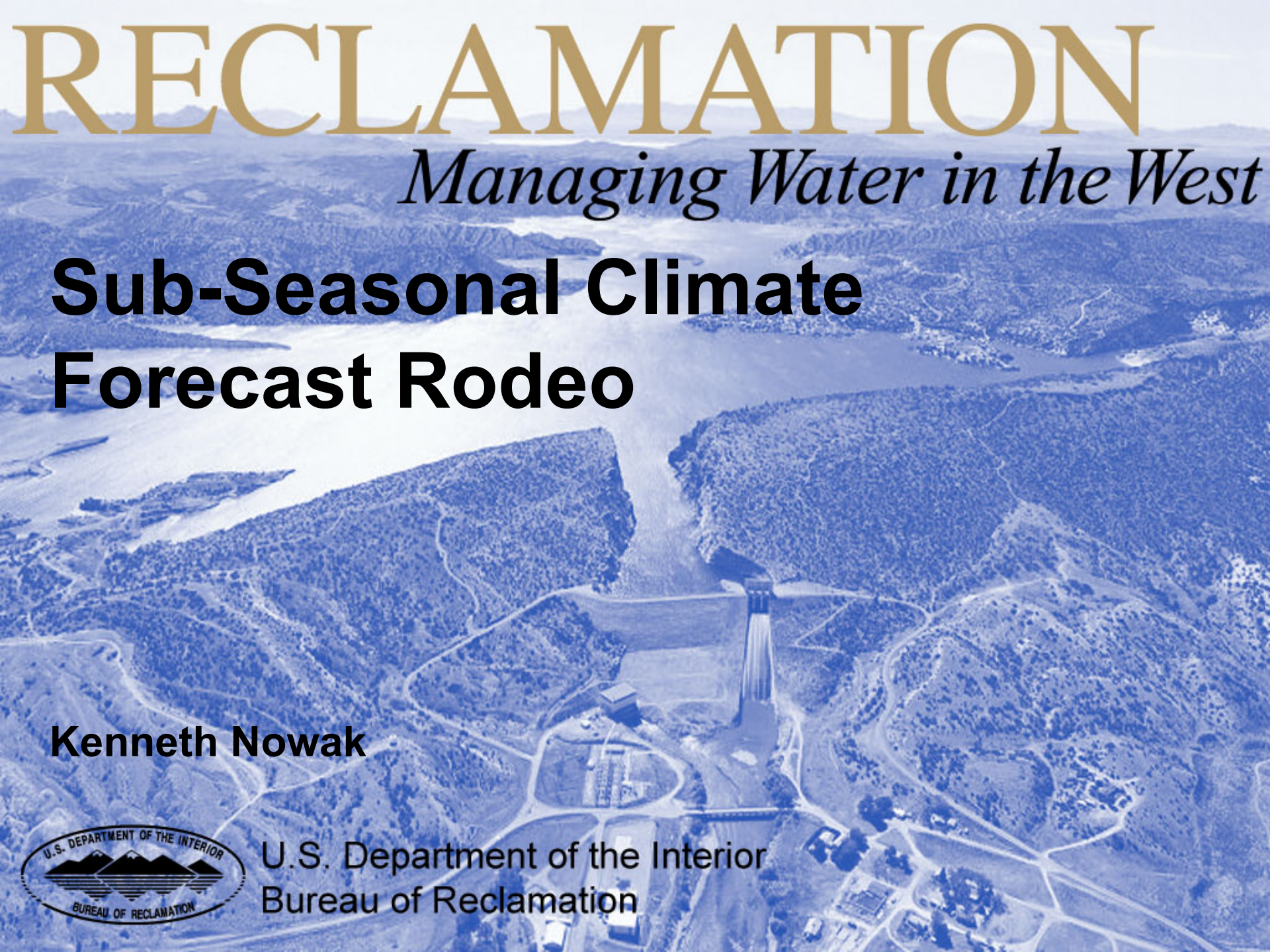


Sub-Seasonal Climate Forecast Rodeo

Kenneth Nowak

U.S. Department of the Interior
Bureau of Reclamation

Bureau of Reclamation

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

- **Manage water in 17 western states**
- **Operate 337 reservoirs**
- **Largest wholesaler of water in the country; provides 1 out of 5 Western farmers with irrigation water for 10 million farmland acres**
- **Second largest hydropower producer; 53 hydroelectric powerplants providing 14000+ MW capacity; generate enough electricity to power 3.5M U.S. homes**

RECLAMATION

Presentation Overview

- Prize Competitions 101
- Sub-Seasonal Forecasting
- The “Rodeo”

What are Prize Competitions?

Prize competitions are a form of crowd sourcing and a way to reach a broader group of thinkers to address difficult topics.

RECLAMATION

How Competitions Work

- Issue a national challenge to solve a specific, typically difficult problem.
- Establish monetary and/or non-monetary incentive prizes.
- Winners must achieve predetermined performance metrics established by sponsors.
- Anyone can compete at their own risk.

R&D Water Prize Competition Center

https://www.usbr.gov/research/challenges/index.html

Sub-Seasonal Forecasting – Relevance to Reclamation

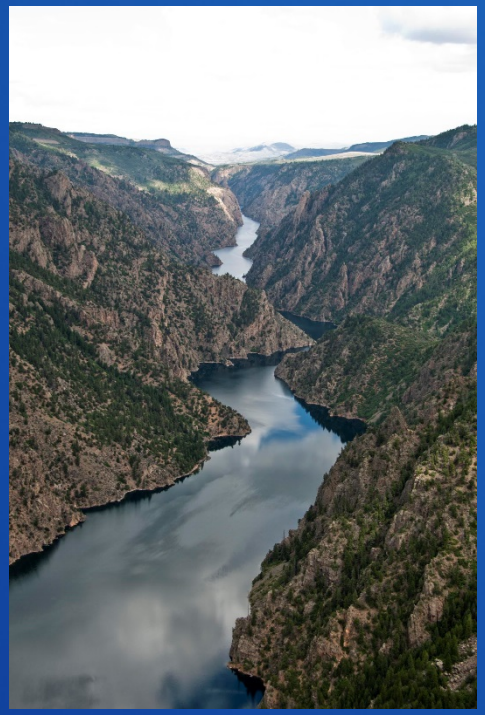
During the past eight years, every state in the Western United States has experienced drought that has affected the economy both locally and nationally through impacts to agricultural production, water supply, and energy.

Improved sub-seasonal forecasts for temperature and would allow water managers to better prepare for shifts in hydrologic regimes, such as the onset of drought or occurrence of wet weather extremes.

Sub-Seasonal Forecasting – Relevance to Reclamation

In addition to managing for drought, improved sub-seasonal forecast would enhance other aspects of Reclamation's operations including:

- Water Allocations
- Flood Management
- Stakeholder Planning
- Environmental Compliance



RECLAMATION

Forecast Rodeo

A year long, real-time sub-seasonal forecasting competition

- Genesis: Drought
  - Definition
    - Agricultural
    - Meteorological
    - Hydrological
    - Others
  - Common Ground
    - Temperature
    - Precipitation
- Objectives
  - Advance Science
  - Raise Awareness
  - Provide Evaluation Platform

RECLAMATION

Competition Partners

USGS
science for a changing world

NOAA
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

US Army Corps of Engineers®

National Integrated Drought Information System
NIDIS
Drought.gov
U.S. Drought Portal

RECLAMATION

Forecast Rodeo Structure

- Forecasts
  - Resolution: a 1x1 grid
  - Variables: Temperature and Precipitation
  - Outlooks: Weeks 3&4 and 5&6
  - Frequency: 2 Weeks
  - Duration: 13 Months
  - Domain: 17 Western States
- Benchmarks
  - CFSv2 (32 member ensemble)
  - Damped persistence
- Schedule
  - Announced: Dec 12, 2016
  - Pre Season: Mar 21, 2017
  - Regular Season: Apr 18, 2017
  - Final Submission: May 3, 2018
  - Winners Announced (est): Sep 8,2018

RECLAMATION

Forecast Rodeo Structure

- Final Submission
  - Code
  - Documentation
  - Hind-Cast*
- Scoring
  - Spatial Anomaly Correlation
  - Drought.gov Leader Board
- Prizes
  - 4 Forecast Categories
    - 1st: $100,000
    - 2nd: $50,000
    - 3rd: $25,000
    - An additional $25,000 prize may be awarded per category based on hind-cast performance solely

*Hind-cast is period is 1999-2010. Performance must be equal to or better than the CFSv2 to be eligible for prizes.

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Current Standings

- 10 of 26 weeks 3&4 forecasts scored
- 9 of 26 weeks 5&6 forecasts scored
- Both temperature outlooks are very competitive
- Precipitation scores significantly lower

Weeks 3&4 Temperature

Team	Newest Score	Average Score
StillLearning	0.604	0.4292
DampedPersistence	**0.0824**	**0.4244**
bgzimmerman	0.5456	0.388
CFSv2	**0.515**	**0.291**
lupoa13	0.6788	0.2363
prxwx	0.1402	0.232
asanteko2000	0.3623	0.0456
ping_liu_sbu	0	0.0402
Salient	-0.6102	-0.2094

Weeks 5&6 Temperature

Team	Newest Score	Average Score
StillLearning	0.4628	0.4236
bgzimmerman	0.4932	0.42
CFSv2	**0.2325**	**0.3938**
lupoa13	0.6738	0.2782
prxwx	0.0365	0.272
asanteko2000	0.5032	0.0703
ping_liu_sbu	0	-0.0313
DampedPersistence	**-0.4391**	**-0.1406**
Salient	-0.6062	-0.2085

Weeks 3&4 Precipitation

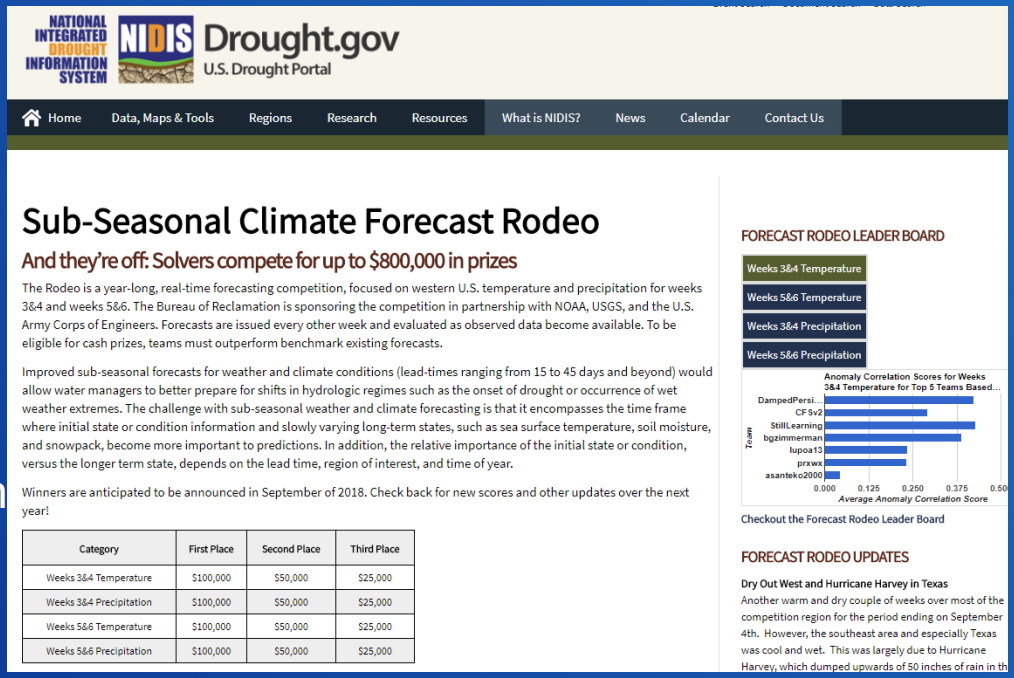
Team	Newest Score	Average Score
Salient	0.7395	0.1775
lupoa13	-0.2978	0.0781
prxwx	0.4575	0.0266
bgzimmerman	-0.3908	0.0143
ping_liu_sbu	0	-0.0058
CFSv2	**0.0753**	**-0.1062**
asanteko2000	-0.7366	-0.1334
StillLearning	0.5748	-0.1411
DampedPersistence	**-0.4314**	**-0.1902**

Weeks 5&6 Precipitation

Team	Newest Score	Average Score
Salient	0.7432	0.1291
bgzimmerman	-0.322	0.0881
lupoa13	-0.32	0.0767
prxwx	0.0692	0.0035
StillLearning	0.516	-0.0148
asanteko2000	-0.6811	-0.0349
ping_liu_sbu	0	-0.0519
CFSv2	**-0.1953**	**-0.1174**
DampedPersistence	**-0.4253**	**-0.1618**

Track Results at NIDIS' Leader Board

- Leader Board is live! **LINK**
- Features
  - Rankings by forecast category
  - Time series plots of forecast scores for top 5 teams and benchmark forecasts
  - Individual team pages
    - Visualize forecast with corresponding observations an benchmark forecasts
    - Time series plots of forecast scores
    - Tabular forecast scores
  - Competition "news feed"



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Questions?

Links:

https://www.usbr.gov/research/challenges/forecastrodeo.html

https://www.drought.gov/drought/utility-type/forecast-rodeo-update

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