Modeling System Benefits in RiverWare

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Introduction

- Why have benefits models?
 - Need a way to quantify monetary savings or damage reduction due to the presence of projects.
 - Required to report project benefits to Congress annually.
- How do we derive these values?
 - Use observed stages that give us the controlled condition, and calculate stages that reflect an uncontrolled condition.
 - Compare these results and using damage curves we are able to calculate the \$\$\$ saved by having the projects in place.



Determining If Benefits Need To Be Calculated







Existing Tools and Methods

Pre-Processing data from WCDS

- Reservoir Inflow/Outflow/Elevation
- Gage Flow/Stage
- Clean data using DSS
 - Fill missing data
 - Remove erroneous peaks
- Existing Tools
 - ► HEC-1
 - ViewGraph
 - DSS
 - ► Flow2Stage
 - DSSMATH/DSS Scrips





Existing Methods

- Run HEC-1 benefits model
 - Convert to 6-Hour
 - Calculate Locals and Unregulated
- Clean Unregulated Data
 - Remove negative local flow values
- Convert to Unregulated Stage hydrographs
- Plot locations with Benefits
- Holdouts
- Holdout Distribution





Model Interfaces



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RiverWare Approach

- Extract data from WCDS
 - Clean
 - Convert to Local
 - Convert to 6-Hour
- Use DMI to input data into RW
- Calculate Locals
- Export DMI to DSS
 - Remove Negative Locals
- Import Cleaned Locals
- Calculate Unregulated Flows
- Calculate Reservoir Holdouts





File Control Workspace Policy DMI Accounting Utilities Units Scripts Help

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Scripts

- Separate Scripts for calculating
 - Locals
 - Unregulated Conditions

Script Dashboard: Local Calcs								
📂 File Edit								
Local Calcs								
Clear values set by the Locals DMI								
Clear values set by the Unregulated DMI								
Set Disable Reservoir Processes to None								
Set Dummy Reaches to Calculate Local Inflows								
Set the run range to: <unspecified> <unspecified> Use Start Date: Use End Date:</unspecified></unspecified>								
Execute the Locals DMI								
Execute run								
Create snapshot Locals								
Execute the Local_Outputs DMI								
Execution Execution Status: Ready Current Action: this script is not executing								





RiverWare Methods

Locals

- Set Reservoir Methods to None
- Use same Routing methods from HEC-1
 - Modified Puls
 - Muskingum
 - Lag
- Create "Dummy" Reaches to calculate Locals
 - No Routing
 - Solve Local Inflow



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RiverWare Methods

- Unregulated Flows
 - Disable Reservoirs to Pass Inflow
 - Dummy Reaches to No Local Inflow, Solve Outflow







RiverWare Unregulated Results





Holdouts

- What was the volume of water maintained in reservoir during events?
- Calculated when Inflow > Outflow
 - Flow converted into Volume
 - Summed over entire modeled period
- When Inflow < Outflow</p>
 - Holdout calculation set to zero
- Benefits distributed by percentage of total volume per basin.



May 2015 Holdouts for Hudson

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-				18:00 May 5, 2015	
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K HUDS.Holdout

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1 value: 475.55 [acre-ft]



May 2015 Holdouts for Neosho River

K	C Open Object - Holdouts									
File Edit View Slot Group										
		Object Name:	Holdouts							
	Data Object									
Γ	Slots	Attributes	Description							
	18:00	May 5, 2015) • 🕥				1~		
	Slot Na	ame	Value	Units						
	ŭ	Council Grove	53,629	acre-ft						
	ω	Marion	17,608	acre-ft						
	L C	John Redmond	466,138	acre-ft						
	ω	Pensacola	648,628	acre-ft						
	ω	Hudson	339,044	acre-ft						
	ω	Ft Gibson	903,695	acre-ft						
	Order:	Default	•		Filte	er Slots 🔻]			





Future Development

- Expansion from test Basin (Neosho River) to all current Benefits Models
- Automation of Stream Rating Curves
- Corps Water Management Systems (CWMS) Implementation
- Model Report



