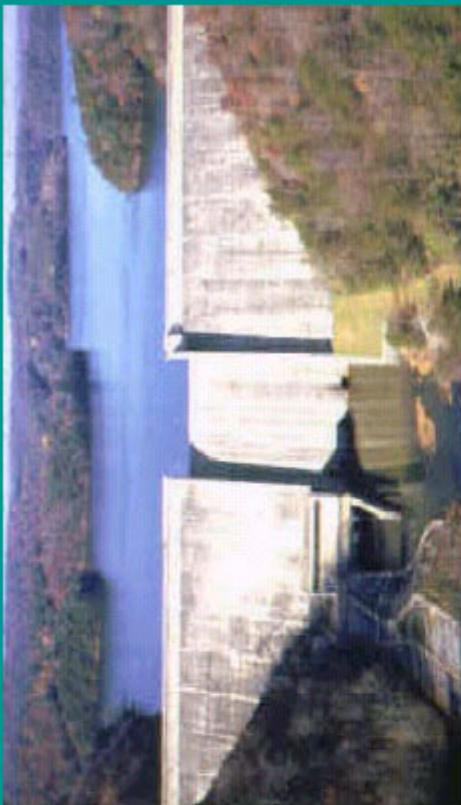


# Simulating Reservoirs in HSPE

## Chesapeake Bay Watershed Model, Phase 5.0

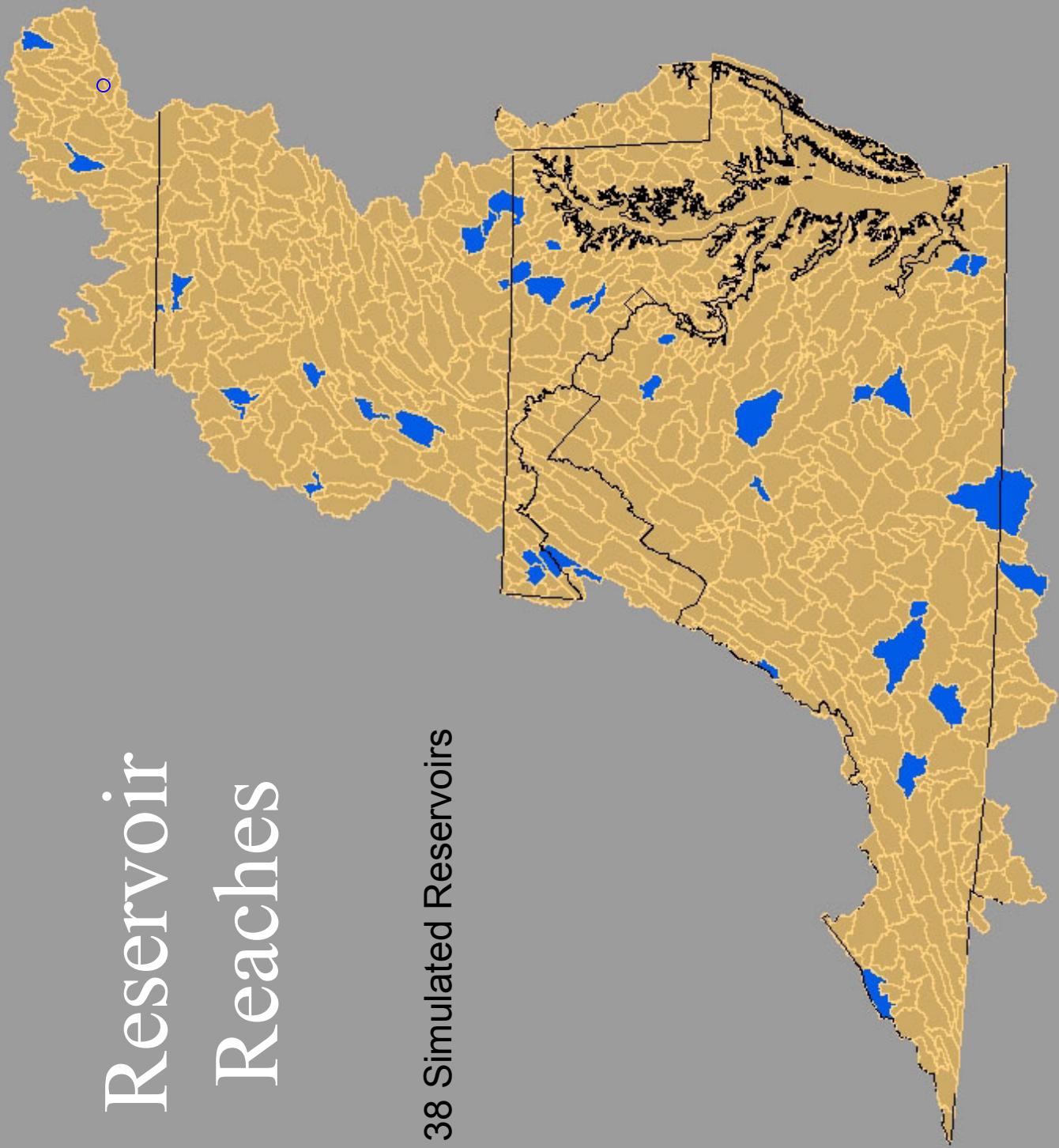


# Reservoir Simulation

- Work done by Alan Simpson USGS-VA
- Data collection
- Derivation of rules
- Calibration of rules to observations

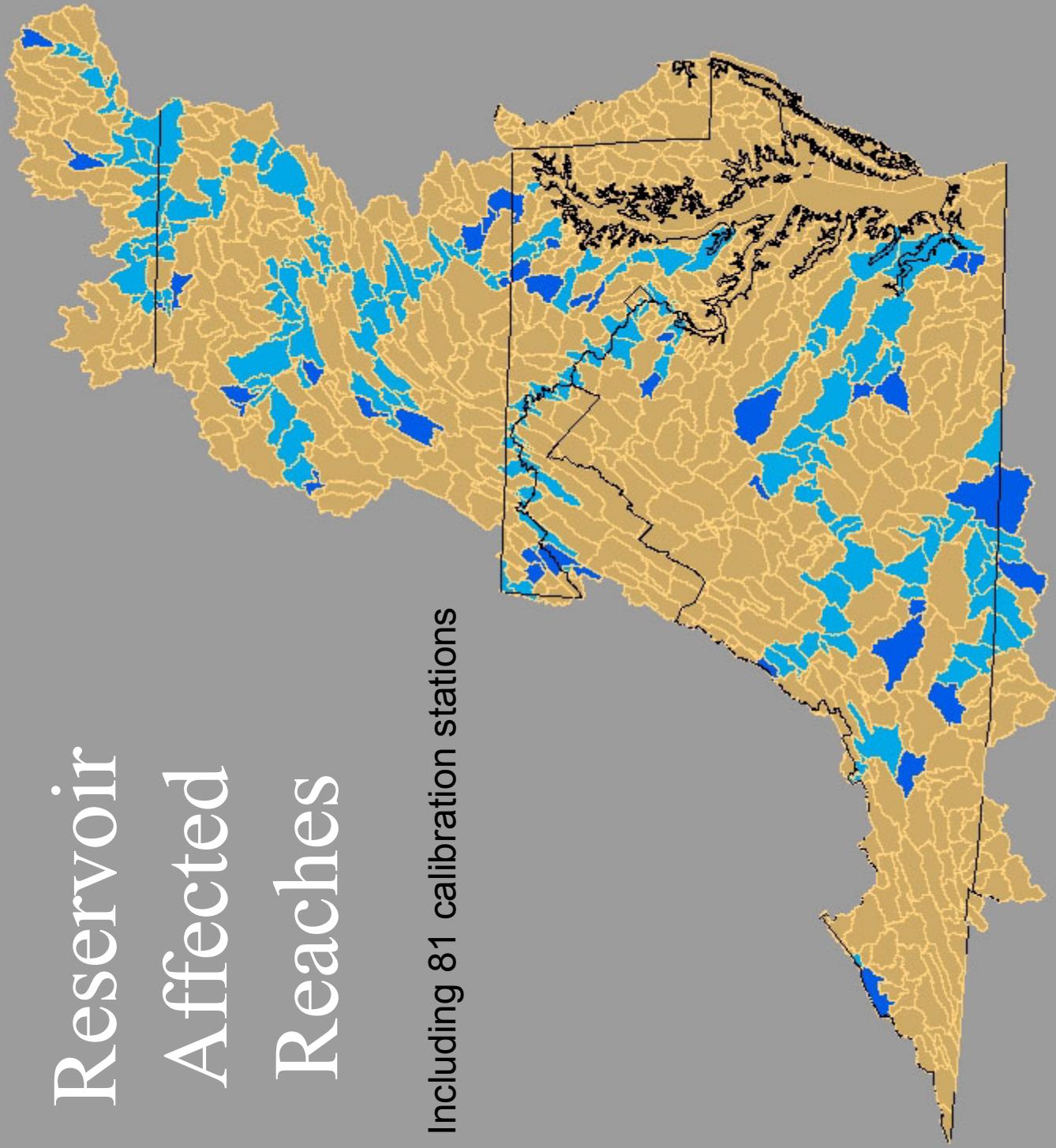
# Reservoir Reaches

38 Simulated Reservoirs



# Reservoir Affected Reaches

Including 81 calibration stations



# Requested Data

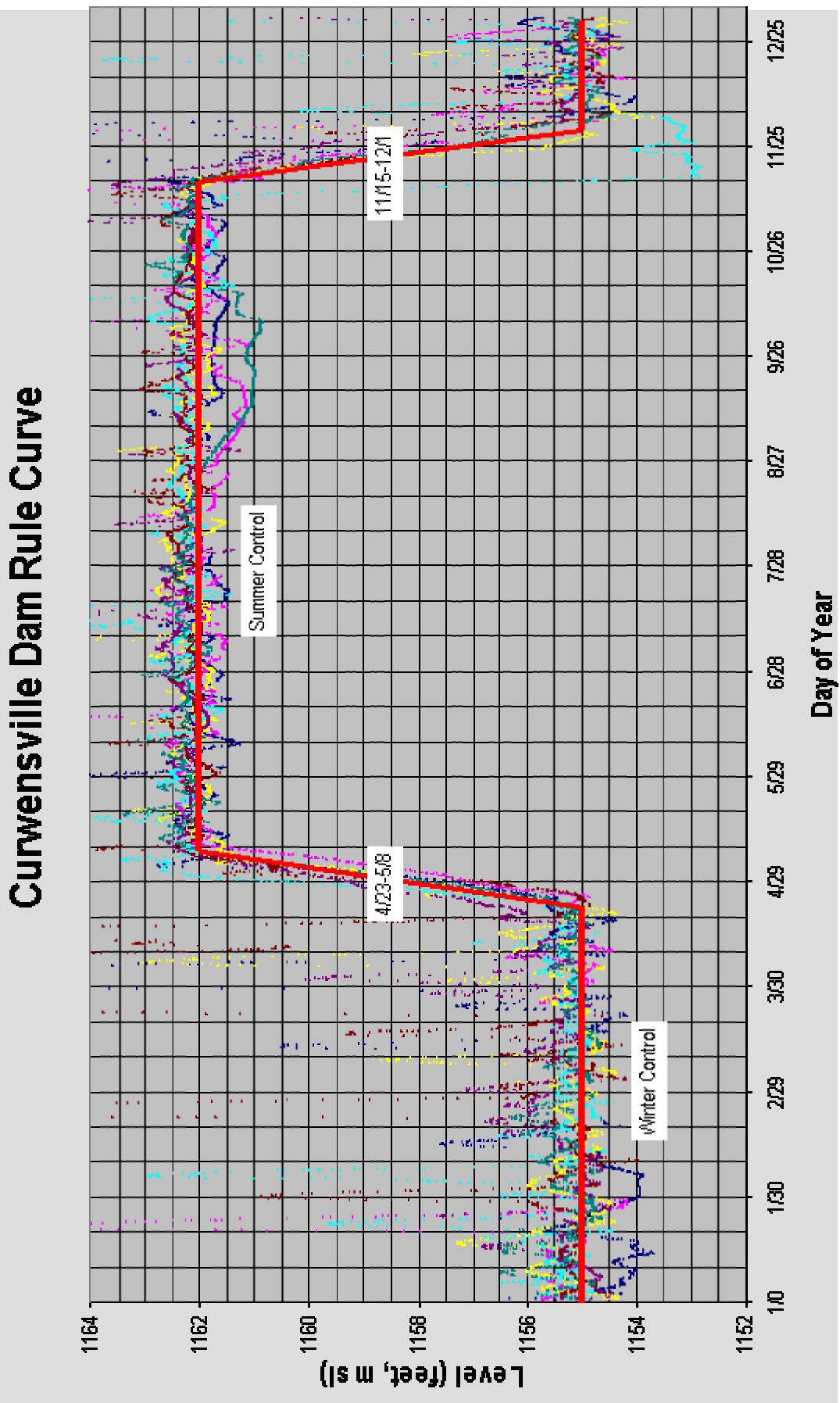
- Capacity vs. Level
- Surface Area vs. Level
- Historical Data
- Operational Dynamics
  - Stage – Discharge (LQ) Relationship
  - Need total, not individual discharges (locks, ladders, gates, spillways)
  - Minimum & Maximum Discharges
  - Special Circumstances

# Operational Classes

- **Uncontrolled, “Run of the River”**

Uncontrolled dams discharge based on weir curve (if available), but dead storage must be considered in volume and area figures.
- **Controlled**
  - Single Target Pool
  - Seasonal Pools
  - Complex River Rules

# Typical Seasonal Pool

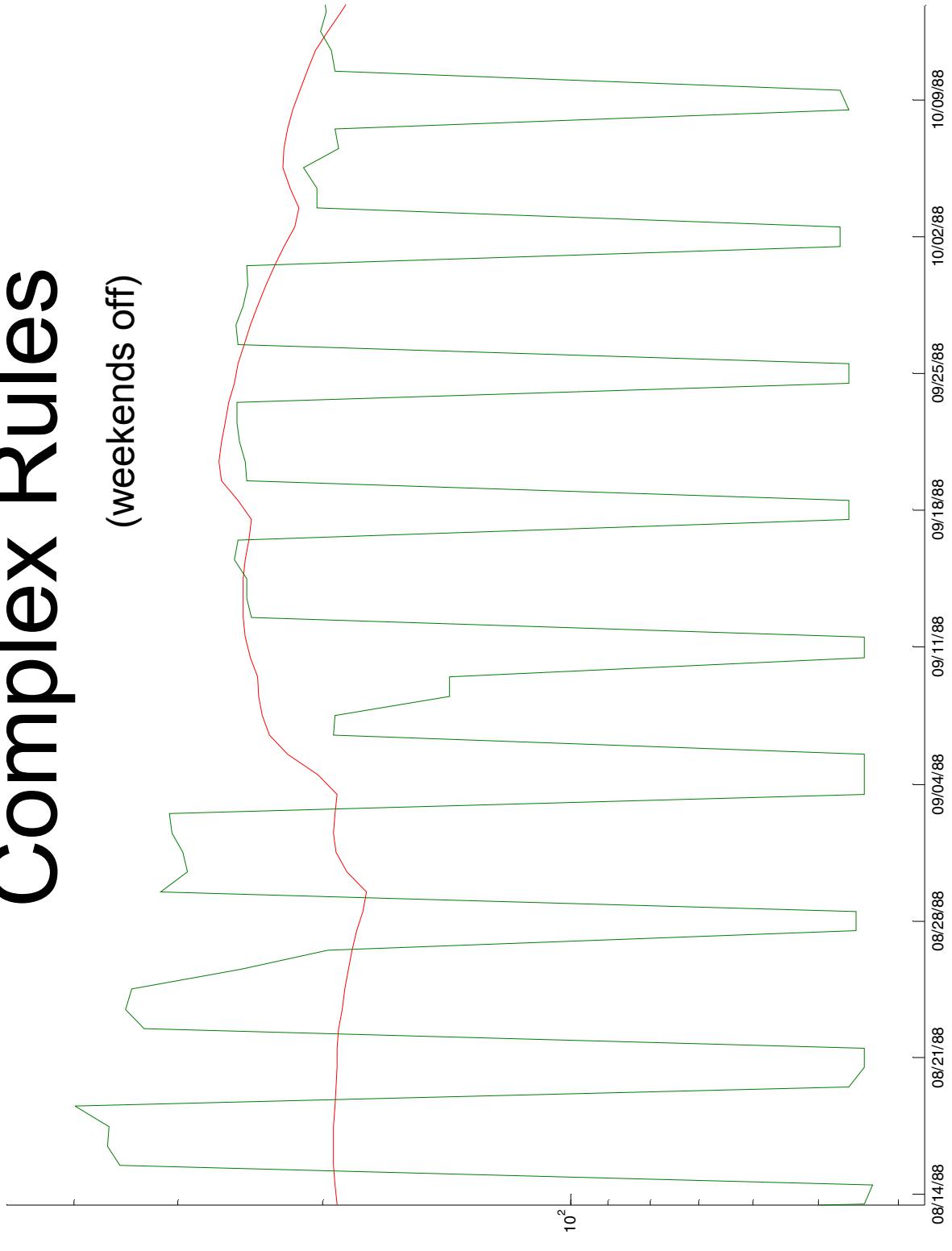


# Complex Seasonal Pool

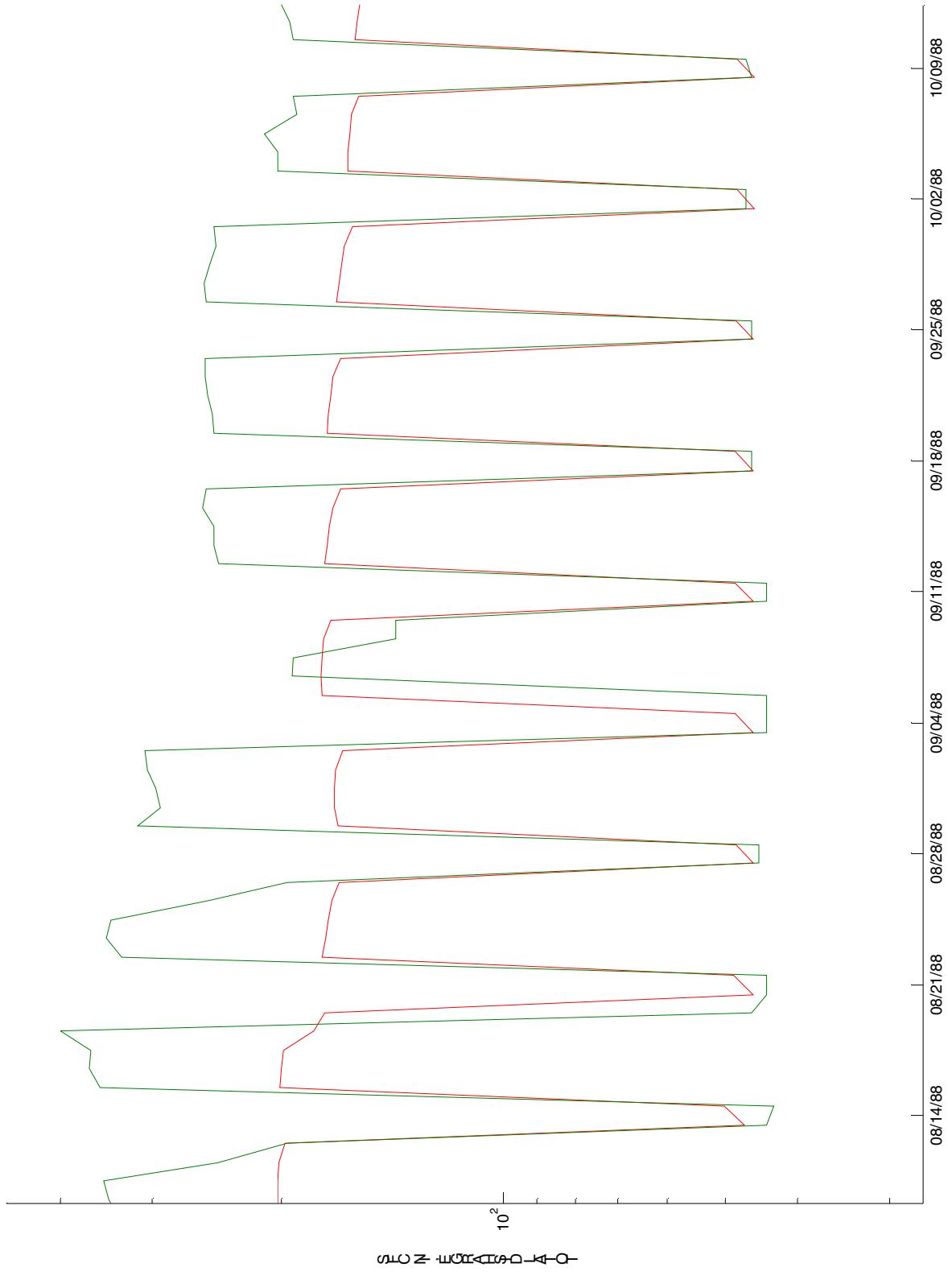


# Complex Rules

(weekends off)



FLOW TIME-SERIES >> scen: HYDRO >> seg: OD2-8560-8630 >> name: PHILPOTT DAM





FTABLE 1  
ROWS COLS 5  
20

## Winter

DEPTH (FT)	AREA (ACRES)	VOLUME (AC-FT)	DISCH1 (CFS)
0.	0	0	0
9.	1	4	0
10.	1	6	50
25.	28	102	50
40.	345	2075	50
43.	485	3250	50
44.	535	3703	1325
45.	581	4257	2600
47.	671	5498	2886
50.	761	7641	3314
51.	790	8416	3457
53.	862	10069	3743
59.	1048	15847	4600
62.	1121	19108	4740
70.	1331	28988	5113
80.	1560	43420	5580
89.	1776	58455	6000
100.	2090	79671	21871
120.	3079	131785	91202
141.	3928	207674	164000

END FTABLE1

## 2-Season

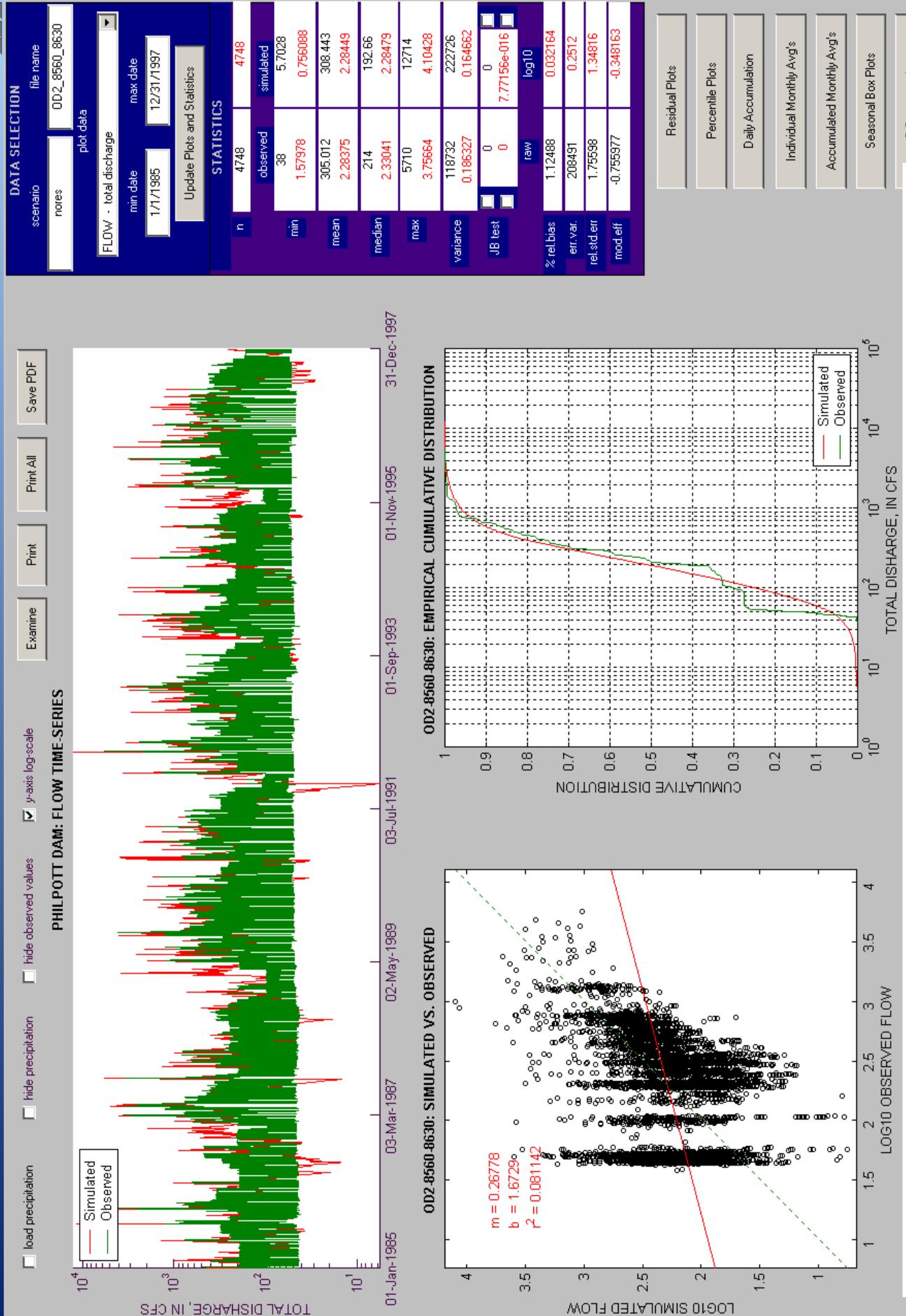
Curwensville  
Dam, PA  
USACE

Start with  
winter ftable

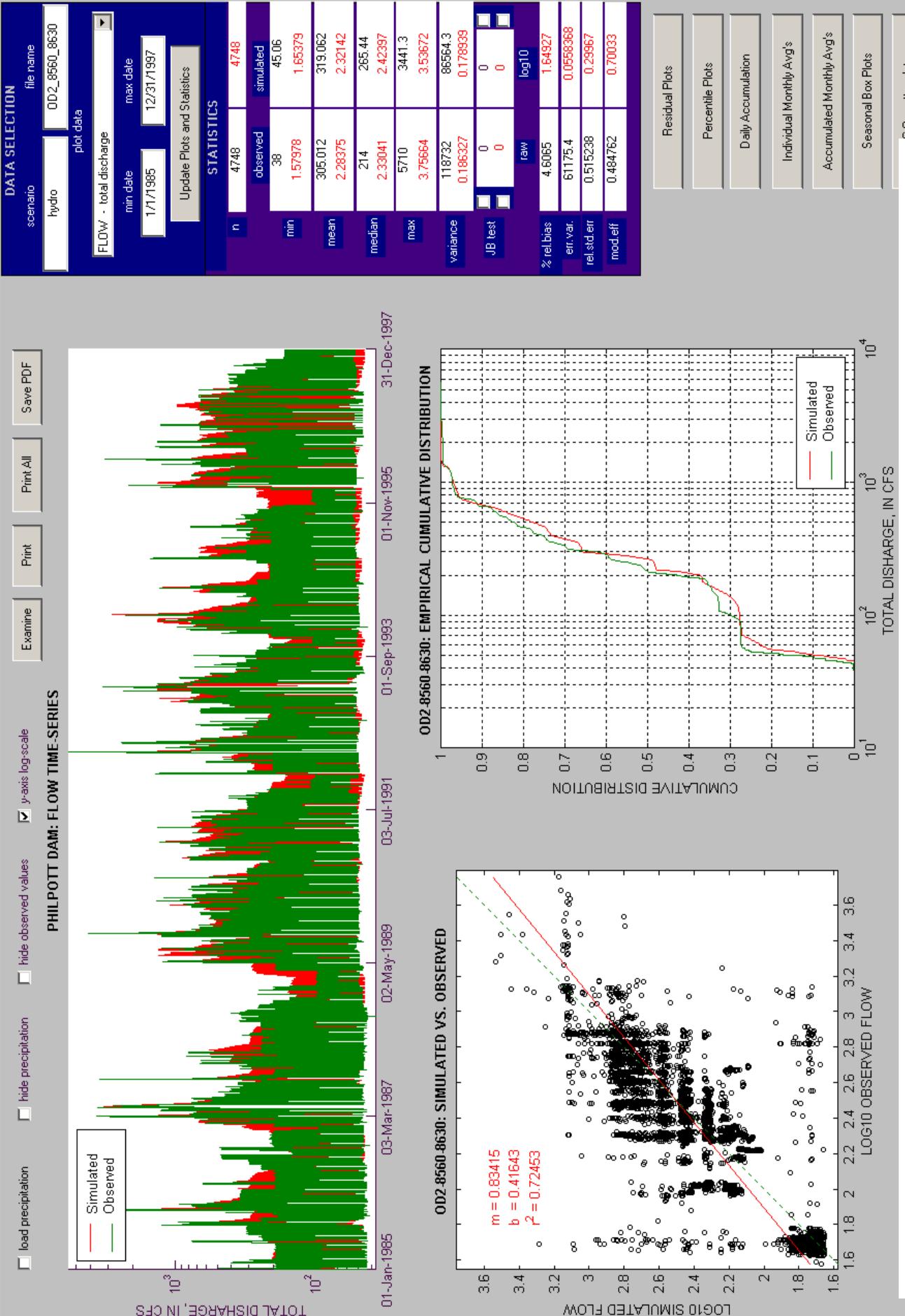
# Modify the ftable in special actions

```
SPEC-ACTIONS
***oper><f><-1>dc<ds<yr><m><d><h><n>dstp <vari><1><2><3><a><-value--> tc tstrnum
RCHRES 1 1984 4 24 1 3 RCHTAB 28 = 1245.312 YR 1 13
RCHRES 1 1984 4 25 1 3 RCHTAB 28 = 1165.625 YR 1 13
RCHRES 1 1984 4 26 1 3 RCHTAB 28 = 1085.938 YR 1 13
RCHRES 1 1984 4 27 1 3 RCHTAB 28 = 1006.250 YR 1 13
.
.
```

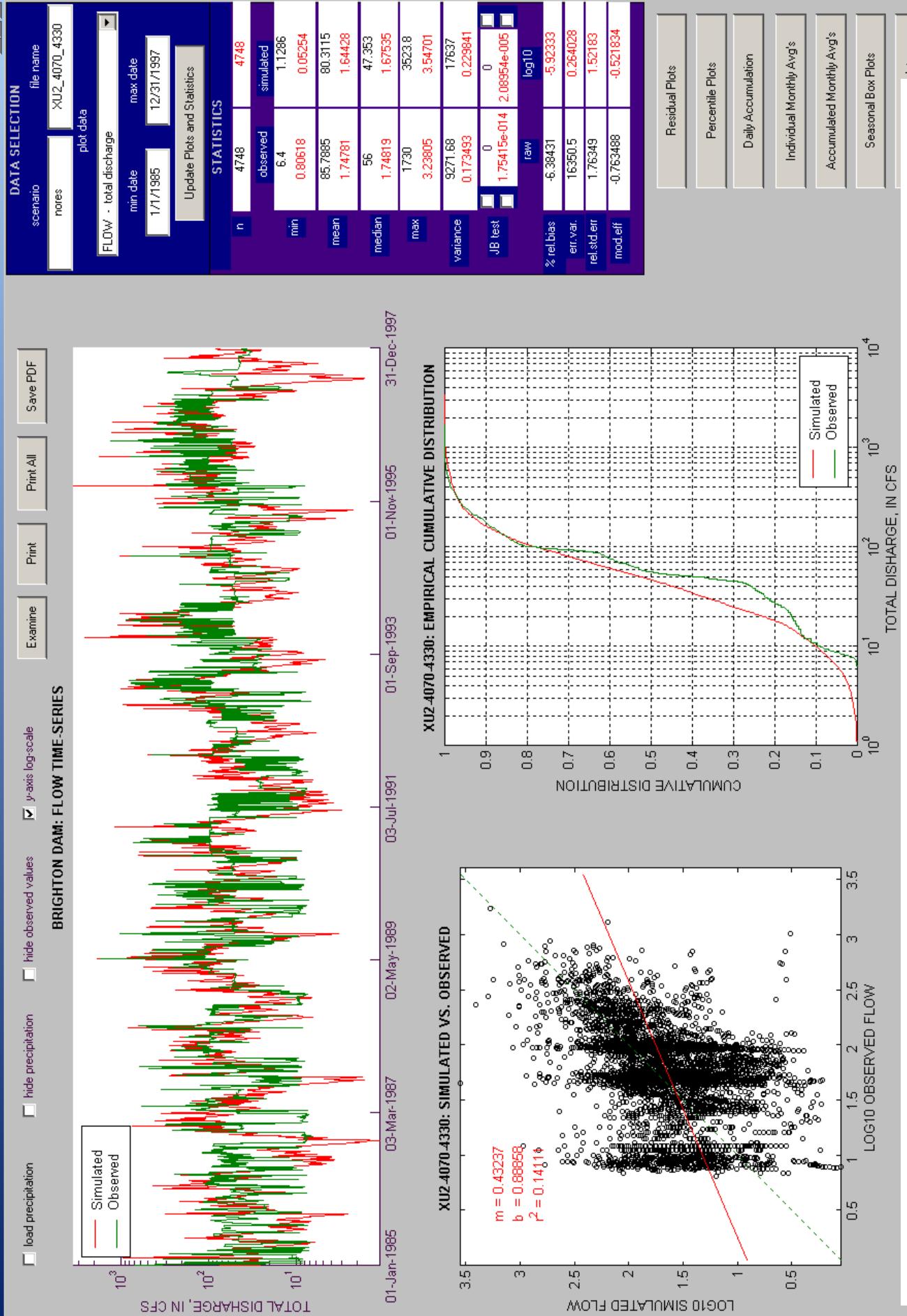
# Philpott Dam on the Roanoke River: Complex Rules – No Dam Simulation



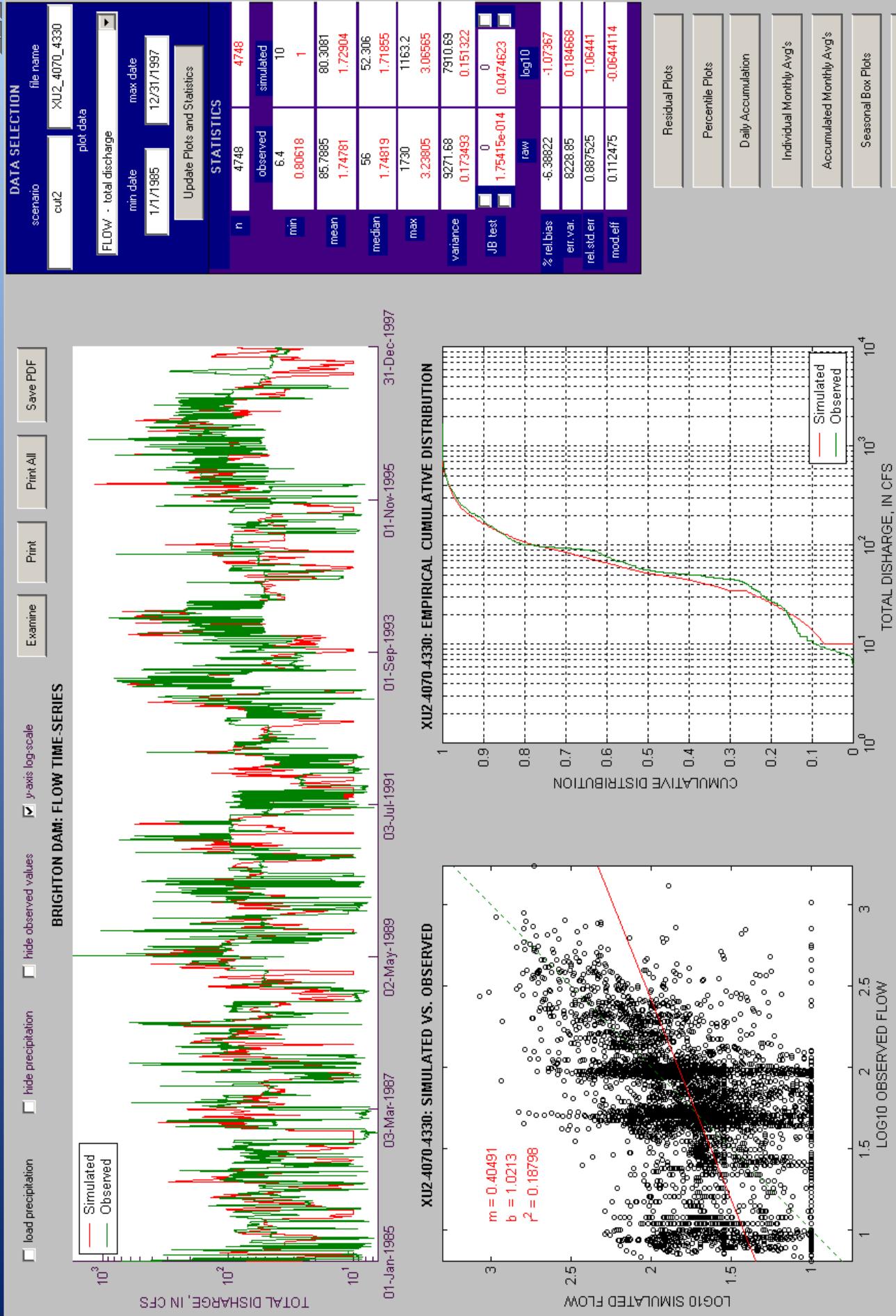
# Philpott Dam on the Roanoke River: Complex Rules – With Dam Simulation



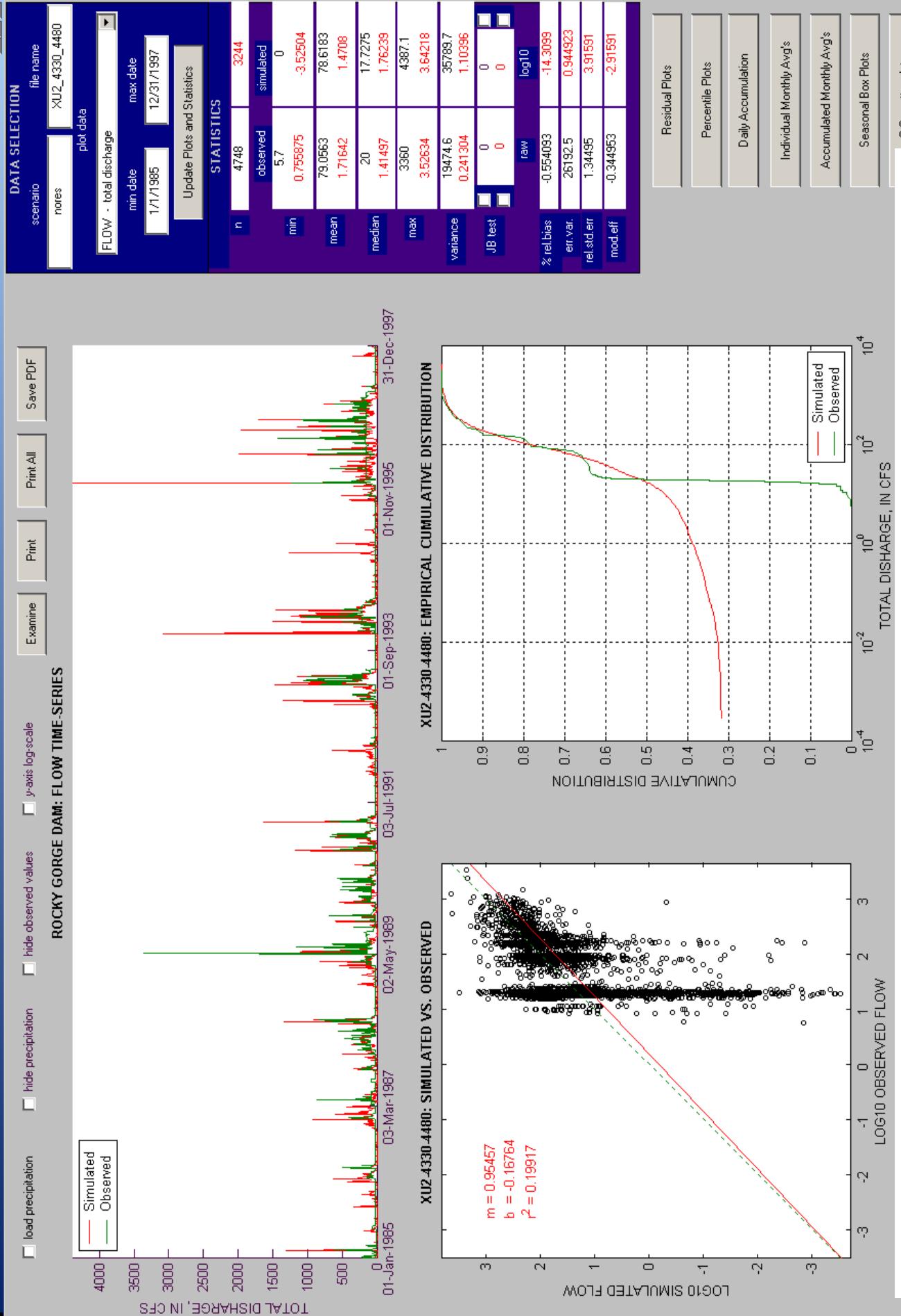
# Brighton Dam on the Patuxent: Complex Seasonal Pattern – No Dam Simulation



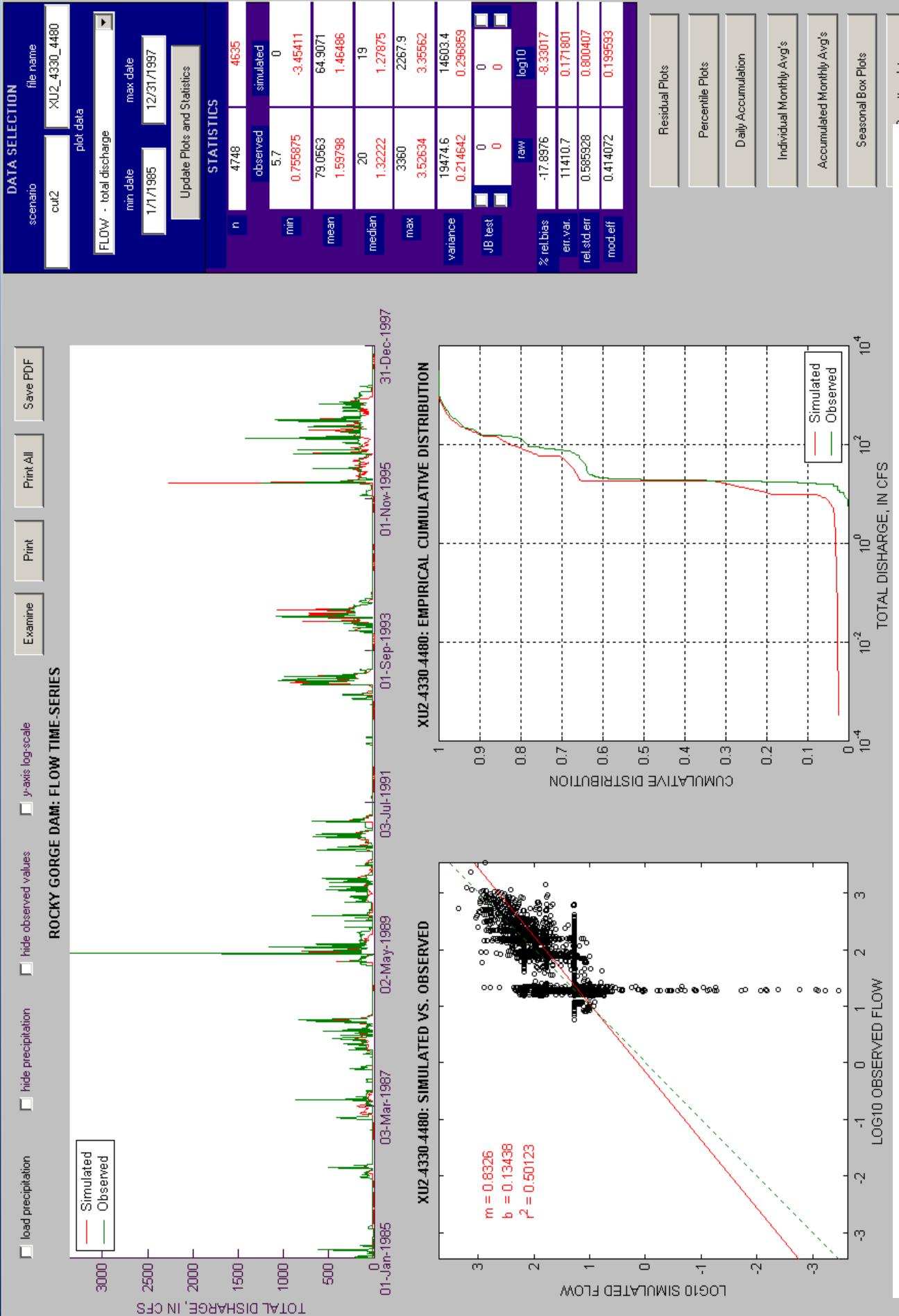
# Brighton Dam on the Patuxent: Complex Seasonal Pattern – With Dam Simulation

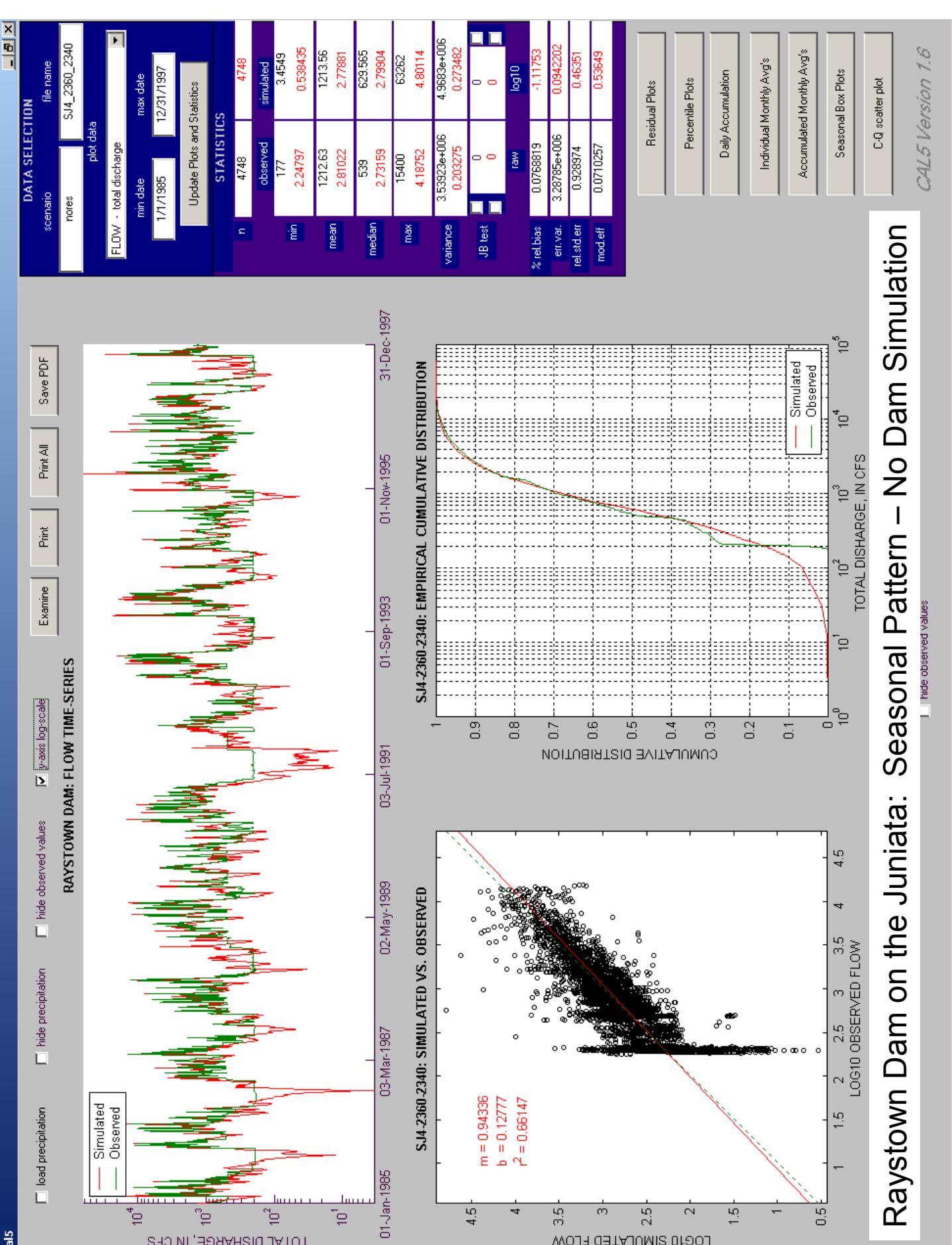


# Rocky Gorge Dam on the Patuxent: Seasonal Pattern – No Dam Simulation

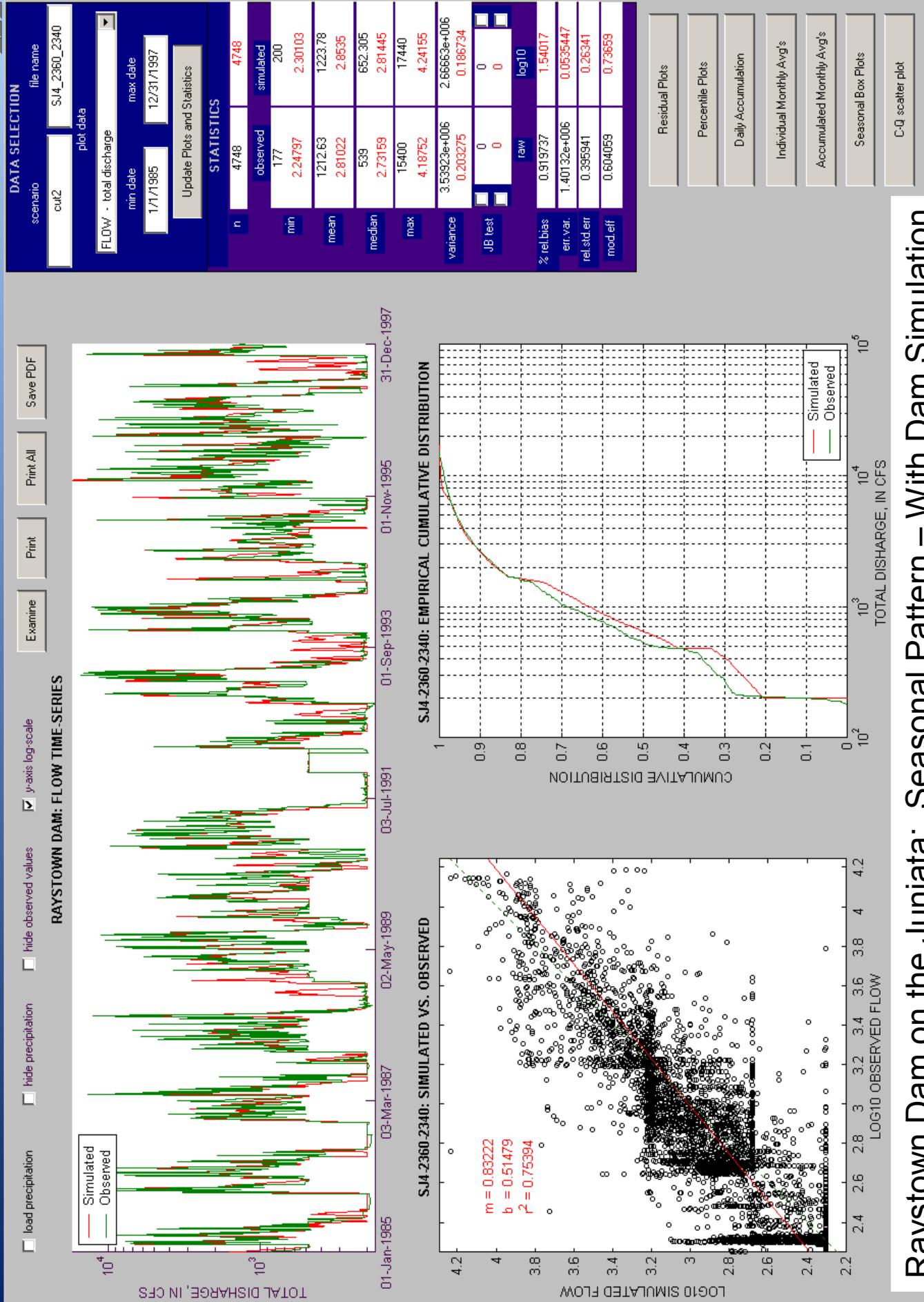


# Rocky Gorge Dam on the Patuxent: Seasonal Pattern – With Dam Simulation

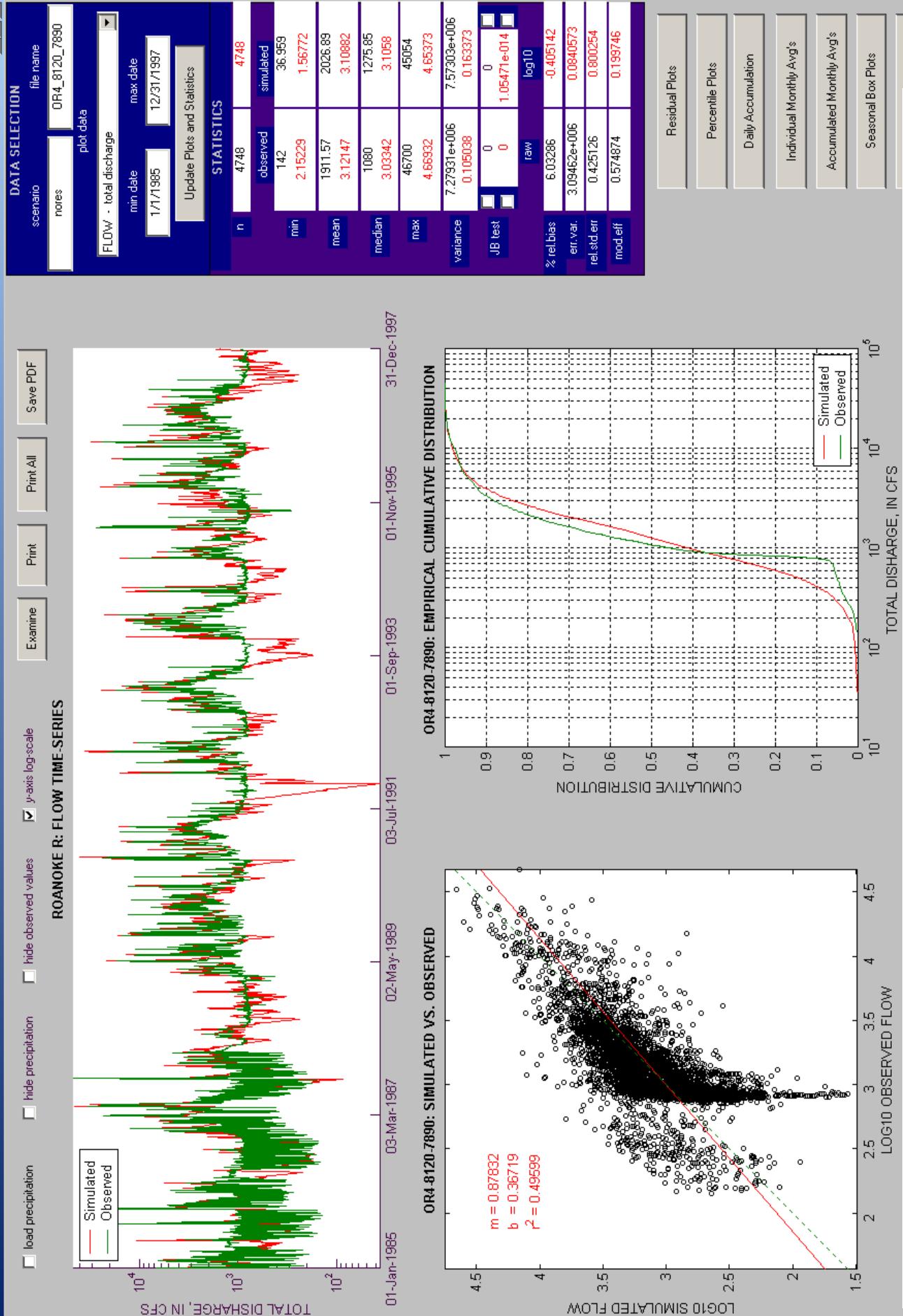




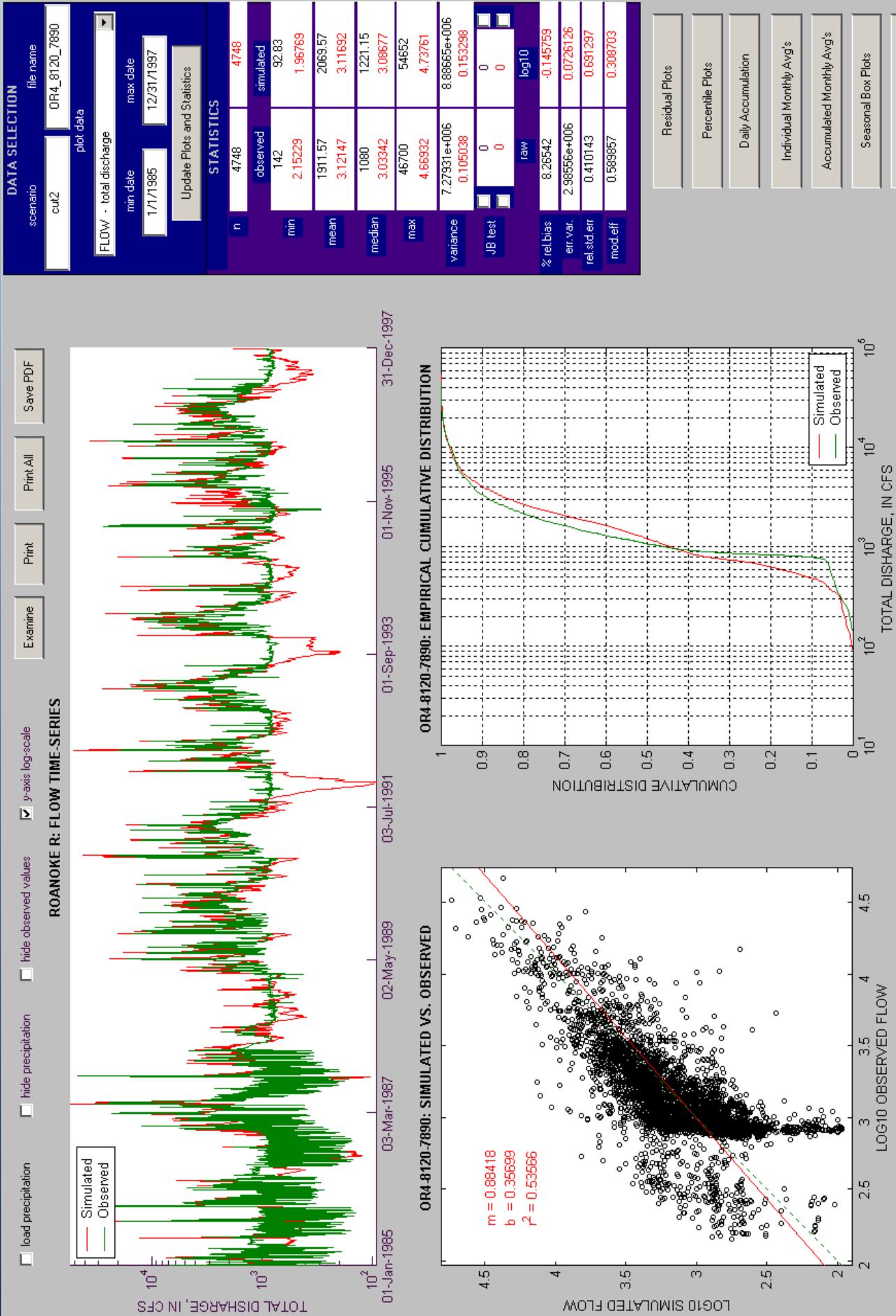
# Raystown Dam on the Juniata: Seasonal Pattern – With Dam Simulation



# Smith Mountain / Leesville Lakes on the Roanoke: Simple – No Dam Simulation



# Smith Mountain / Leesville Lakes on the Roanoke: Simple – With Dam Simulation



# Changes in Hydrologic Calibration with Reservoir Implementation

- Model Efficiency
  - 11 stations got worse
  - 70 stations got better
  - Average change of + 0.16
- Log Model Efficiency
  - 14 stations got worse
  - 67 stations got better
  - Average change of + 0.26