


Climate Info and Modeling

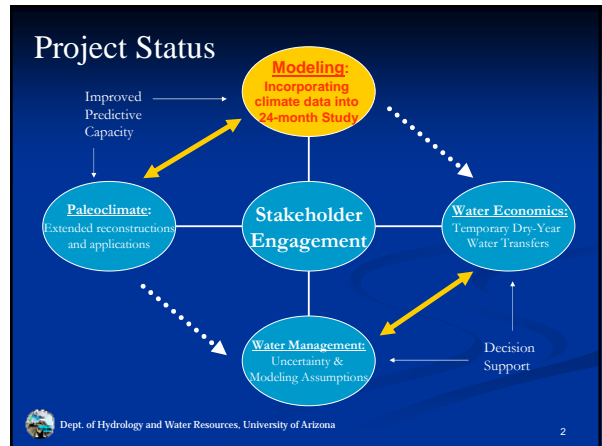
A methodological approach to including outside information into USBR projections

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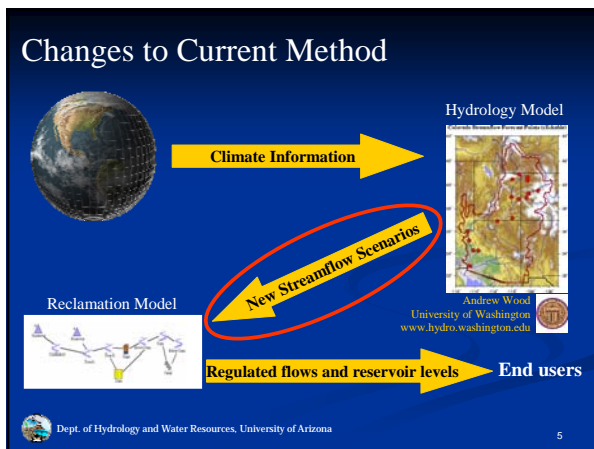
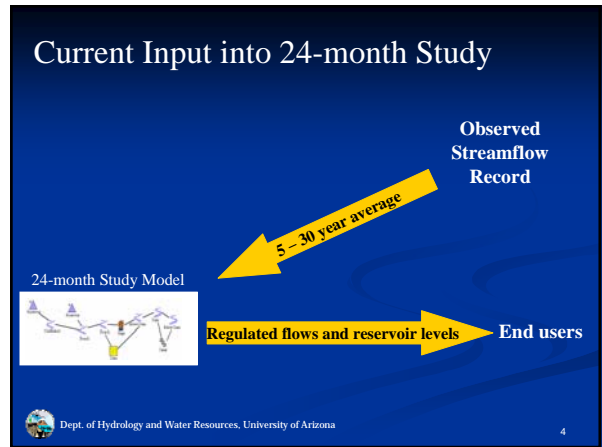
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What We Are Doing:

- Demonstrating the methodology for incorporating outside information into Reclamation's 24-month Study
- Focusing on the Lower Colorado River Basin
- 12 month streamflow forecasts from a hydrology model at the University of Washington (Andrew Wood, Niklas Christensen, Dennis Lettenmaier)

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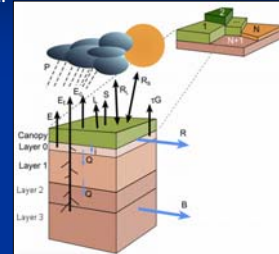
Variable Infiltration Capacity Model (VIC)

Meteorological Forcing Data:

- Precipitation
- Temperature (max/min)
- Wind

Subgrid Variability of:

- Vegetation
- Soil Moisture Storage
- Topography



Canopy Layer 0

Layer 1

Layer 2

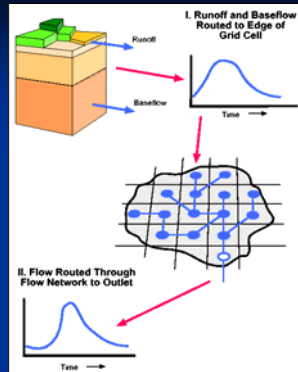
Layer 3

http://www.hydro.washington.edu/Lettenmaier/Models/VIC/ModelDescription/VIC_Main_Fig.html

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Routing Method

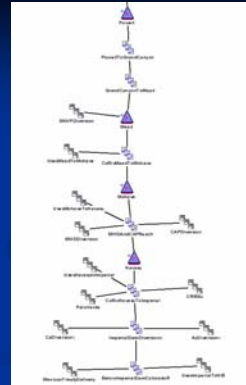
- Hydrologic outputs: baseflow and runoff from each grid cell
- Grid cells are routed to model input 'location'



24-month Study Model

- Paria River*
- Little Colorado River*
- Virgin River*
- Grand Canyon
- Lake Mead
- Lake Mohave
- Lake Havasu
- Bill Williams River*
- Imperial Dam

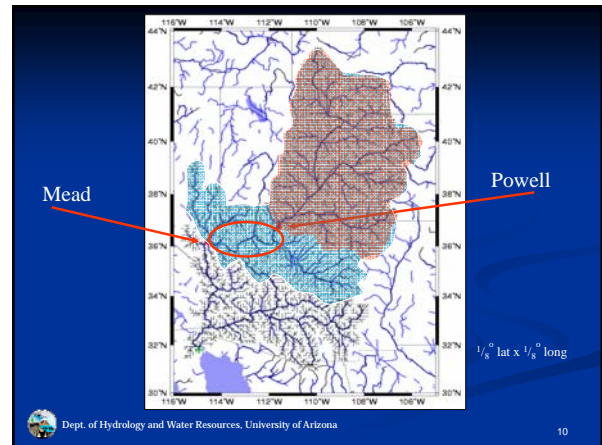
*Expanded Model (Tighi, 2006)



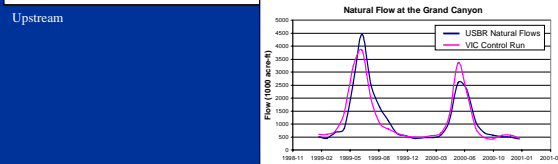
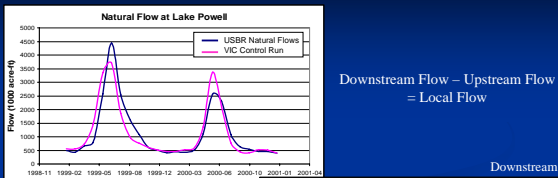
Data Input

- Retrospective streamflow forecast ensembles
 - Precip and Temp: 1950-2001
- All basin rules will remain the same
- Only user defined inputs will be changed
- 9 local flow input points for Lower Basin

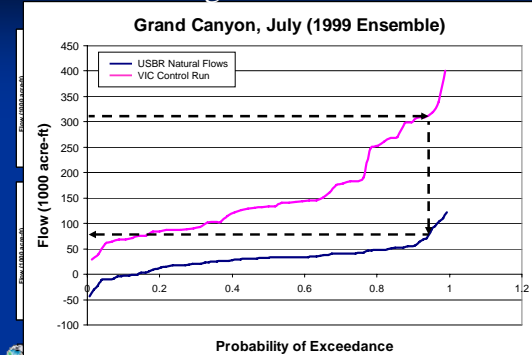
Convert Natural Flows to Local Flows



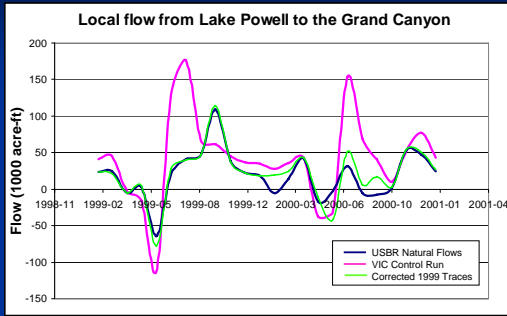
Convert Natural Flows to Local Flows



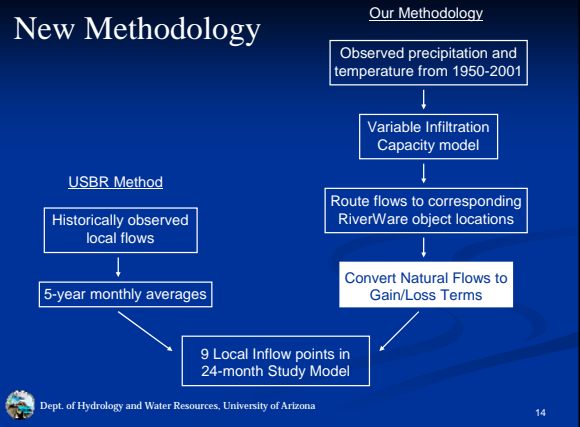
Bias Correcting Flows



Correction Method



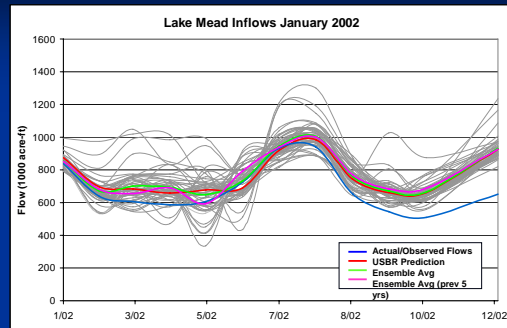
New Methodology



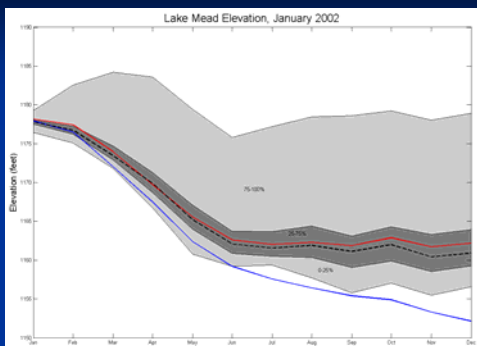
Model Analysis

- Three different 24-month Study models
 - 2001 (average inflow)
 - 1999 (above-average inflow)
 - 2002 (below-average inflow)
- Ensembles from 1950-2001 – Mead inflows/elevations, tributaries
- Ensemble percentile plots – Mead inflows/elevations, tributaries

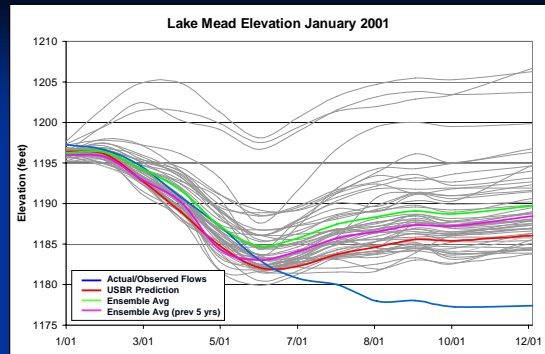
Lake Mead Inflow Ensemble

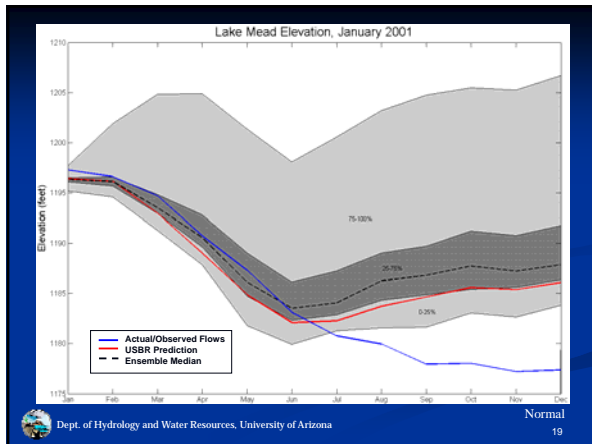


Lake Mead Percentile Plots



Lake Mead Elevation January 2001





Conclusions

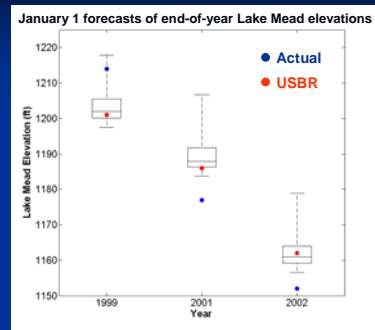
- Developed a method with which to incorporate outside information/new flow scenarios
- Percentile plots allow for a better definition of possible outcomes

Implications

- Better definition of range of outcomes
- Look at range of end-of-calendar year elevations in Lake Mead: Normal, Surplus, or Shortage

Lake Mead Elevation (feet)	Resulting Conditions
Above 1145	Full Domestic Surplus
1125-1145	Partial Domestic Surplus
Below 1125	Normal or Shortage

Implications



Special thanks to:

Bureau of Reclamation: Terry Fulp, Shana Tighi, Doug Blatchford
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