

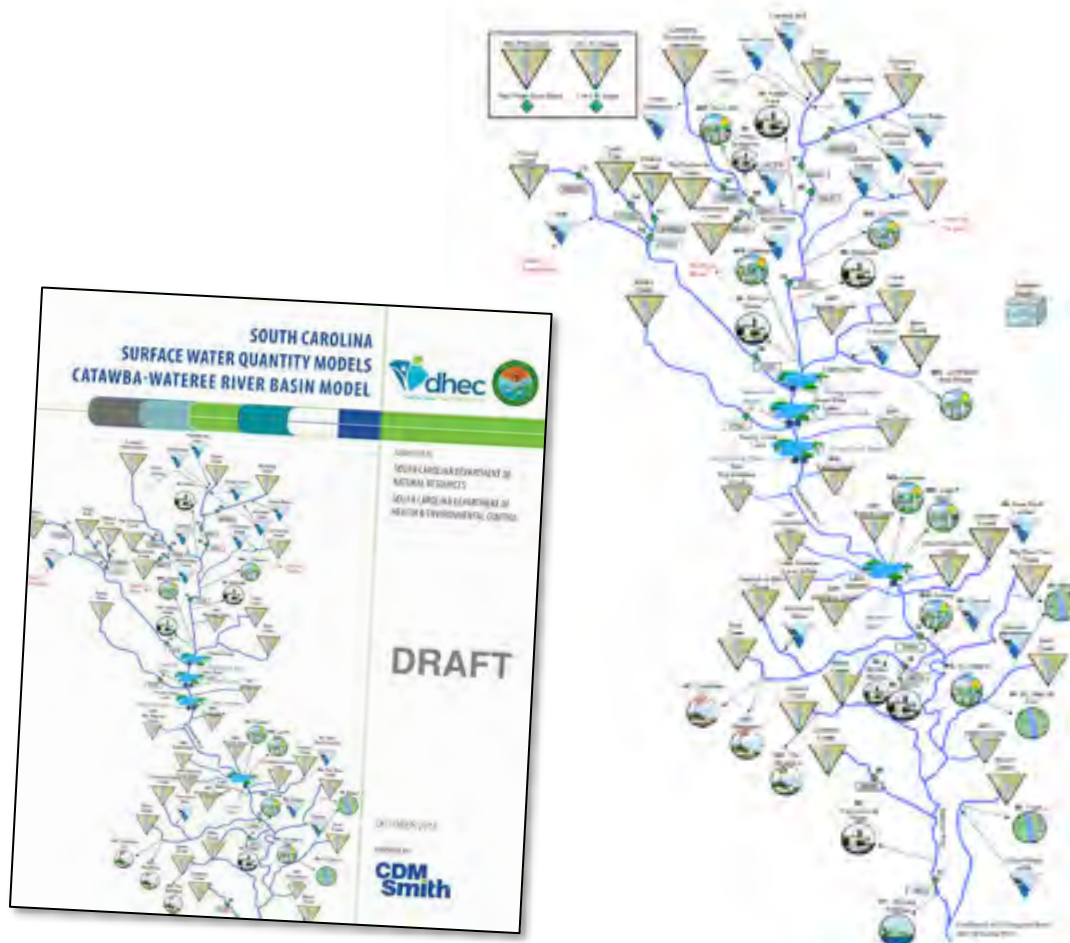
South Carolina Surface Water Quantity Modeling Project

Catawba-Wateree Basin Meeting No. 2 – Introduction to the Draft Model

John Boyer, PE, BCEE

Nina Caraway

Nov 2, 2016



**CDM
Smith**

Presentation Outline

- Project background and status
- Model calibration/verification
 - Calibration/verification philosophy and approach
 - Calibration results and discussion
- Overview and demonstration of the model

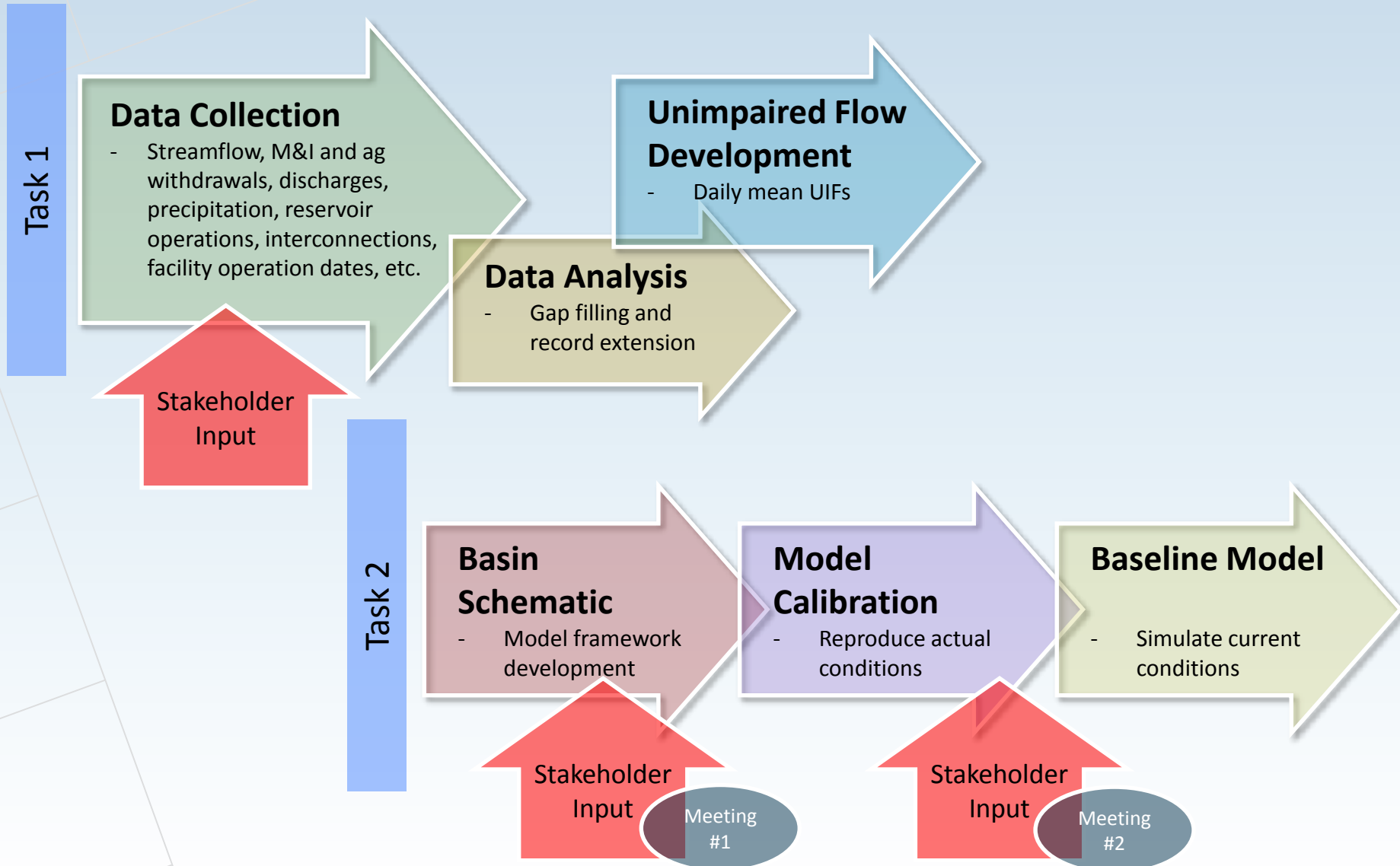
Project Purpose

- Build surface water quantity models capable of:
 - Accounting for inflows and outflows from a basin
 - Accurately simulating streamflows and reservoir levels over the historical inflow record
 - Conducting “What if” scenarios to evaluate:
 - future water demands
 - management strategies
 - system performance

The Simplified Water Allocation Model is...

- A water accounting tool
 - *Calculates physically and legally available water*
 - *Traces water through a natural stream network, simulating withdrawals, discharges, storage, and hydroelectric operations*
- Not a precipitation-runoff model (e.g., HEC-HMS)
- Not a hydraulic model (e.g. HEC-RAS)
- Not a water quality model (e.g., QUAL2K)
- Not an optimization model
- Not a groundwater flow model (e.g., MODFLOW)

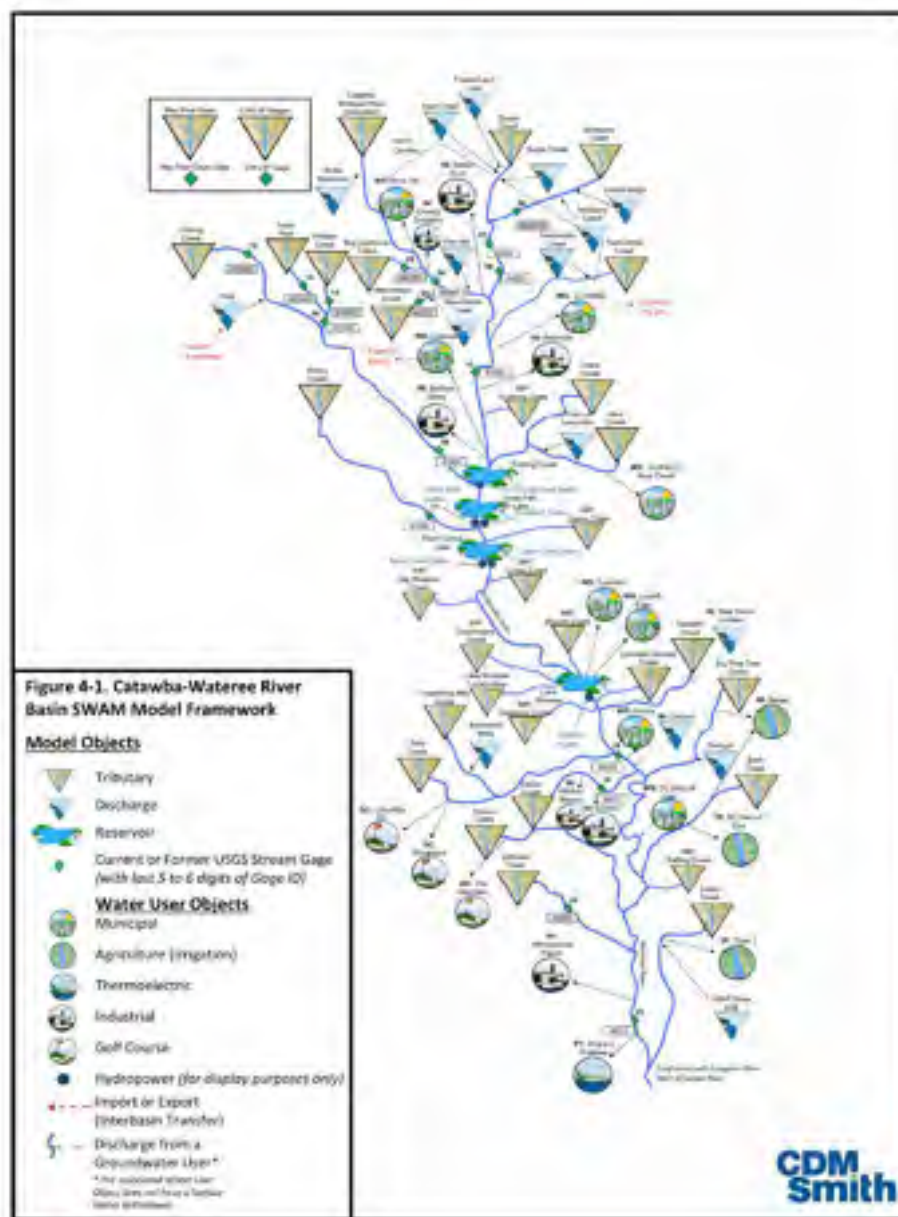
Project Status – Catawba-Wateree Basin



Calibration vs. Baseline Model

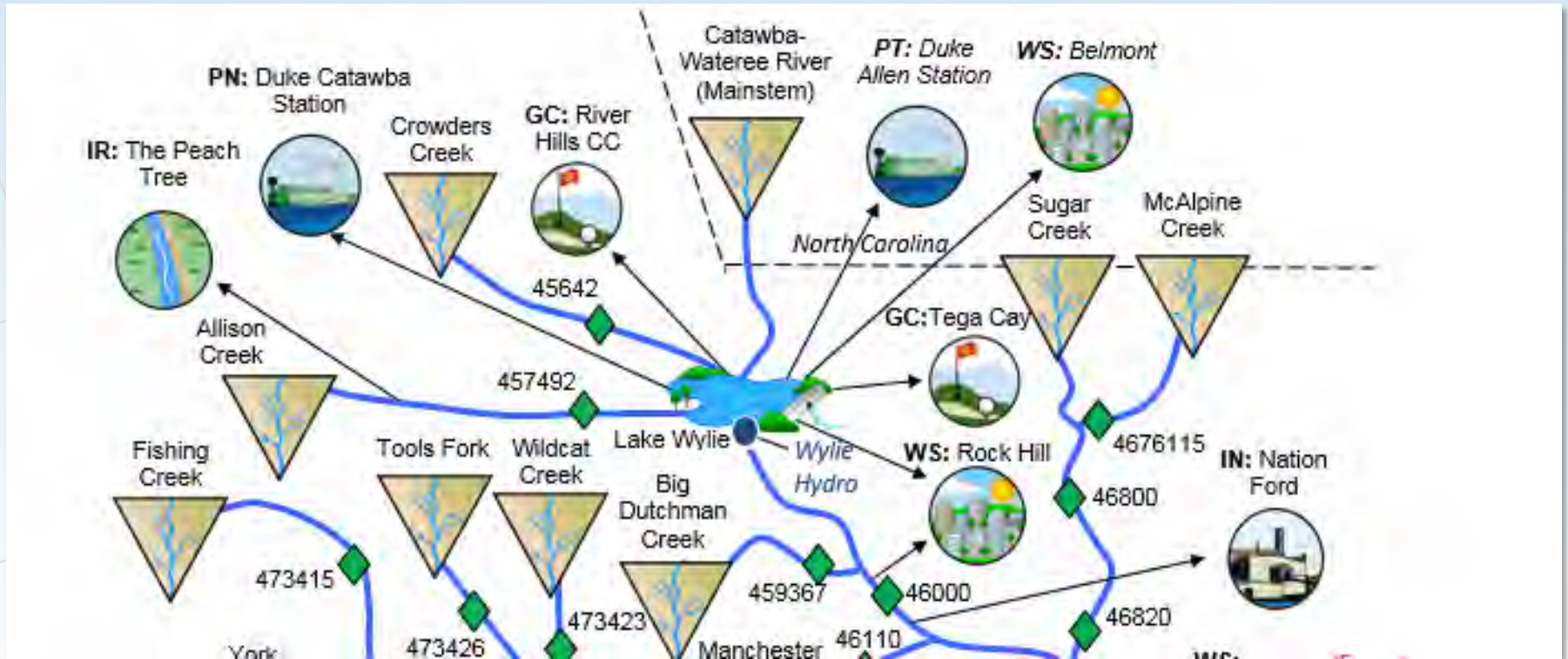
- **Calibration Model**
 - Purpose: confirm models ability to accurately simulate river basin flows and storage amounts
 - Uses recent withdrawal, discharge and flow records
- **Baseline Model**
 - Purpose: Evaluate water availability under future conditions
 - Uses entire record of flow and most current withdrawals and discharges
- Both models are used coordination with CHEOPS model to obtain flows from NC portion of the system (outflow from Lake Wylie)

Catawba-Wateree Basin – SWAM Framework



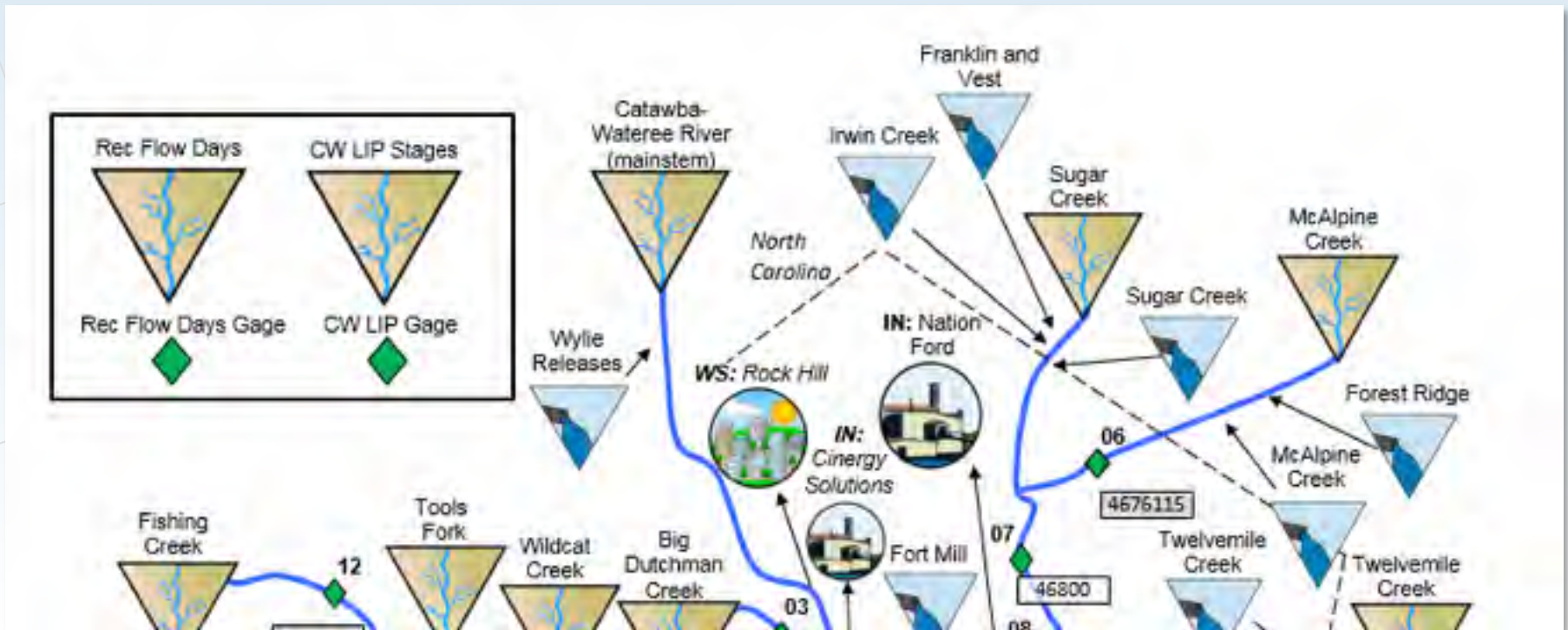
Framework Changes

- Original Framework included Lake Wylie and its major tributaries



Framework Changes

- Revised Framework begins at the outlet to Lake Wylie
- Wylie releases are specified as a discharge object and mainstem headwater flows are scaled from the inflow dataset
- Major NC dischargers were added on Sugar and McAlpine creeks



Modeling Report and Other Documents

- <http://www.dnr.sc.gov/water/waterplan/surfacewater.html>

The screenshot shows the website for the South Carolina Department of Natural Resources (DNR). The header includes the DNR logo and the slogan "Life's Better Outdoors". The main navigation menu lists various topics: [Buy](#), [Boating](#), [Education](#), [Fishing](#), [Hunting](#), [Land](#), [Maps](#), [Recreation](#), [Water](#), and [Wildlife](#). The page title is "Surface Water Modeling and Assessments".

Information

- Contact Us
- News
- Office Status
- Presentations
- Surface Water Modeling
- Water Assessment (2009 Report)
- Water Plan (2004 Report)
- White Papers
- Water Plan Home
- Hydrology Section

Surface Water Modeling and Assessments

Effective water planning and management requires an accurate assessment of the location and quantity of the water resources of the State, and one of the most useful tools for evaluating management strategies is a computer model that simulates the surface water system throughout an entire watershed. To that end, SCDNR and SCDHEC have begun the process of developing surface-water quantity models for each of the [major water systems](#), or basins, in South Carolina.

A more detailed discussion of the proposed surface water modeling can be found in the document [Developing Surface Water Modeling in South Carolina](#), and an overview of each of the eight basins for which the models will be developed can be found in the document [Major Basins of South Carolina](#).

In July 2014, SCDNR South, Inc. was awarded a contract to develop the models for the state.

PROJECT DOCUMENTS:

For any questions regarding these reports and presentations, please contact Joe Gellies by phone (803-734-6426) or email.

For information about stakeholder meetings, please visit www.southwater.com.

(Documents below list of 12 items.)

- [Home / Info / All Documents](#)
- [Monthly Progress Reports](#)
- [Legislative Quarterly Reports](#)
- [Technical Reports](#)
- [Technical Memorandums](#)
- [Meeting Notes](#)
- [Presentations](#)
- [Videos](#)
- [River Basins](#)

At the bottom of the page, there are social media icons for Facebook, YouTube, Twitter, and LinkedIn.

The cover of the report is titled "SOUTH CAROLINA SURFACE WATER QUANTITY MODELS CATAWBA-WATERLEE RIVER BASIN MODEL". It features the DHEC logo and the South Carolina Department of Natural Resources logo. The cover includes a large, detailed map of the Catawba-Waterlee River Basin, showing the river network and various sub-basins. The map is color-coded with green and blue. The text "DRAFT" is prominently displayed in the center-right. At the bottom right, it says "DEVELOPED BY CDM Smith".

Catawba-Wataree River Basin

MODEL CALIBRATION/VERIFICATION

Calibration Objectives

1. Extend hydrologic inputs (headwater UIFs) spatially to adequately represent entire basin hydrology by parameterizing reach hydrologic inputs
2. Refine initial parameter estimates, as appropriate
 - E.g., reservoir operating rules and %Consumptive Use assumptions
 - Gain confidence in the model as a predictive tool by demonstrating its ability to adequately replicate past hydrologic conditions, operations, and water use
 - Avoid being overly prescriptive

Potential Sources of Model Error and Uncertainty

- Gaged flow data ($\pm 20\%$)
- Gaged reservoir levels ($\pm ?\%$)
- Reported withdrawal data
- Consumptive use percentages
- Return flow lag times (if applicable, e.g. outdoor use)
- Basin climate and hydrologic variability
- *Reservoir operations (operator decision making)*
- *Reach hydrology: gains, losses, local runoff and inflow*

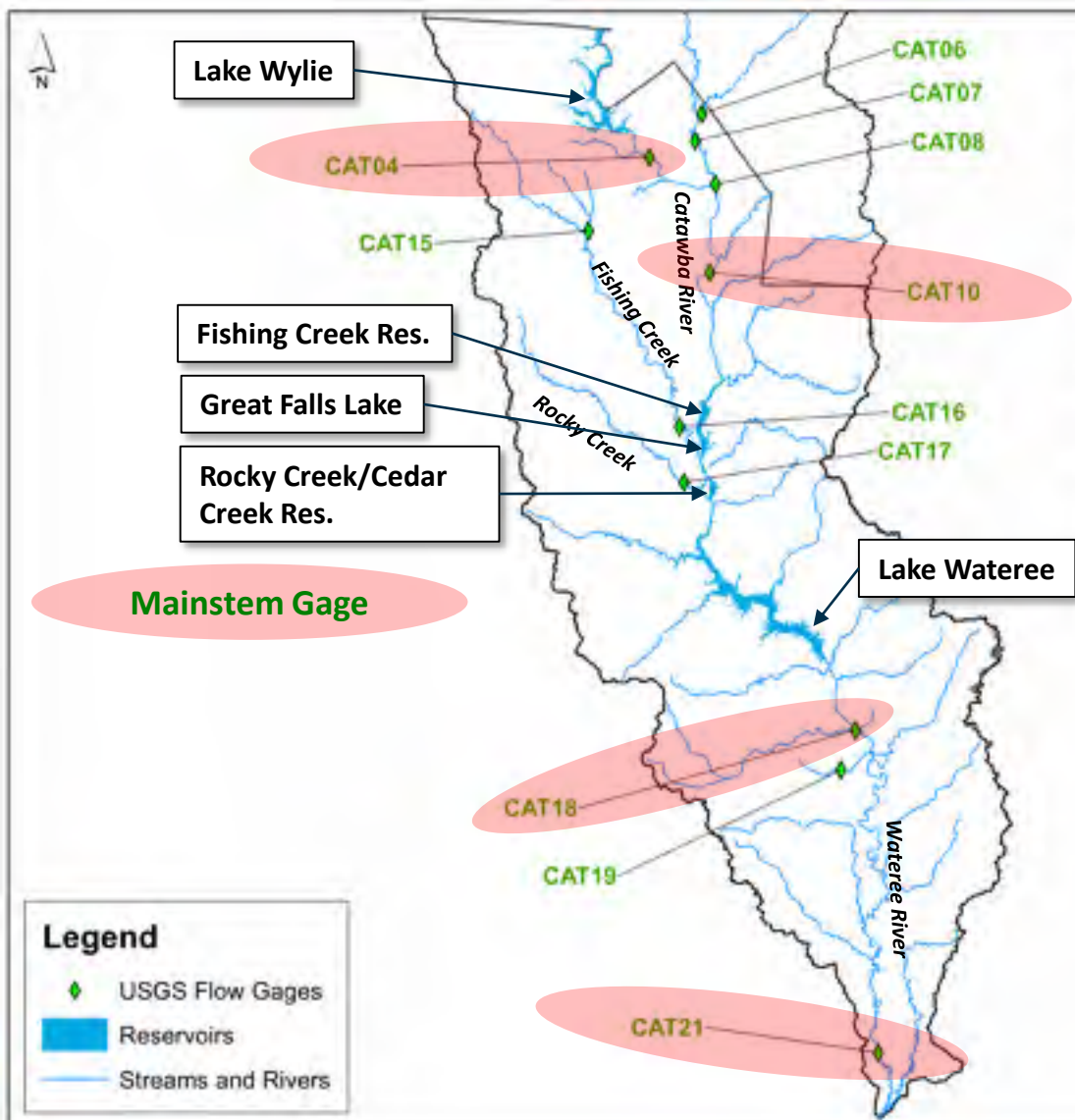
Calibration/Validation General Approach

- Two hindcast periods
 - 1983 – 2010 for **tributaries**
 - Includes droughts in both early and late 2000's
 - 2006 – 2010 on **mainstem** to reflect operating rules in the Comprehensive Relicensing Agreement (CRA)
 - Particular focus on 2007-2008 drought years
- Comparison to gaged (measured) flow or reservoir data
 - Operations and impairments are implicit in that data
- LIP Timeseries was included from CHEOPS model
 - Not exact match to actual historical LIP timeseries likely due slight differences in model vs. actual storage and the impact on storage index calculations which are a LIP trigger

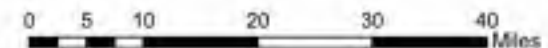
Calibration/Validation General Approach

- Assess performance at (subject to gage data availability):
 - Multiple mainstem locations
 - All tributary confluence locations
 - Major reservoirs (where levels/storage are available)
- Multiple model performance metrics, including:
 - Timeseries plots (monthly and daily variability)
 - Annual and monthly means (water balance and seasonality)
 - Percentile plots (extremes and frequency)

Calibration/Validation Locations

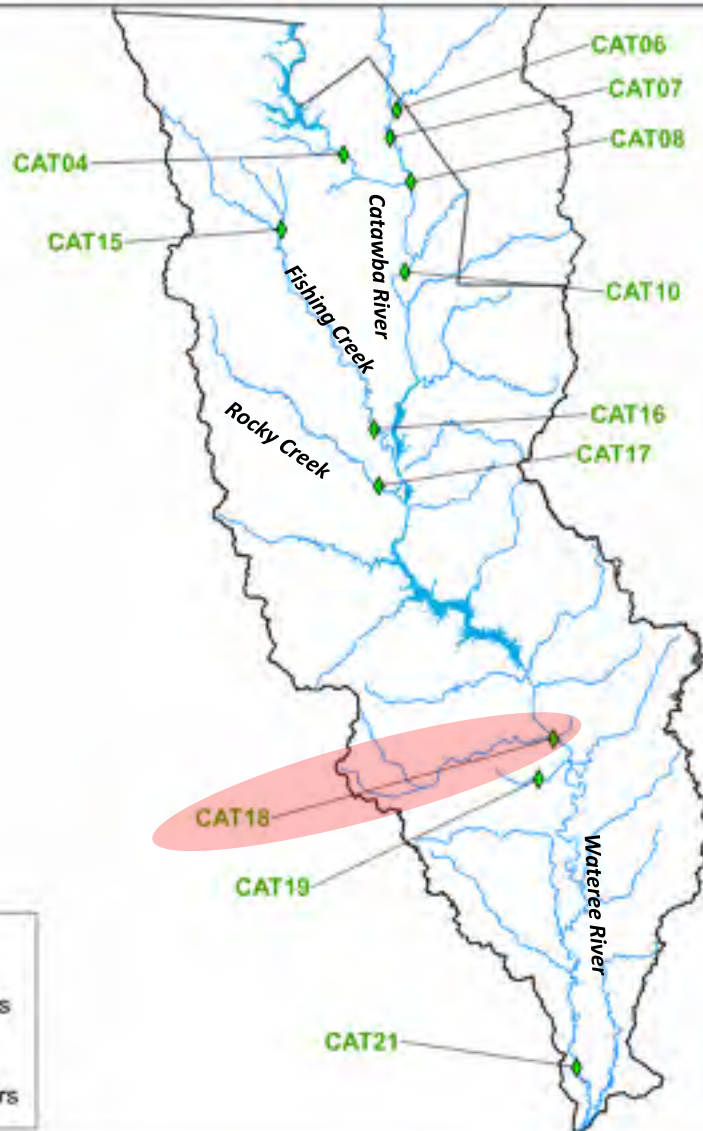


Project Gage ID	USGS Number	Tributary Object	Periods of Record	Basin Area (sq. mi.)	River Mile
CAT04	02146000	Mainstem	4/1942 - 8/1995 10/1995 - 12/2010	3048	4
CAT06	0214676115	McAlpine Creek	10/2005 - 12/2010	95	15
CAT07	02146800	Sugar Creek	4/2006 - 12/2010	263	24
CAT08	02146820	Sugar Creek	5/2001 - 9/2002	275	30
CAT10	02147020	Mainstem	1/1992 - 9/1994 10/1995 - 12/2010	3538	20
CAT15	021473428	Wildcat Creek	8/1998 - 6/2001 1/2006 - 12/2010	30	4
CAT16	02147403	Fishing Creek	2/2001 - 10/2003	280	40
CAT17	02147500	Rocky Creek	3/1951 - 9/1981 8/1986 - 12/2010	196	24
CAT18	02148000	Mainstem	10/1929 - 9/1983 5/1984 - 12/2010	5057	738
CAT19	02148071	Gillies Creek	4/1994 - 9/1997	8	3
CAT21	02148315	Mainstem	7/1968 - 2/1983 5/1983 - 12/2010	5554	131



Wateree River near Camden

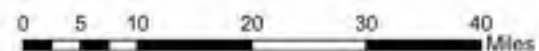
USGS Gage 02148000



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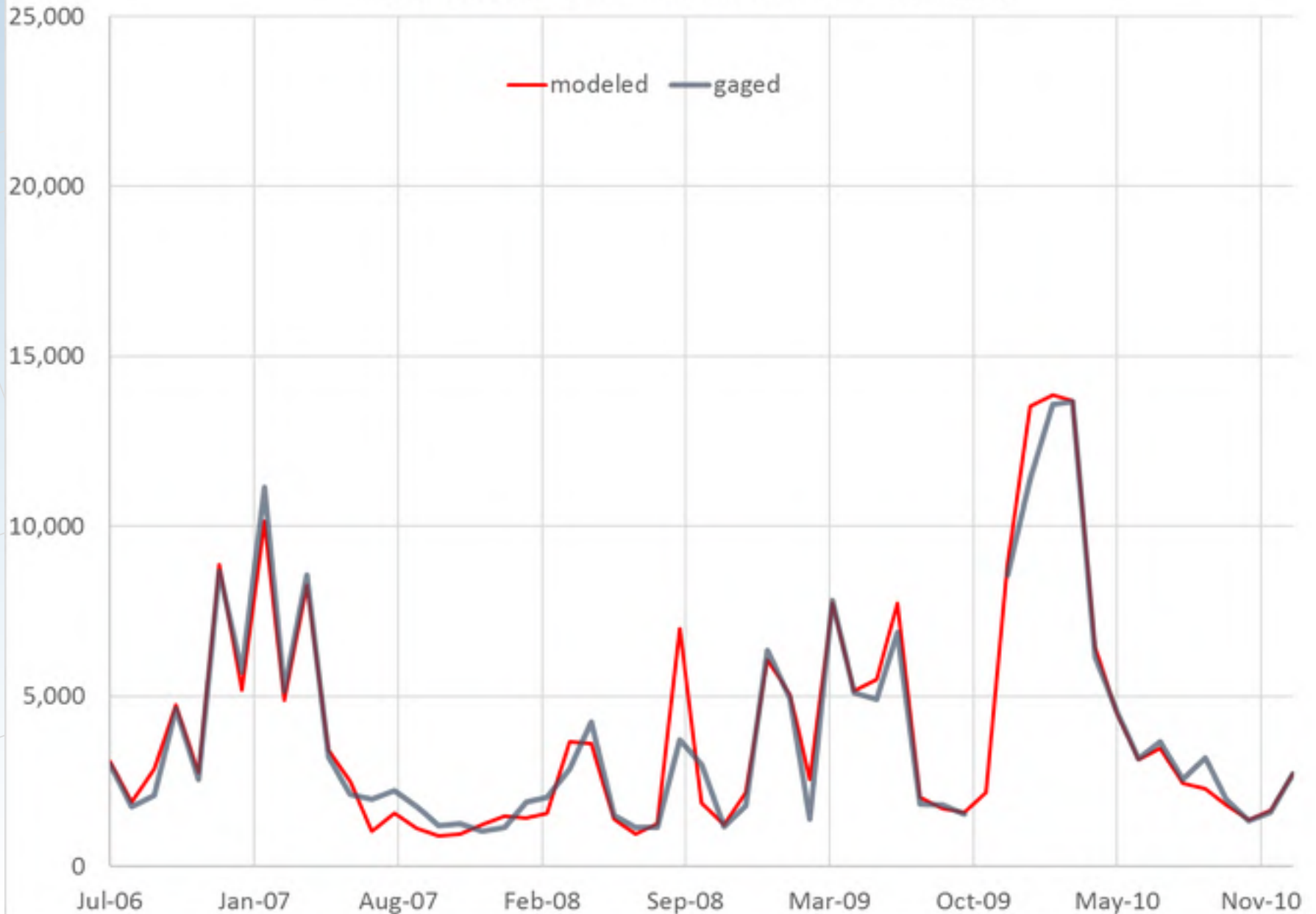
Legend

- USGS Flow Gages
- Reservoirs
- Streams and Rivers



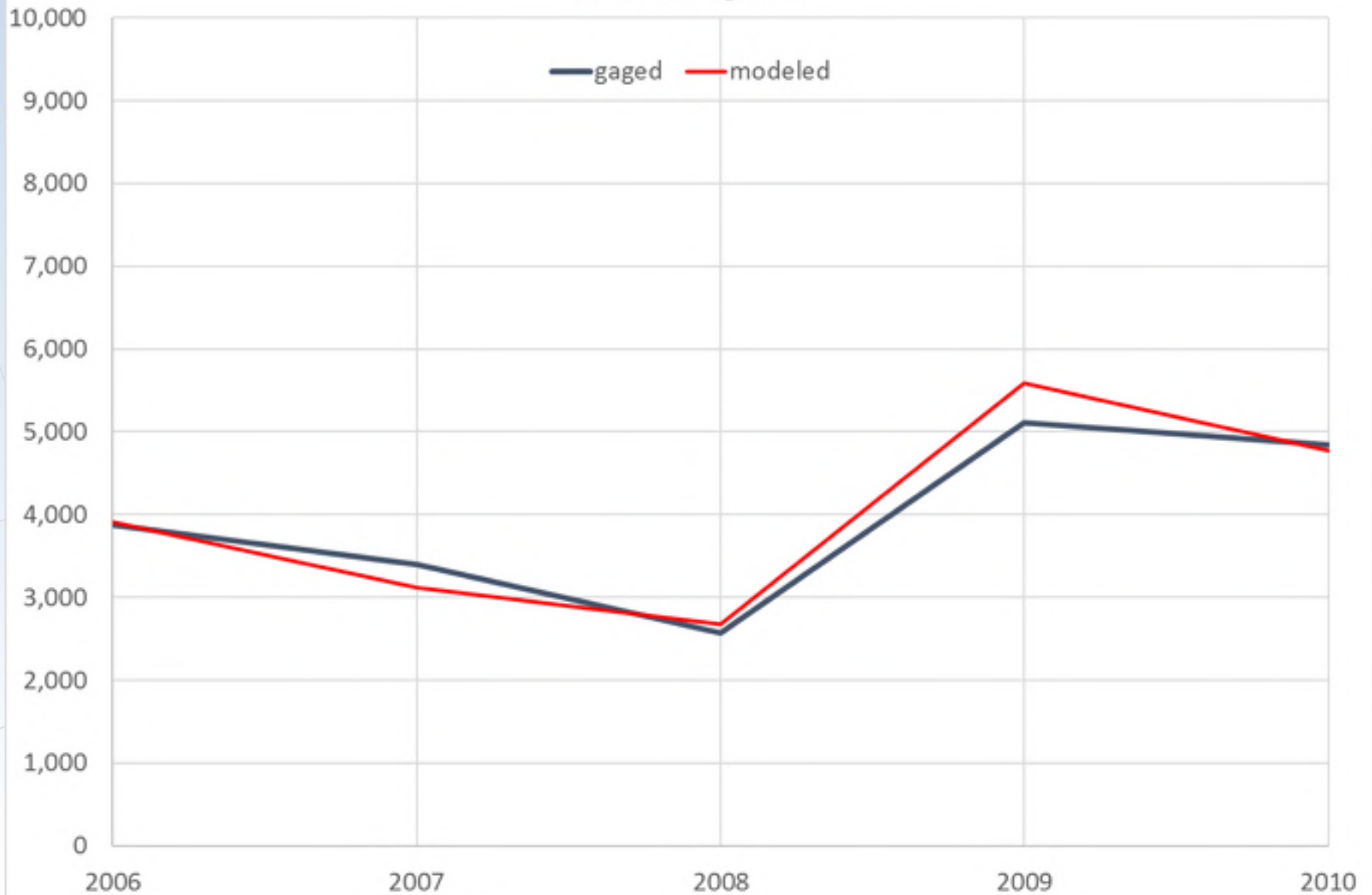
Monthly Flow Comparison

CAT18 (02148000) WATEREE RIVER NR. CAMDEN, SC (CFS)



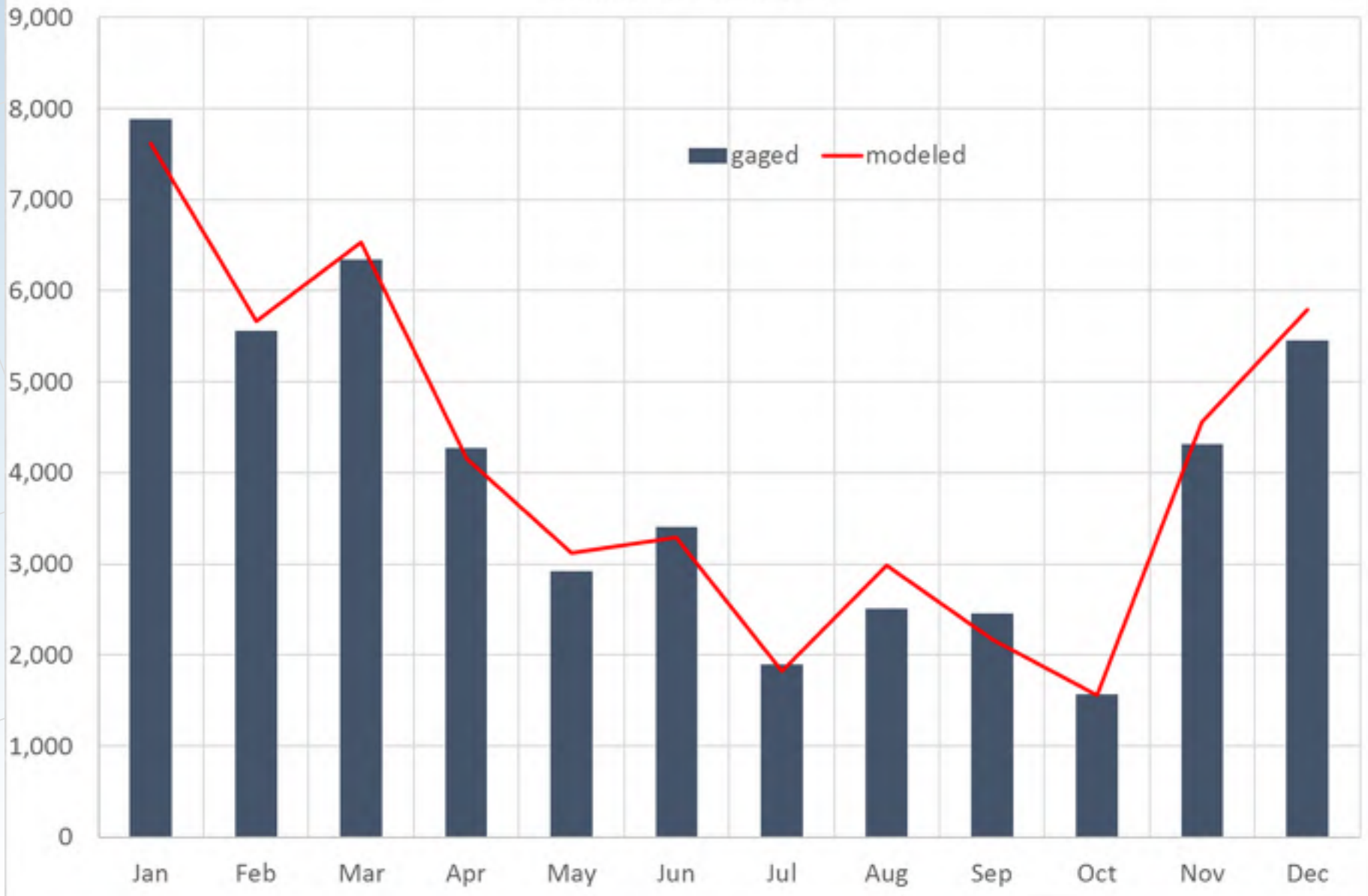
Annual Average Flow Comparison

CAT18 (02148000) WATEREE RIVER NR. CAMDEN, SC (CFS)
Annual Average Flow



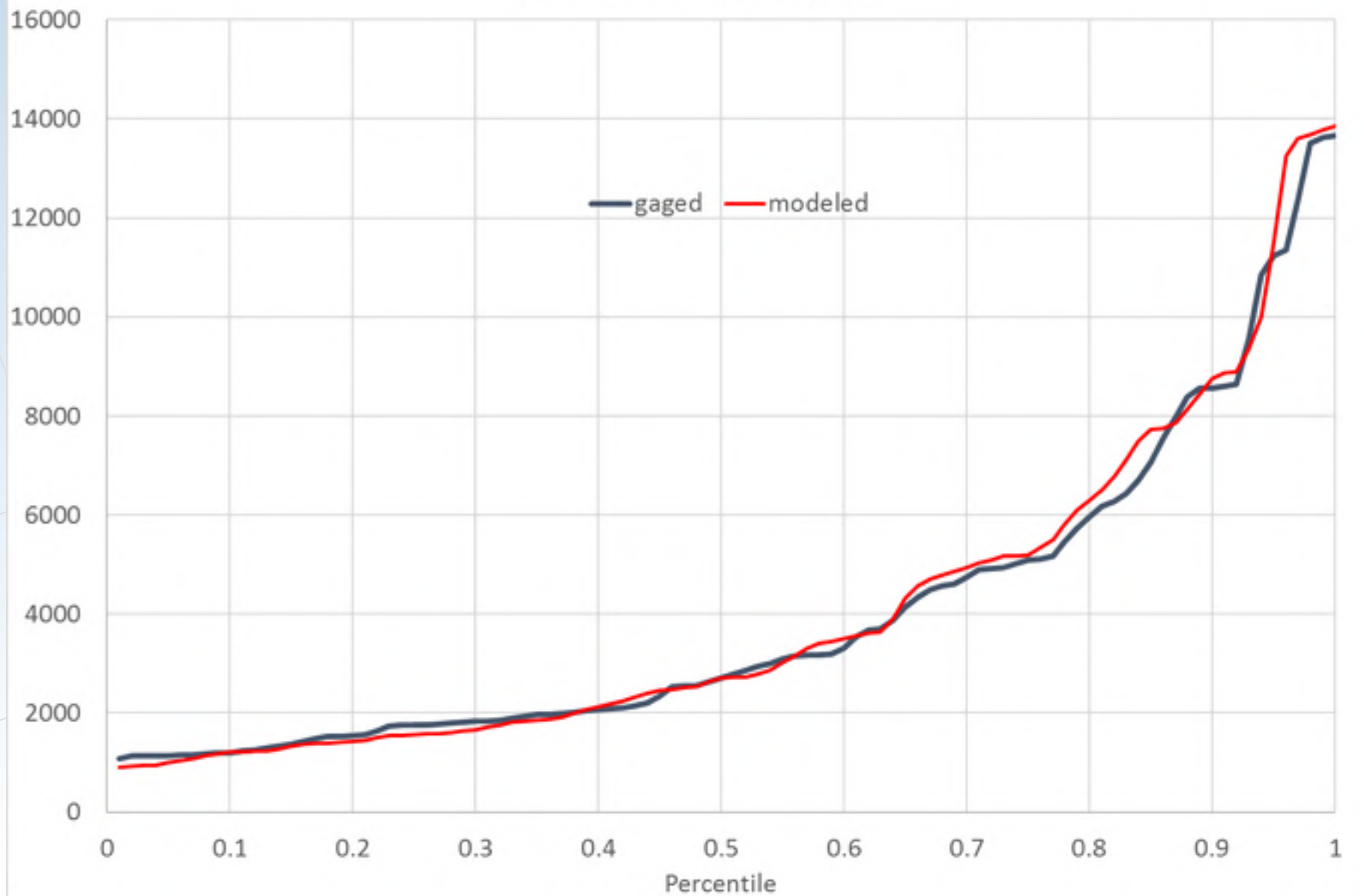
Monthly Mean Flow Comparison

CAT18 (02148000) WATEREE RIVER NR. CAMDEN, SC
Monthly Mean Flow (CFS)



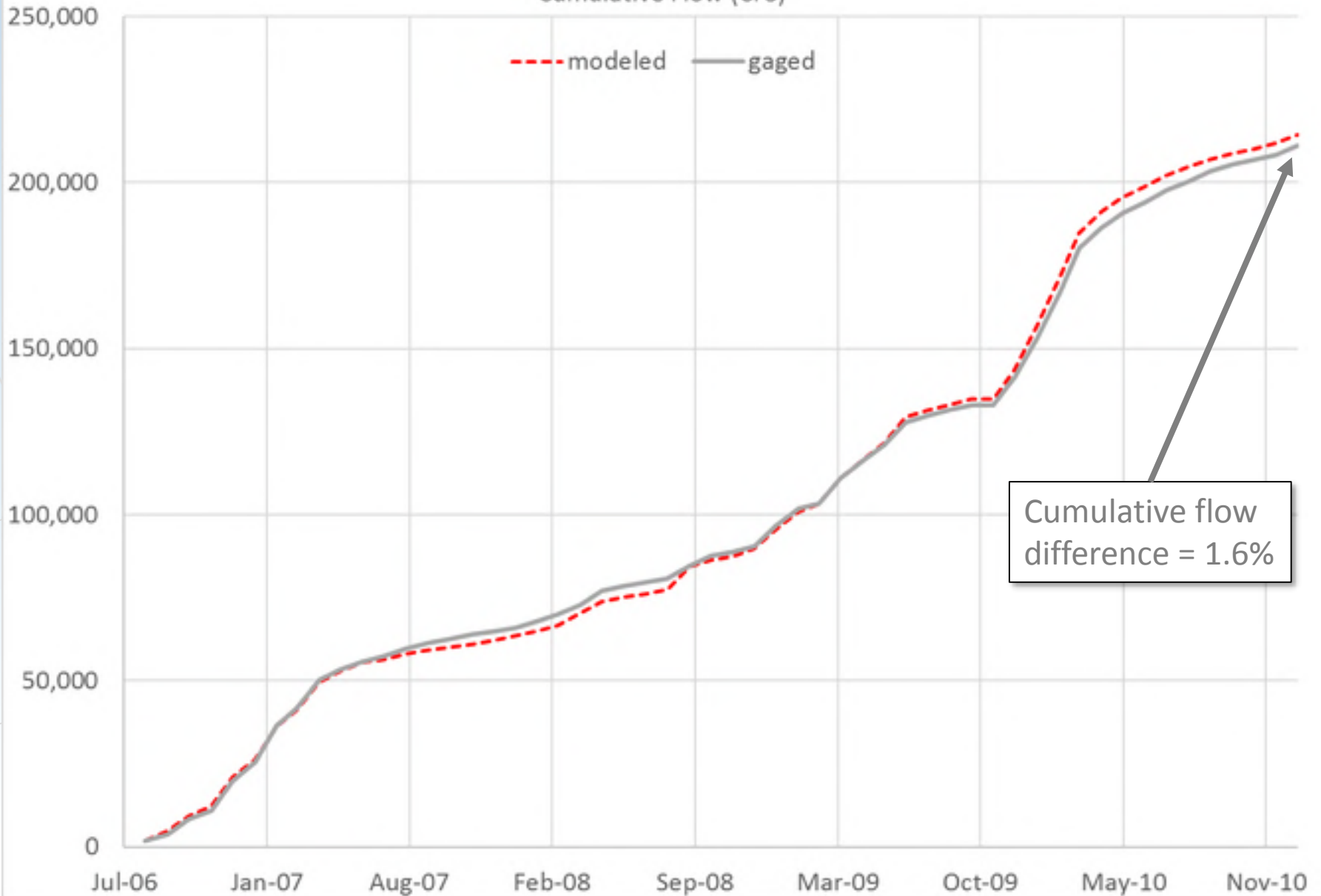
Monthly Flow Percentiles Comparison

CAT18 (02148000) WATEREE RIVER NR. CAMDEN, SC
Monthly Flow Percentiles (CFS)



Cumulative Flow Comparison

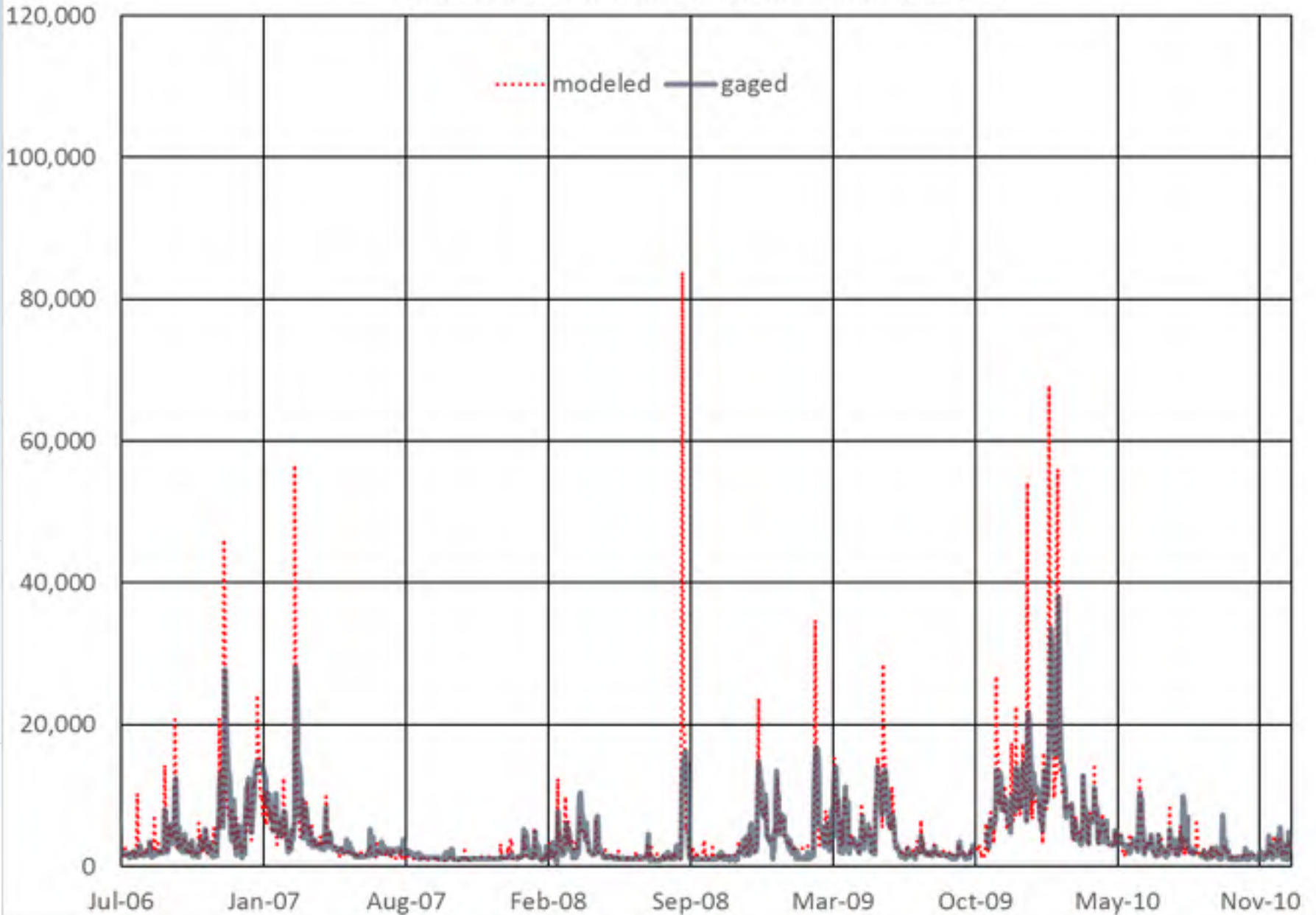
CAT18 (02148000) WATEREE RIVER NR. CAMDEN, SC
Cumulative Flow (CFS)



Cumulative flow difference = 1.6%

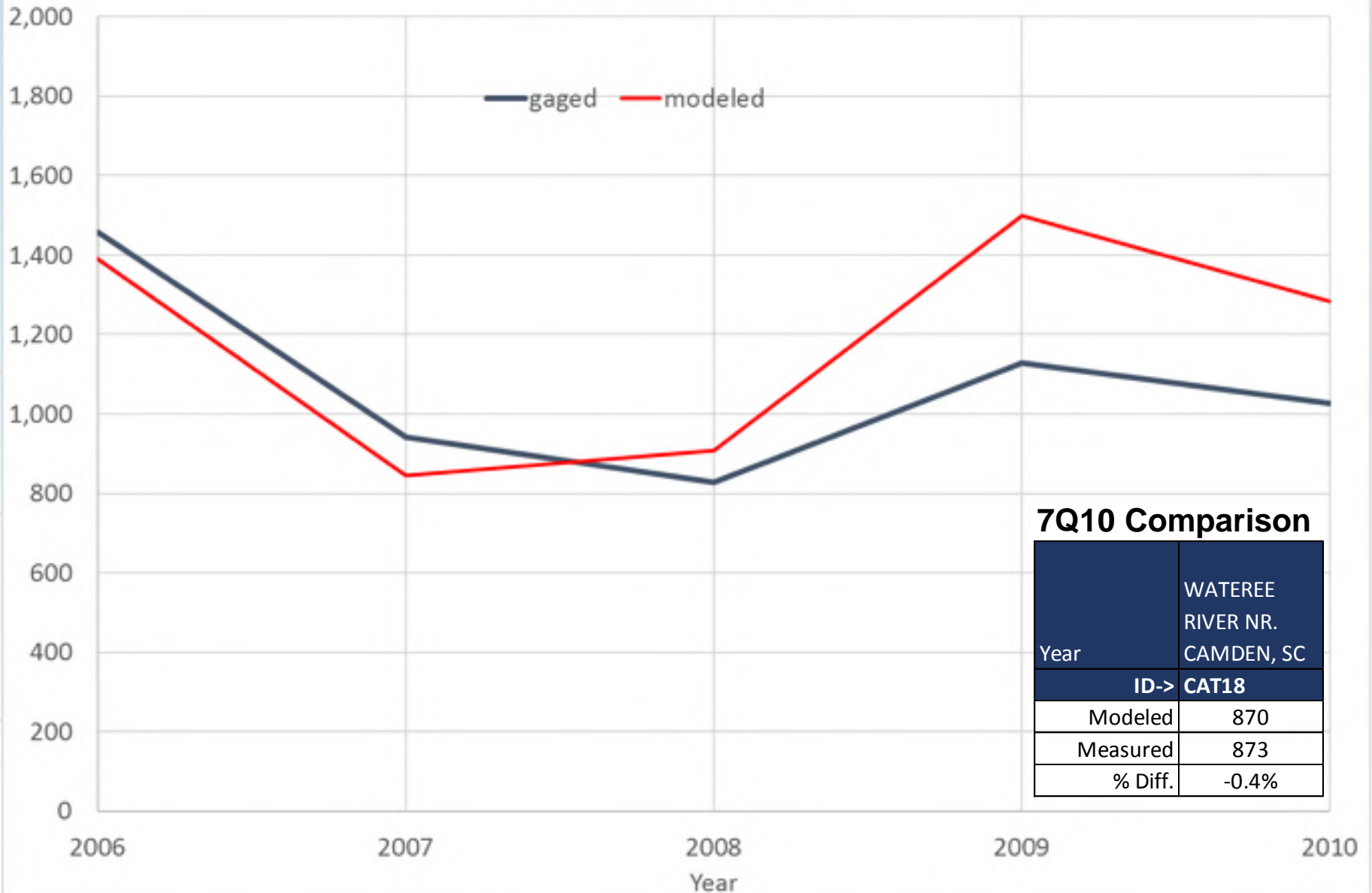
Daily Flow Comparison

CAT18 (02148000) WATEREE RIVER NR. CAMDEN, SC (CFS)



Annual 7-Day Low Flows

CAT18 (02148000) WATEREE RIVER NR. CAMDEN, SC
Annual 7-day Low Flow (CFS)



7Q10 Comparison

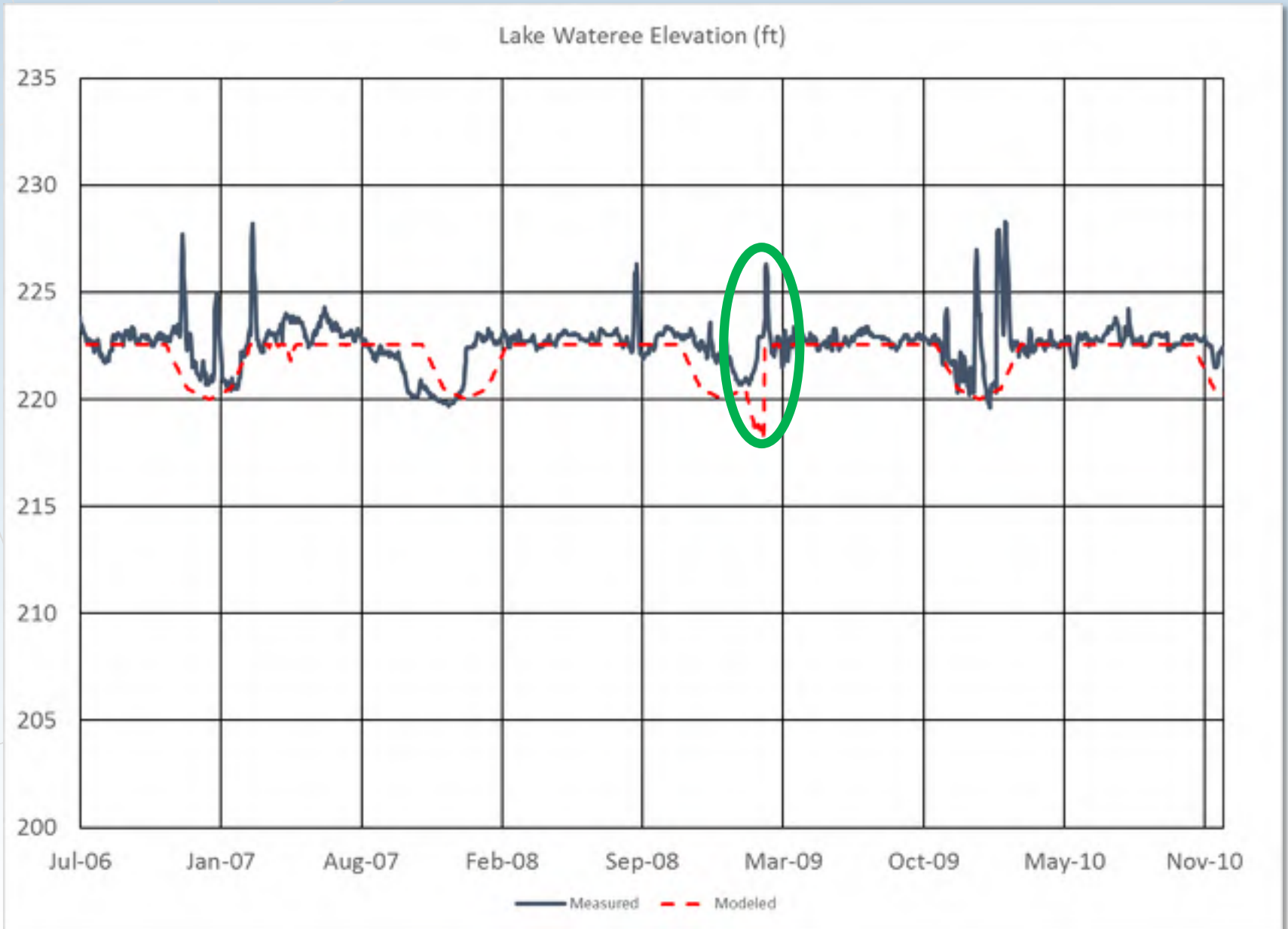
WATEREE RIVER NR. CAMDEN, SC	
Year	CAT18
Modeled	870
Measured	873
% Diff.	-0.4%

SWAM Calibration/Validation Summary

- For most sites, modeled mean flow values, averaged over the full period of record, are within 2% of measured mean flows

Project ID	Station	Modeled Average	Measured Average	% Diff Average	Years of Record	
CAT07	SUGAR CREEK NEAR FORT MILL, SC	359	384	-6.5%	5	} >5% difference
CAT16	FISHING CREEK BELOW FORT LAWN, SC	240	248	-3.1%	3	
CAT10*	CATAWBA RIVER BELOW CATAWBA, SC	3,259	3,353	-2.8%	19	} 5% or less diff.
CAT17	ROCKY CREEK AT GREAT FALLS, SC	147	149	-1.5%	25	
CAT15	WILDCAT CREEK BELOW ROCK HILL, SC	19	19	-1.1%	9	} 2% or less difference
CAT04*	CATAWBA RIVER NEAR ROCK HILL, SC	2,726	2,749	-0.9%	28	
CAT21*	WATEREE R. BL EASTOVER, SC	2,816	2,829	-0.5%	28	
CAT06	MCALPINE CREEK AT SR2964 NR CAMP COX, SC	111	112	-0.4%	6	
CAT19	GILLIES CREEK NEAR LUGOFF, SC	13	13	1.3%	4	
CAT18*	WATEREE RIVER NR. CAMDEN, SC	4,010	3,956	1.4%	28	} 5% or less diff.
CAT08	SUGAR CR. NR FT. MILL, S.C.	241	230	4.9%	2	

SWAM Calibration/Validation Summary



SWAM Calibration/Validation Summary

- Monthly mean flows percentile deviations are all generally within 5%-10% with no clear seasonal bias
- Modeled low flow values (as represented by 7Q10 flows) are within:
 - 0.4% and 7.2% on the Catawba-Wateree River
 - Rocky Creek (1.1 cfs modeled, 0.03 cfs observed)
- Modeled cumulative flows are within 0.1% and 2.1% of gaged flows for mainstem
- Modeled cumulative flows are within 0.5% and 6.3% of gaged flows for tributaries
- The model adequately hindcasts delivered water supply for each water user in the model (no significant shortfalls)

Catawba-Wataree River Basin

BASELINE MODEL AND USES

Baseline Model

- Will represent current demands and operations combined with an extended period of estimated hydrology
 - Most demands reflect 2004-2013 averages
 - Estimated hydrology from 1951 to 2010
 - Inactive users are not included
- The baseline model serves as the starting point for future predictive simulations
- Must be used in coordination with CHEOPS model to obtain flows from NC portion of the system (outflow from Lake Wylie)

Example Use

Adding a New User

- Add a new M&I permittee on Fishing Creek
 - Demand = 15 mgd
 - Consumptive Use = 50%
(return to Fishing Creek)
- *Is there enough water to support the new user?*



Add an Industrial Water User Object from the Palette



Simplified Water Allocation Model (SWAM)

Simulation Period

Start Date (MM/DD/YYYY): 01/01/1983 End Date (MM/DD/YYYY): 12/31/2010

Simulation Type

Monthly Planning Prior Appropriations
 Daily Planning Riparian Water Rights
 Firm Yield Calculator

Input Summaries and Outputting

Make Plotting Make Locations Economic Accounts Output Types

Input & Output Units

AF, AFM, AFD MG, MOD, CFS m3, m3/d, m3/d



Add the New User in the Water User Dialogue

The image displays the 'Simplified Water Allocation Model (SWAM)' software interface. The main window is titled 'Simplified Water Allocation Model (SWAM)' and features a 'Simulation Period' section with 'Start Date' and 'End Date' fields, and a 'Simulation Type' section with 'Monthly Planning' and 'Prior Appropriations' options. To the right, there is an 'Input Summaries and Outputting' panel with buttons for 'Make Priorities', 'Make Locations', 'Review Accounts', and 'Print Lists', along with an 'Output Units' section.

The 'Water User' dialog box is open, showing a 'Main' tab. The 'Water User Name:' field is highlighted with a red circle and contains the text 'New User'. A 'Delete Node' button is located to the right of this field. Below the name field, there is a checkbox for 'Multiple Sources of Water?'. The dialog also includes a 'Supplemental Supply/Demand Alternatives' section with checkboxes for 'Conservation', 'Recapture Reuse', 'Ag Transfer', 'Transbasin Import', and 'Water Exchange'. A 'Comments' text area is located below this section. At the bottom right of the dialog, there are 'Save' and 'Close' buttons.

The background shows a map with various water features, including 'Rec Flow Days', 'Fishing Creek', and 'Import from Broad'. An 'Object Palette' is visible on the left side of the screen.

Specify Water Use

Simplified Water Allocation Model (SWAM)

Simulation Period: Start Date (MM/DD/YYYY) 01/01/1983, End Date (MM/DD/YYYY)

Simulation Type: Monthly Planning, Prior Appropriations

Water User

Main | Water Usage | Source Water | Return Flows

Monthly User Distribution: Manual, M&I, Agriculture

Annual Baseline Usage: Total Use (MGY) [] Distribute

Input Format: monthly means, timeseries

Monthly Water Usage

Month	Monthly Usage (MGD)	% Indoor Use	% CU Indoor	% CU Outdoor
Jan	15	100	50	0
Feb	15	100	50	0
Mar	15	100	50	0
Apr	15	100	50	0
May	15	100	50	0
Jun	15	100	50	0
Jul	15	100	50	0
Aug	15	100	50	0
Sep	15	100	50	0
Oct	15	100	50	0
Nov	15	100	50	0
Dec	15	100	50	0

Save Close

Specify Source and Withdrawal Location

The image shows the 'Simplified Water Allocation Model (SWAM)' software interface. The main window is titled 'Simplified Water Allocation Model (SWAM)' and contains a 'Water User' dialog box. The dialog box has several tabs: 'Main', 'Water Usage', 'Source Water', and 'Return Flows'. The 'Source Water' tab is active, and the 'Source Stream' dropdown menu is set to 'Fishing Creek'. The 'Diversion Location (mi)' is set to '20'. The 'Priority Date' is set to '1/21/1900'. The 'Source Water Type' is set to 'Direct River'. The 'Diversion Capacity' is set to '10000 (CFS)' and the 'Permit Limit' is set to '10000 (MGM)'. The 'Seasonal Permit' and 'Minimum Flow' options are unchecked. The 'Save' and 'Close' buttons are visible. The background shows the 'Input Summaries and Outputting' window with buttons for 'Make Priorities', 'Make Locations', 'Review Accounts', and 'Print Sums'. The 'Object Palette' is visible on the left side of the screen.

Simulation Period
Start Date: 01/01/ End Date: Simulation Type: 12 Monthly Planning Prior Assumptions

Water User
Main | Water Usage | Source Water | Return Flows

Source Stream: Fishing Creek

Source Water Type
 Direct River
 Reservoir
 Groundwater

Diversion Location (mi): 20

Priority Date: 1/21/1900

Diversion Capacity: 10000 (CFS)
Permit Limit: 10000 (MGM)
 Seasonal Permit
 Minimum Flow

Save
Close

Identifying Notes:

Specify Return Location

Water User

Main | Water Usage | Source Water | Return Flows

Return Flow Locations

- single point
- multiple

Receiving Stream: Fishing Creek

RF Location (mi): 21

RF Lag (months): 0

Save Close

Input Summaries and Outputting

Model Properties Model Locations Resource Networks Output Specs

Input & Output Units

F, AFM, AFD MG, MOD, CFS mg, m3/d, m3/s

Run Model Scenario



Simplified Water Allocation Model (SWAM)

Simulation Period

Start Date (MM/DD/YYYY)	End Date (MM/DD/YYYY)
01/01/1983	12/31/2010

Simulation Type

<input checked="" type="checkbox"/> Monthly Planning	<input type="checkbox"/> Prior Appropriations
<input type="checkbox"/> Daily Planning	<input checked="" type="checkbox"/> Riparian Water Rights
<input type="checkbox"/> Firm Yield Calculator	

Input Summaries and Outputting

Buttons: Make Plotting, Make Locations, Economic Accounts, Output Types

Input & Output Units

<input type="checkbox"/> AF, AFM, AFD	<input checked="" type="checkbox"/> MG, MOD, CFS	<input type="checkbox"/> m3, m3/d, m3/d
---------------------------------------	--------------------------------------------------	-----------------------------------------

Rec Flow Days Gage CWLIP Stages

Rec Flow Days Gage CWLIP Gage

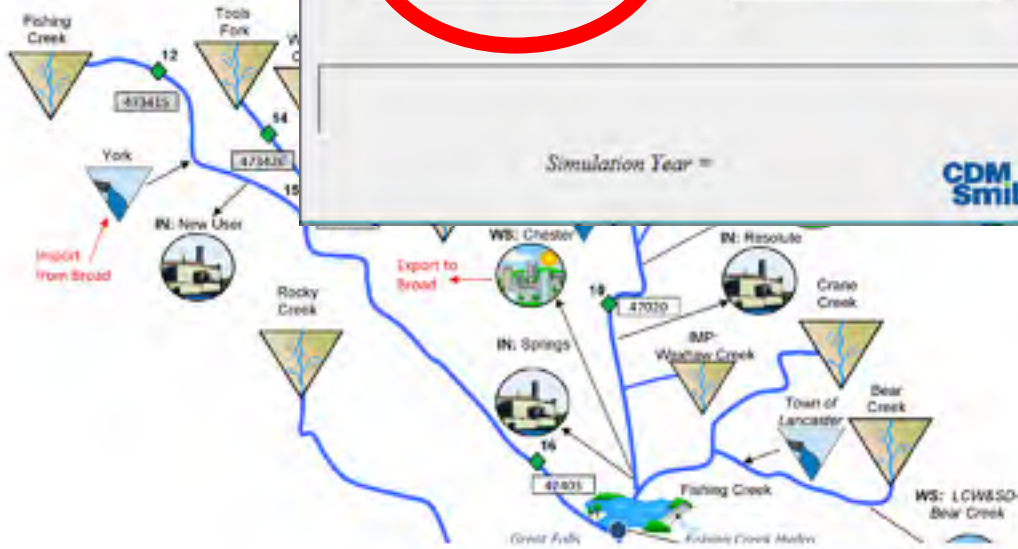
SWAM

Simplified Water Allocation Model (SWAM)

(Click on button:)

Run **Cancel**

Simulation Year =



Build a Shortage Plot for the New User



Simplified Water Allocation Model (SWAM)

Simulation Period

Start Date (MM/DD/YYYY)	End Date (MM/DD/YYYY)
01/01/1983	12/31/2010

Simulation Type

<input checked="" type="checkbox"/> Monthly Planning	<input type="checkbox"/> Prior Appropriations
<input type="checkbox"/> Daily Planning	<input checked="" type="checkbox"/> Riparian Water Rights
<input type="checkbox"/> Firm Yield Calculator	

Input Summaries and Outputs

Make Plotting Make Locations Economic Accounts Change Species

Input & Output Units

<input type="checkbox"/> AF, AFM, AFD	<input checked="" type="checkbox"/> MG, MOD, CFS	<input type="checkbox"/> m3, m3/d, m3/d
---------------------------------------	--------------------------------------------------	-----------------------------------------



Build a Shortage Plot for the New User

The screenshot displays the **Simplified Water Allocation Model (SWAM)** software interface. The main window is titled "Simplified Water Allocation Model (SWAM)" and contains the following sections:

- Simulation Period:** Start Date (MM/DD/YYYY) 01/01/1983, End Date (MM/DD/YYYY) 12/31/2010.
- Simulation Type:** Monthly Planning, Prior Appropriations, Daily Planning, Riparian Water Rights, Firm Yield Calculator.

To the right, the **Input Summaries and Output** panel includes buttons for "Node Properties", "Node Locations", "Reservoir Accounts", "Flow Sums", and a bar chart icon circled in red. Below these are "Input & Output Units" options: AF, AFM, AFD, MG, MGD, CFS, m3, m3/d, m3/s.

The **Output Plotting** dialog box is open, showing:

- Node:** IN: New User
- Output Parameter:** Shortage (MGD)
- Plot Type:** Time Series, Exceedance
- Buttons: Clear Exceedance Links, Create Dynamic Plot, Close

The background shows a network diagram with nodes like Fishing Creek, Tools Fork, Wildcat Creek, York, Rocky Creek, Fishing Creek, Crane Creek, Town of Lancaster, Bear Creek, and Fishing Creek. Nodes are marked with numbers (12, 14, 11, 15, 13, 16, 14, 15) and some have "Import from Broad" or "Export to Broad" labels. A legend at the top left shows "Rec Flow Days" and "CW LIP Stages" gauges.

Build a Shortage Plot for the New User



Simplified Water Allocation Model (SWAM)

Simulation Period

Start Date (MM/DD/YYYY): 01/01/1983

End Date (MM/DD/YYYY): 12/31/2010

Simulation Type

Monthly Planning

Prior Appropriations

Daily Planning

Riparian Water Rights

Firm Yield Calculator

Input Summaries and Outputting

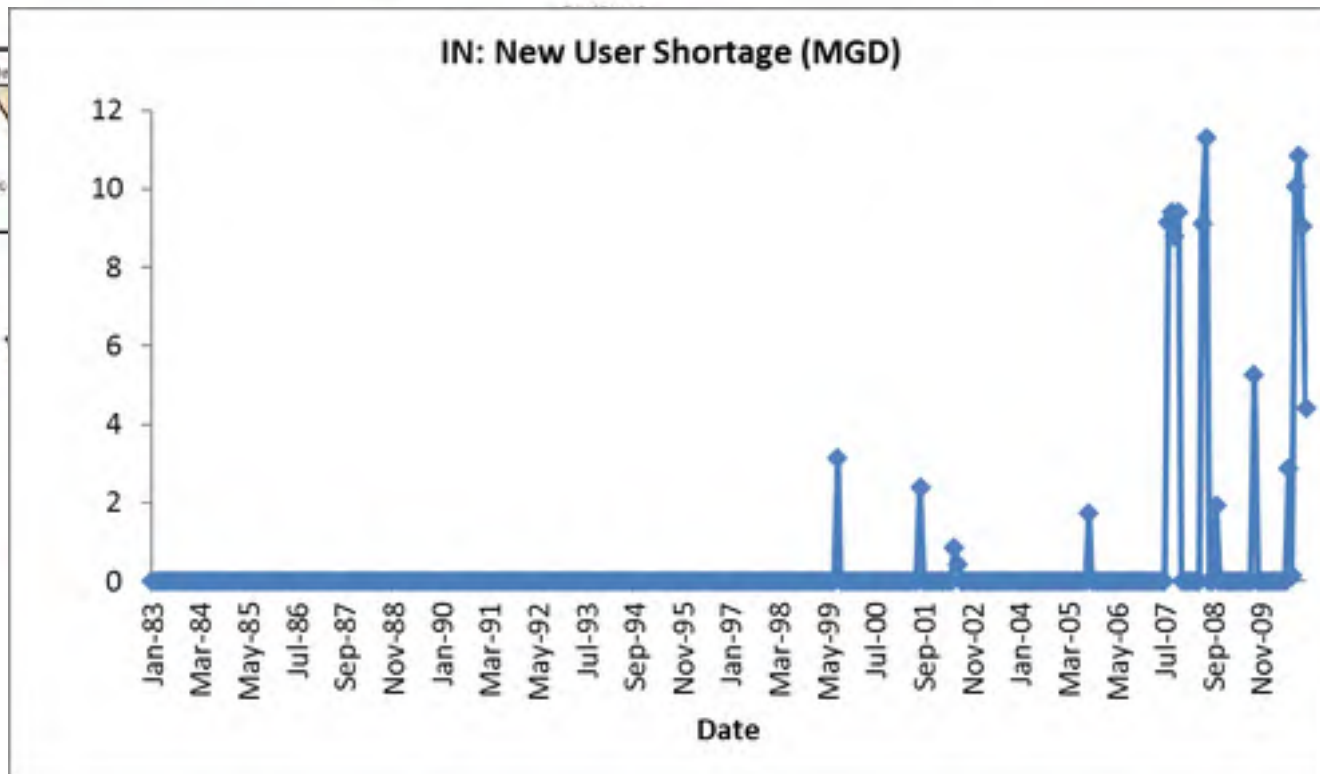
Study Periods: Study (Monthly), Study (Quarterly), Research Networks, Output Type

Input & Output Units

AF, AFM, AFD

MG, MGD, CFS

m3, m3/d, m3/s



Shortages are Also Listed in the Node Output Table

Output		<u>Priority Rank</u>	<u>Reach</u>	<u>Location</u>	<u>Permit Limit (MGM)</u>	<u>Diversion Capacity (CFS)</u>	<u>Storage Capacity (MG)</u>	<u>Reservoir Withdrawal Permit (MGM)</u>
	<i>IN: New User</i>	22	<i>ishing Cree</i>	20	10000	10000	0	
	Physically Avail. (MGD)	Legally Avail. (MGD)	Demand (MGD)	River Withdrawal (MGD)	Storage (MG)	Groundwater Withdrawal (MGD)	Shortage (MGD)	Return Flow (MGD)
Min	4	4	15	4	0	0	0	2
Max	744	357	15	15	0	0	11	8
Avg	89	87	15	15	0	0	0	7
9/30/06	58	58	15	15	0	0	0	8
10/31/06	26	26	15	15	0	0	0	8
11/30/06	226	226	15	15	0	0	0	8
12/31/06	75	75	15	15	0	0	0	8
1/31/07	104	104	15	15	0	0	0	8
2/28/07	68	68	15	15	0	0	0	8
3/31/07	140	140	15	15	0	0	0	8
4/30/07	71	71	15	15	0	0	0	8
5/31/07	20	20	15	15	0	0	0	8
6/30/07	27	27	15	15	0	0	0	8
7/31/07	20	20	15	15	0	0	0	8
8/31/07	6	6	15	6	0	0	9	3
9/30/07	6	6	15	6	0	0	9	3
10/31/07	6	6	15	6	0	0	9	3
11/30/07	6	6	15	6	0	0	9	3
12/31/07	32	32	15	15	0	0	0	8
1/31/08	28	28	15	15	0	0	0	8
2/28/08	55	55	15	15	0	0	0	8
3/31/08	112	112	15	15	0	0	0	8

Reduce the New User's Total Water User to 5 mgd

Simplified Water Allocation Model (SWAM)

Simulation Period: Start Date (MM/DD/YYYY) 01/01/1983, End Date (MM/DD/YYYY)

Simulation Type: Monthly Planning, Prior Appropriations, Riparian Water Rights, Daily Planning

Water User

Main | Water Usage | Source Water | Return Flows

Monthly User Distribution: Manual, M&I, Agriculture

Annual Baseline Usage: Total Use (MGY) [] Distribute []

Input Format: monthly means, timeseries

Monthly Baseline Usage

Month	Monthly Usage	% Indoor Use	% CU Indoor	% CU Outdoor
Jan	5	100	50	0
Feb	5	100	50	0
Mar	5	100	50	0
Apr	5	100	50	0
May	5	100	50	0
Jun	5	100	50	0
Jul	5	100	50	0
Aug	5	100	50	0
Sep	5	100	50	0
Oct	5	100	50	0
Nov	5	100	50	0
Dec	5	100	50	0
	(MGD)			

Save Close

Rerun Model Scenario



Simplified Water Allocation Model (SWAM)

Simulation Period

Start Date (MM/DD/YYYY)	End Date (MM/DD/YYYY)
01/01/1983	12/31/2010

Simulation Type

<input checked="" type="checkbox"/> Monthly Planning	<input type="checkbox"/> Prior Appropriations
<input type="checkbox"/> Daily Planning	<input checked="" type="checkbox"/> Riparian Water Rights
<input type="checkbox"/> Firm Yield Calculator	

Input Summaries and Outputting

Buttons: Make Priorities, Make Locations, Economic Accounts, Output Sums

Input & Output Units

<input type="checkbox"/> AF, AFM, AFD	<input checked="" type="checkbox"/> MG, MOD, CFS	<input type="checkbox"/> m3, m3/d, m3/d
---------------------------------------	--------------------------------------------------	-----------------------------------------

Rec Flow Days

Rec Flow Days Gage

CWLP Stages

CWLP Stages Gage

SWAM

Simplified Water Allocation Model (SWAM)

(Click on button:)

Run **Cancel**

Simulation Year =



Dynamic Shortage Plots Update Automatically



Simplified Water Allocation Model (SWAM)

Simulation Period

Start Date (MM/DD/YYYY)	End Date (MM/DD/YYYY)
01/01/1983	12/31/2010

Simulation Type

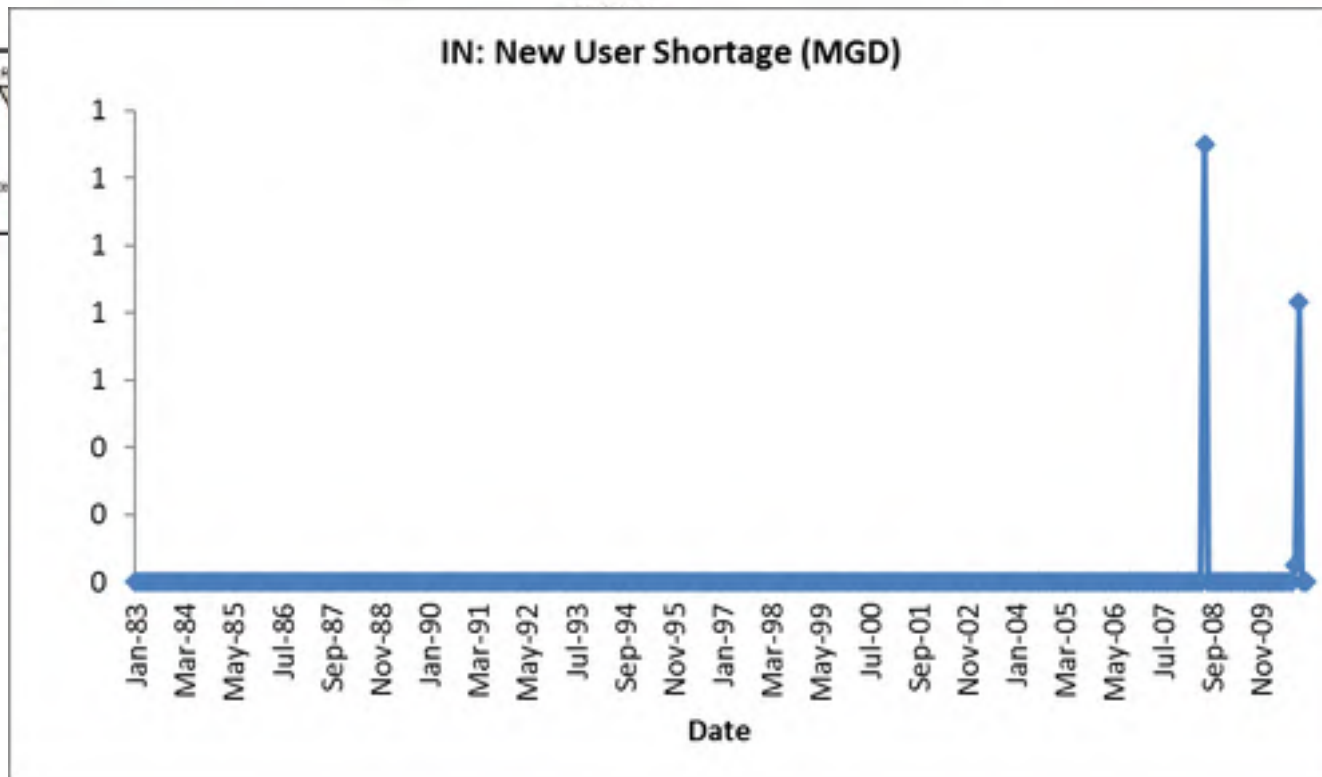
<input checked="" type="checkbox"/> Monthly Planning	<input type="checkbox"/> Prior Appropriations
<input type="checkbox"/> Daily Planning	<input checked="" type="checkbox"/> Riparian Water Rights
<input type="checkbox"/> Firm Yield Calculator	

Input Summaries and Outputting

Make Plots, Make Reports, Economic Accounts, Output Types

Input & Output Units

<input type="checkbox"/> AF, AFM, AFD	<input checked="" type="checkbox"/> MG, MGD, CFS	<input type="checkbox"/> m3, m3/d, m3/d
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Demonstrations and Q&A

- Stations 1 (Nina) and 2 (John)

Add a new user and incorporate conservation measures

Explore impact of LIP adjustments

Catawba-Wateree River Basin

THANK YOU