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Managing Water in the West

Columbia River Forecast Group Workshop

March 12, 2009



U.S. Department of the Interior
Bureau of Reclamation

Overview of USBR Runoff Forecasts

PN Regional Office produces volume forecasts for 34 different locations

- Headwater Projects (reservoirs and control points)
- Hungry Horse integral to Columbia River system

Forecasts are produced at the beginning of the month starting in January

Ability to produce a forecast on any day with use of telemetered data

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How Are USBR Products Used?

Used to set reservoir operations

- Formal and informal flood control
- Water supply availability
 - Irrigation supply
 - ESA / salmon augmentation
 - Power operations
- Informational purposes

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USBR Runoff Forecasting

All forecasts are internal operating forecasts

- Shared with other agencies and interested parties as requested
- Not disseminated publicly

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USBR Runoff Forecasting

Reclamation and the COE (Walla Walla) coordinate operating forecasts for Section 7 projects in the Snake Basin

- Boise system inflow
- Snake River at Heise
- Little Wood Reservoir inflow
- Ririe Reservoir inflow

Reclamation produces Hungry Horse forecast and operates to it

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USBR Runoff Forecasting

Our goal is simple: Adopt the most accurate forecast

Maintain flexibility in choosing a forecast

- **No mandated methodology; no rigid rules**
- **Ability to modify equation derived values**
- **Consideration of other agency forecasts**

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USBR Runoff Forecasting

Two primary forecast techniques

- Multiple Linear Regression (MLR)
- Principal Components Analysis (PCA)

Results from both methods are analyzed and compared

Discrepancies are explored

Decision based on professional judgment, could be a blend of forecasts

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USBR Runoff Forecasting

Multiple Linear Regression typically uses 4 variables to estimate seasonal volume

- Fall/Winter precip
- April 1 Snowpack
- Spring precip
- Antecedent runoff (surrogate for soil moisture)

One single equation to define seasonal volume

USBR Runoff Forecasting

Each forecast: a new seasonal volume is calculated

Residual forecast is then created

Seasonal Volume minus Runoff to Date

Requires an assumption of future conditions

- Assume average “subsequent conditions”
- Ability to quickly run alternate future conditions

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USBR Runoff Forecasting

Principal Components is completely different

- Directly produces a residual runoff forecast
- Uses only known data up to date of forecast
- Unconstrained to use any data or combinations of data based on best historic correlation
- Constrained to use the same pool of data as MLR however

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All Forecasts need Verification!

The most important step of all

Does it look right? Can we explain anomalies?

How does it compare with:

- Snowpack
- Other forecasts
 - NRCS
 - RFC
 - COE
 - Others (CRITFC)

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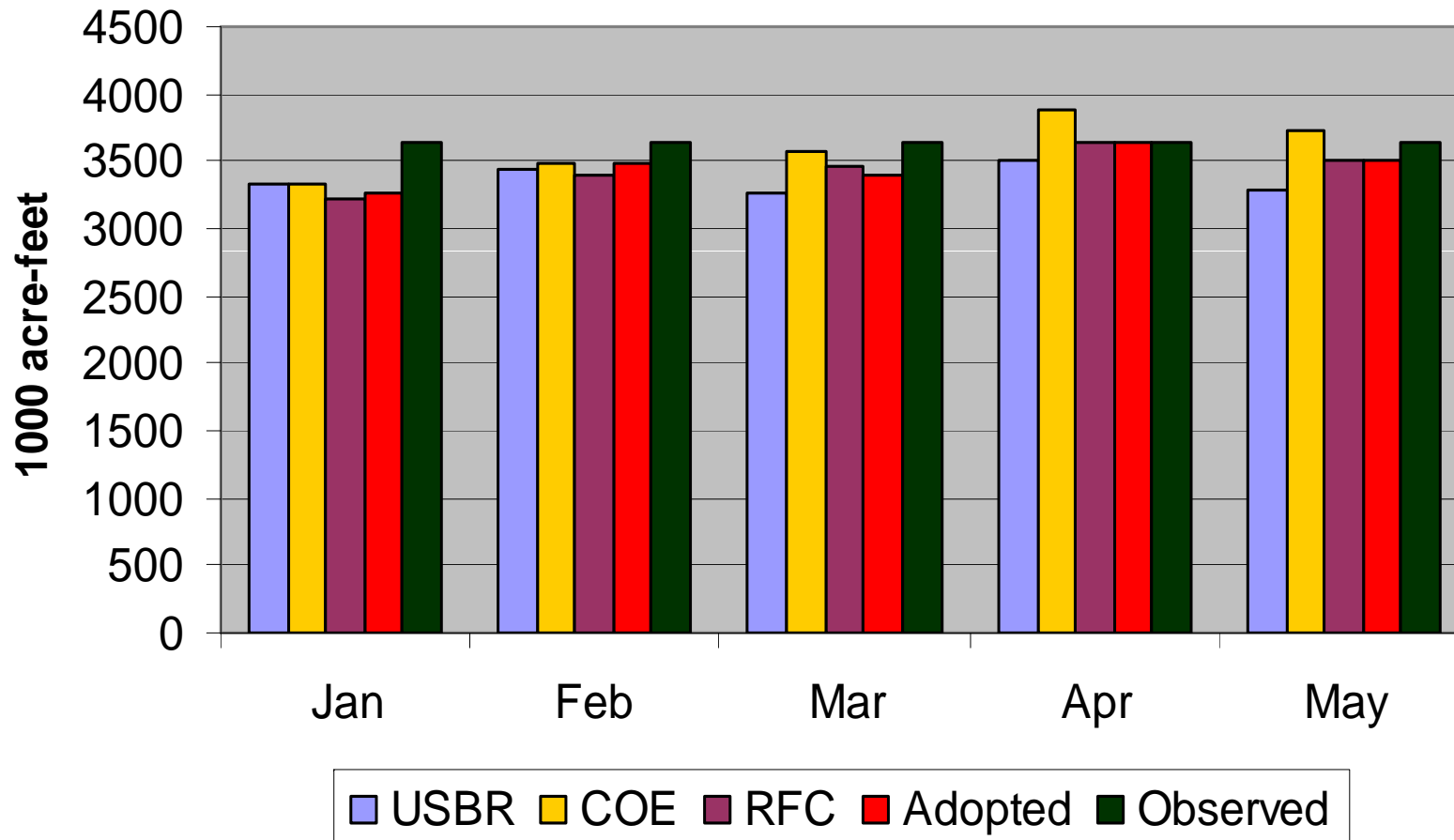
Verification

How does it compare with similar years?

- Rank the historic volumes
- Examine snowpack and hydrographs of surrounding years
- Look for analog years

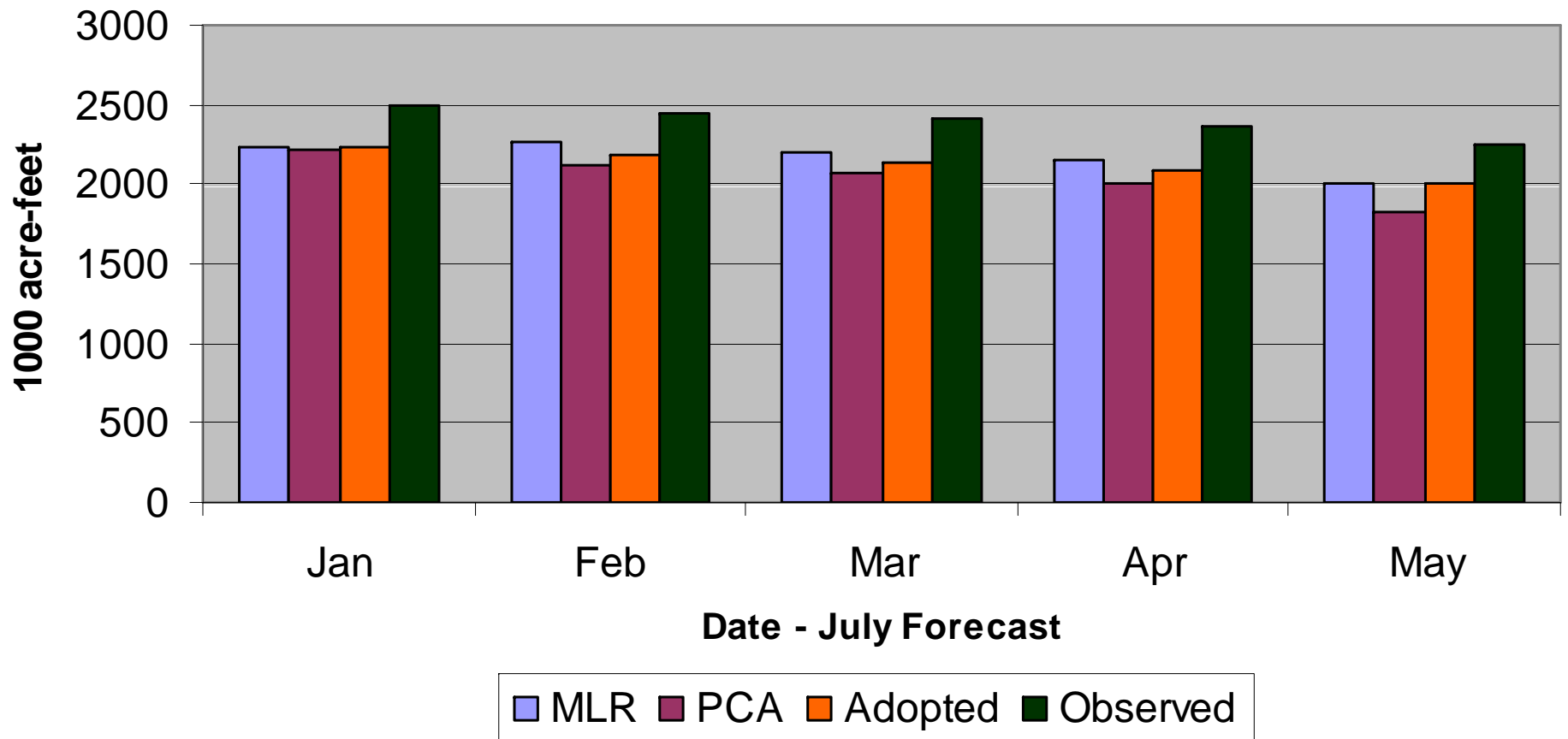
Snake River at Heise

April - July Inflow



Hungry Horse Reservoir

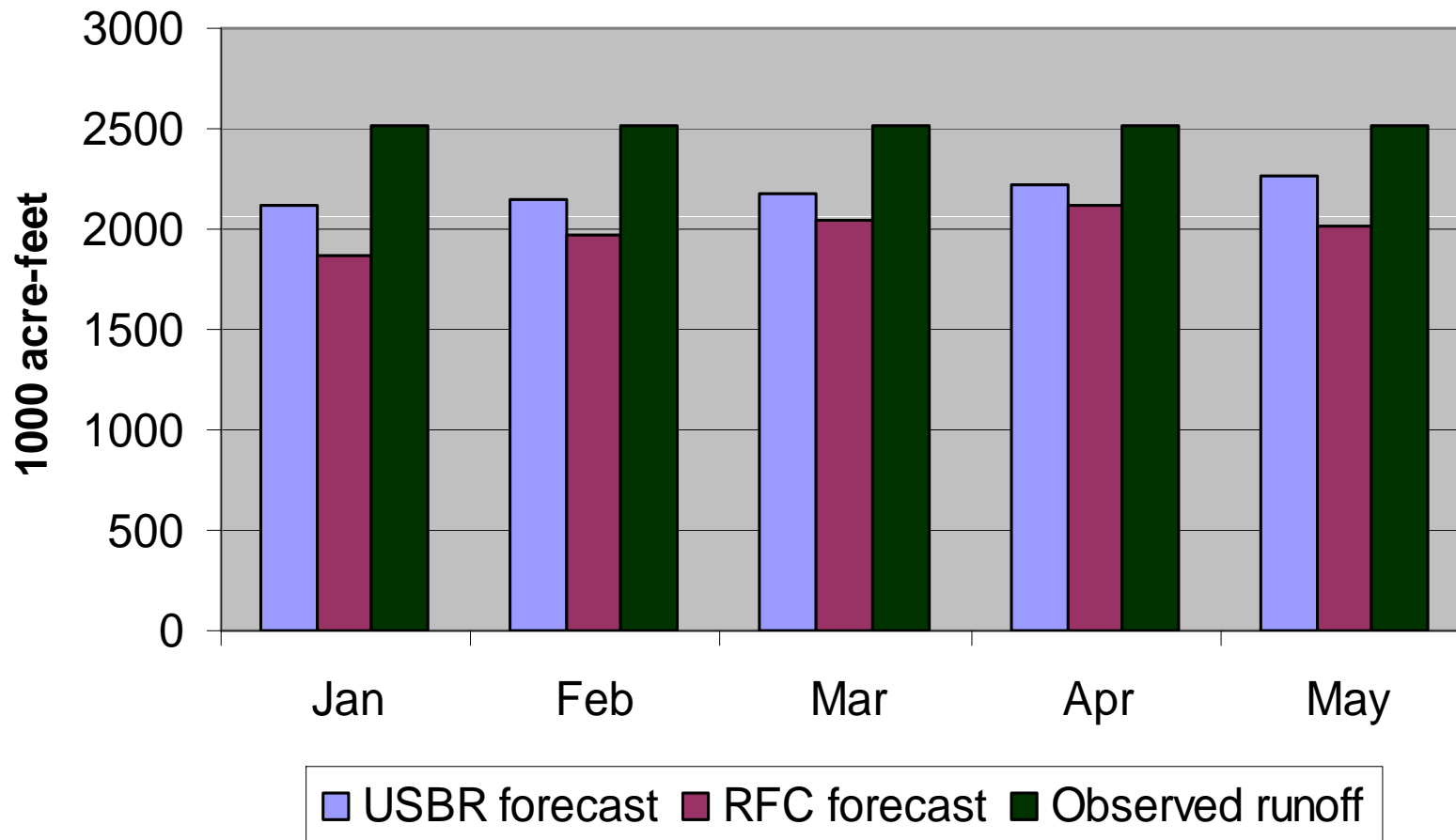
USBR Forecast Performance - 2008



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Hungry Horse Reservoir

April - September Inflow



Conclusion

Every forecast is wrong

We earn the big bucks to hopefully figure out how wrong, and to know how wrong we can afford to be

Every forecast is a tool for our operations “tool box”

Maintain flexibility to adjust and react

QUESTIONS / COMMENT ?

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