

# Forecasting Snake River Discharge at Murphy



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**February 12, 2015 Presentation to  
Technical Working Group in Boise**

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# Agenda

- The Challenge
- The Solution
- Existing Forecast Tool
- Forecasting Details
- Questions

# The Challenge

- Will Snake River discharge at the Murphy gage fall below minimum flow requirements?

# The Solution

- Develop a tool that can be used to forecast daily Snake River discharge at Murphy

# How? The Details

## Existing Tool

- Monthly forecast at one spring
- State's numerical model (ESPAM v. 2.0)
- Uses "rough" avg. starting heads array
  - Any head value from Jan or Feb; calc. departure from avg. head (1992 through 2008 avg)
  - Added this departure from avg. to the avg. '92 through '08 heads and ran model
- Forecasts total annual recharge from Northside and Big Wood using SWSI at Heise and Big Wood using correlation b/t two (92 to 08)
  - distributed across the year according to avg. monthly recharge for each entity
- Avg. pumping w/in 50 miles

## MONTHLY SPRING DISCHARGE FORECASTING TOOL

### USER INPUT

<b>FORECAST YEAR</b>	<b>2013</b>
<b>January 1 Snake River at Heise SWSI</b>	<b>0.3</b>
<b>January 1 Big Wood SWSI</b>	<b>0.5</b>



#### Starting Heads Component

- 1 Interpolate head surface (IDWR database)
- 2 MODFLOW (only impact of starting heads)
- 3 MODFLOW post processing to obtain monthly spring discharge

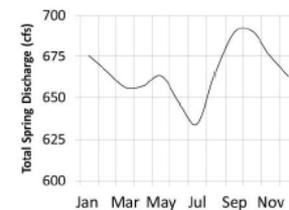
#### Irrigation Recharge Component

- 1 January SWSI Data
- 2 Regression eqn. (Fig. 7) to obtain total annual recharge
- 3 Distribute recharge across months of forecast year
- 4 Response function and convolution to obtain monthly spring discharge

#### Pumping Component

- 1 Distribute average annual pumping across months of forecast year
- 2 Response function and convolution to obtain monthly spring discharge

Cumulative Effect on Spring Discharge



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## MONTHLY SPRING DISCHARGE FORECASTING TOOL

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RUN

## Tool Upgrades

- Use ESPAM v. 2.1
- Develop monthly Snake River gains between Milner and King Hill
- Post processing and stats to estimate 3-day rolling average flow at the Murphy gage
- Include prediction uncertainty
- Combine the State's numerical model with a statistical forecasting approach (to forecast aquifer stresses)

# More Details - Starting Heads

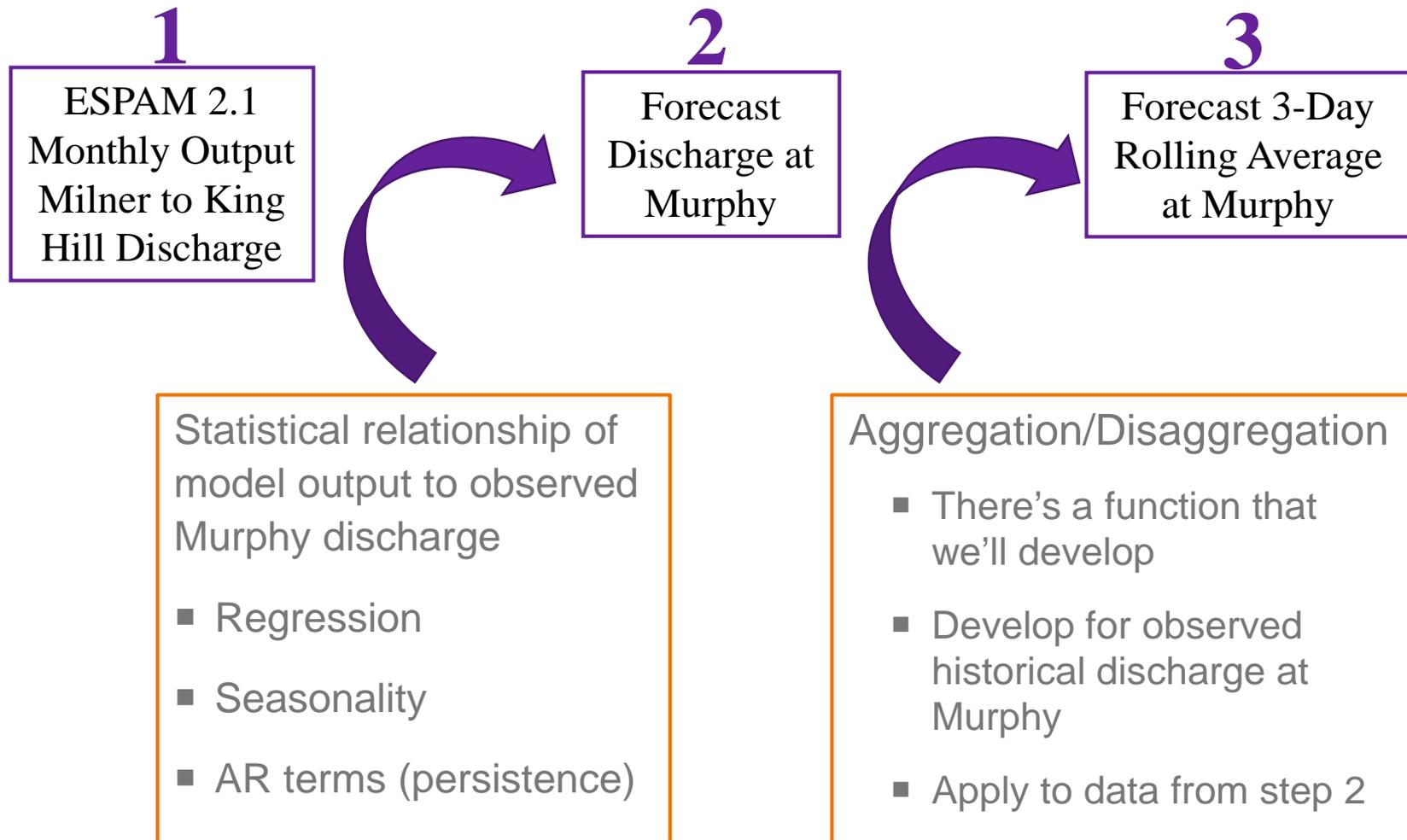
- Improve starting heads procedure
  - Review available observed water level data to assess whether an improved surface can be developed
  - Assess whether automating the procedure is possible

# More Details – Predictor Variables

More thorough analysis of potential predictors of irrigation recharge of upcoming year..

- SWSI
- SWE
- Reservoir storage (Jackson, Palisades, American Falls)

# Automate process to get from monthly to 3-day rolling average



# More Details – The End Products

- Two tools
  - One that can be used each January
  - One that can be used each May
- Assess Sources of uncertainty
  - Uncertainty in prediction of irrigation recharge (model inputs or scenarios)
  - Statistical uncertainty associated with relating model output from Milner to King Hill to Murphy
  - Disaggregation procedure
- Quantify uncertainty (Bootstrapping/Monte Carlo simulation)
  - 3-day rolling average forecast (expected value)
  - Percentiles of the prediction interval
- Present the final output from the tool in graphically and numerically

# Questions and Suggestions?

