TVA Reservoir Operations and Drought

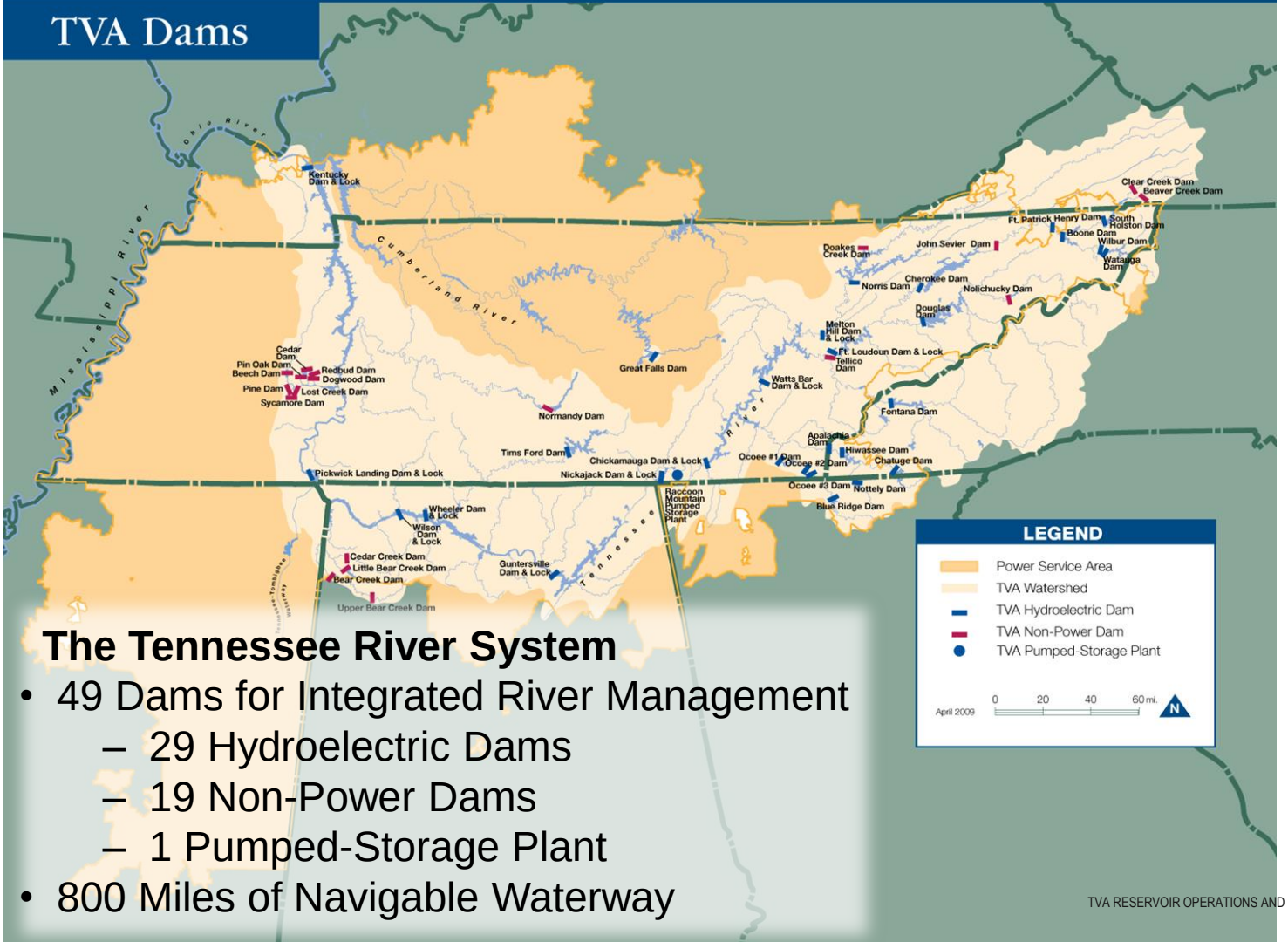
North Carolina Drought Management Advisory Council Meeting

Amanda K. Bowen, P.E.

April 30, 2015

Overview

- Background on the Tennessee River System
- TVA's Reservoir Operations Policy
- TVA's Reservoir Operating Guides
- TVA's Drought Communications
- The Tennessee Valley Water Partnership



The Tennessee River System

- 49 Dams for Integrated River Management
  - 29 Hydroelectric Dams
  - 19 Non-Power Dams
  - 1 Pumped-Storage Plant
- 800 Miles of Navigable Waterway

The TN River System in North Carolina

- 4 TVA Hydroelectric Dams
  - Fontana
  - Chatuge
  - Hiwassee
  - Apalachia
- Water Withdrawals
  - 16 Municipalities
  - 13 Industries
  - 17 Mining Companies

TVA's Integrated River System

Flood-Damage Reduction

Power Generation

Navigation

Recreation

Water Quality

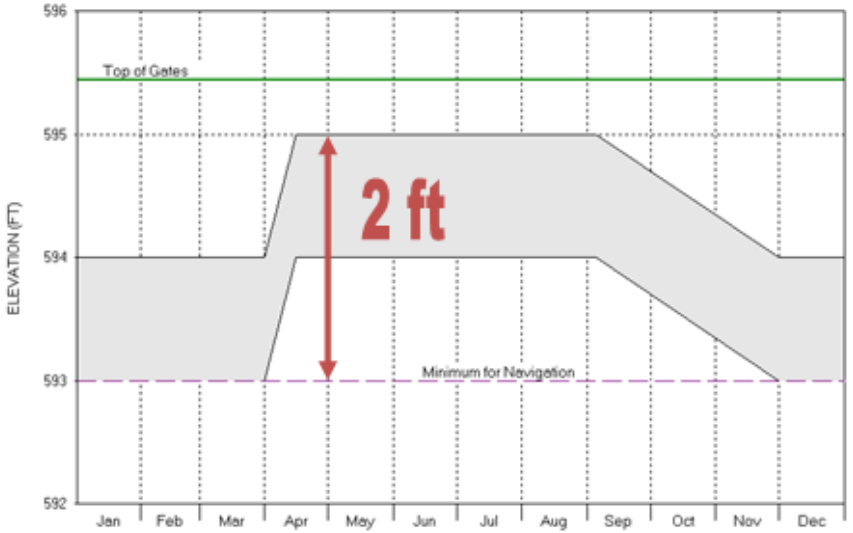
Water Supply

Reservoir Operations Policy 2003

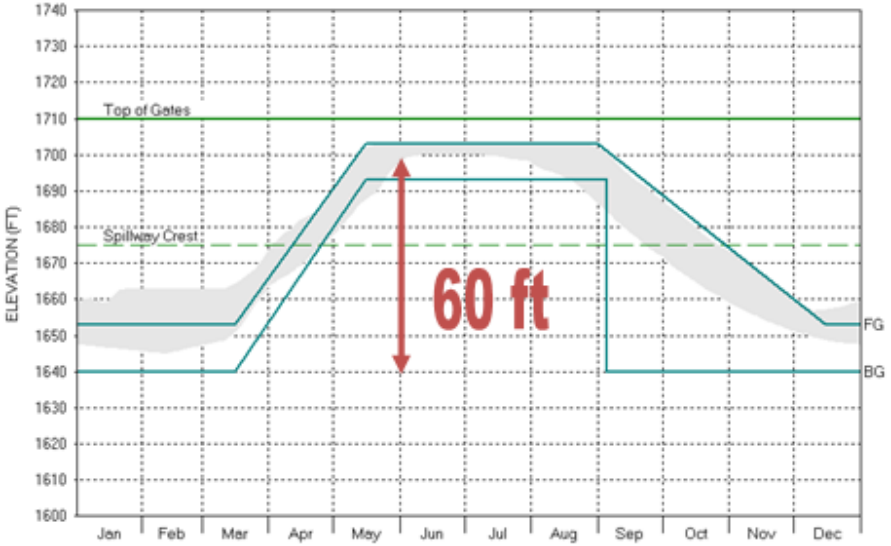
- Labor Day Drawdown
- Maintain Minimum Flows
- Additional Dissolved Oxygen Requirements
- Meet System Flows
- Implementation of the Tributary System Storage Guide Curve

Comparison of Reservoir Operating Guides

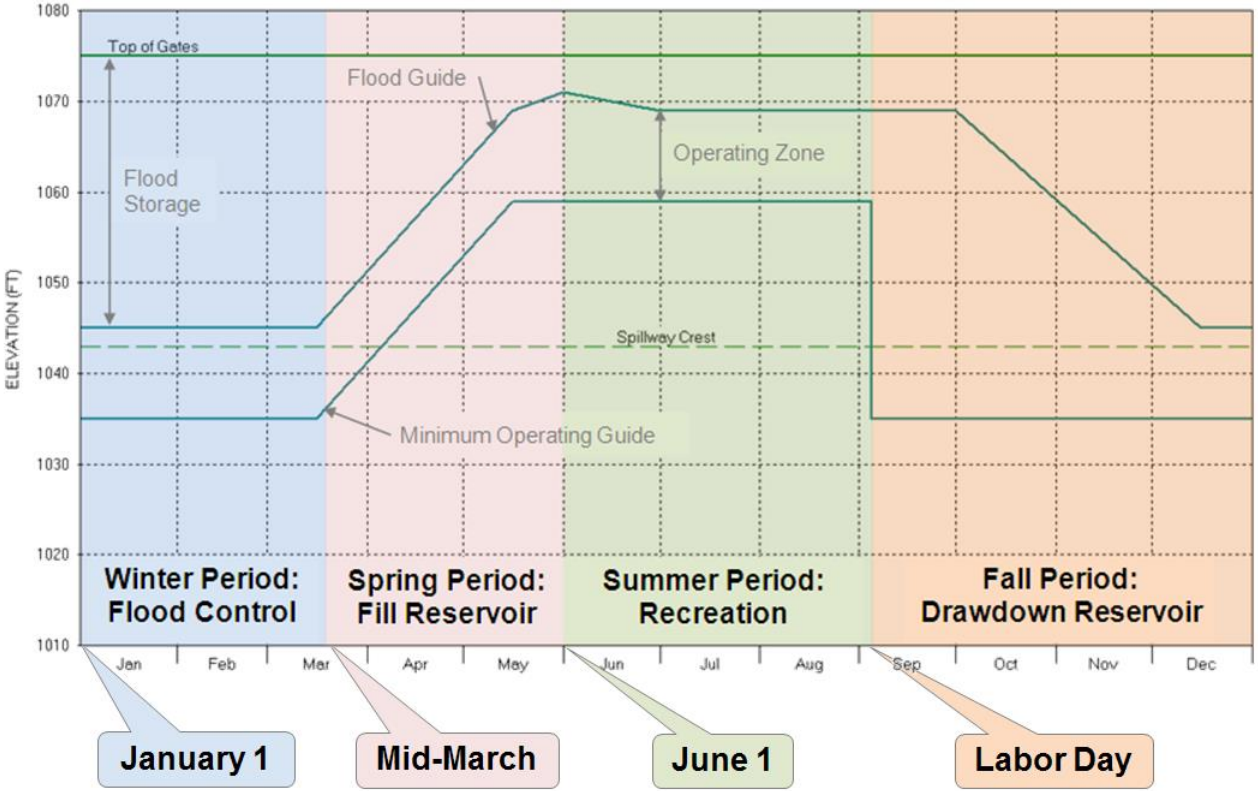
Main Stem: Guntersville



Tributary: Fontana

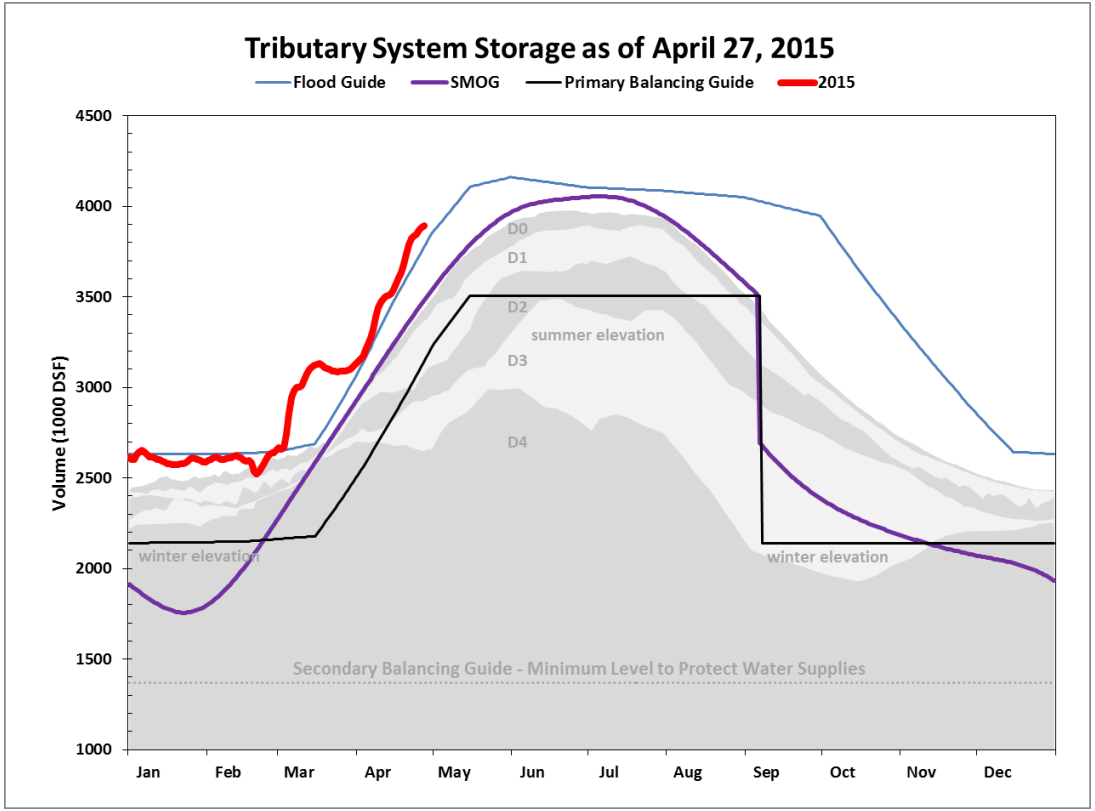


Generic Tributary Operating Curve



Tributary System Storage

- South Holston
- Watauga
- Cherokee
- Douglas
- Fontana
- Norris
- Chatuge
- Nottely
- Hiwassee
- Blue Ridge

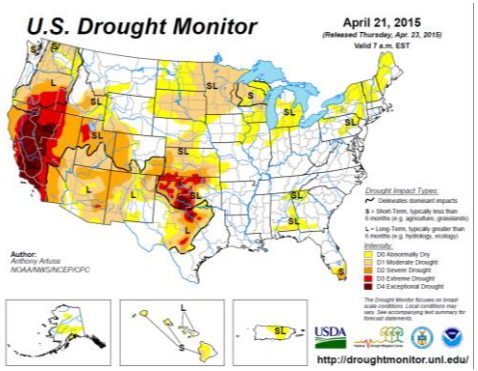


TVA's Drought Communications

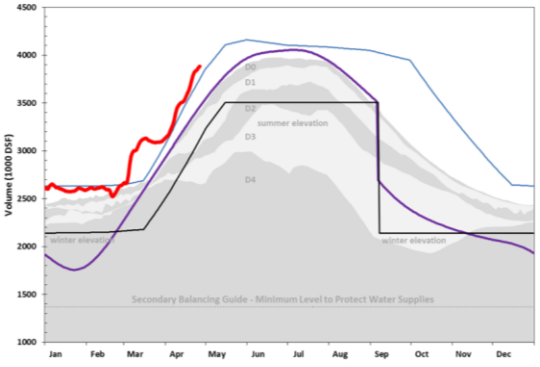
- Goal
  - To facilitate coordination and communication of drought conditions, impacts, and responses

- Authorities and Responsibilities
  - States
    > Development and use of water resources within the State
  - TVA
    > Integrated operation and management of the Tennessee River System

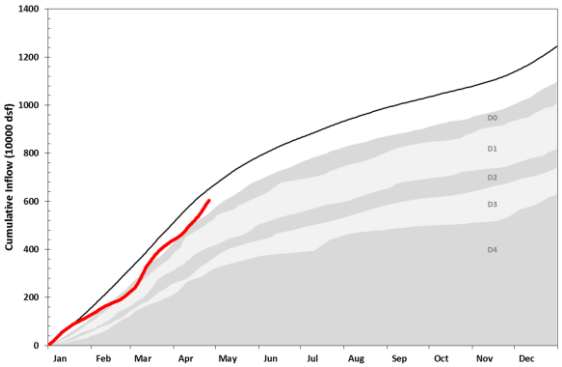
Determination of Drought Phase



1) Published Conditions



2) Evaluation of Reservoirs



3) Assessment of Inflows

Determination of Drought Phase

US Drought Monitor: Rating Criteria

			Ranges				
Category	Description	Possible Impacts	Palmer Drought Index	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Short and Long-term Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered	-1.0 to -1.9	21-30	21-30	-0.5 to -0.7	21-30
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested	-2.0 to -2.9	11-20	11-20	-0.8 to -1.2	11-20
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed	-3.0 to -3.9	6-10	6-10	-1.3 to -1.5	6-10
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions	-4.0 to -4.9	3-5	3-5	-1.6 to -1.9	3-5
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0-2	0-2	-2.0 or less	0-2

TVA Drought Response Phases

- **Watch**
  - abnormally dry trends of rainfall and runoff
- **Precautionary** **(D0 – D1: abnormal to moderate)**
  - prolonged period below normal rainfall and runoff
  - potentially significant adverse impacts
- **Action** **(D2 – D4: severe or worse)**
  - storage volume in tributary reservoirs below the System Minimum Operating Guide
- **Emergency** **(D4: exceptional)**
  - continued low system inflows and reservoir elevations
  - potential exists for not being able to maintain both minimum reservoir releases and operating elevations
- **Recovery**
  - prolonged periods of normal or above normal rainfall and runoff
  - sufficient to mediate drought and restore normal elevations and flows

Tennessee Valley Water Partnership (TVWP)

- Mission:
  - To improve regional cooperation in water resource management

- TVWP Drought Committee:
  - Activated during the “Action Phase” (D2 to D4)
  - Formalizes exchange of drought information
  - Coordinates response activities between the States

TVA's TVWP Report

Reservoir	Tributary Storage Reservoirs Elevation (feet)		
	April 27, 2015	Median	Flood Guide
South Holston	1728.29	1724.78	1728.0
Watauga	1958.16	1955.51	1958.5
Cherokee	1063.87	1058.12	1061.9
Douglas	987.24	984.46	985.8
Fontana	1696.36	1686.72	1688.2
Norris	1019.46	1012.96	1018.7
Chatuge	1924.36	1922.36	1922.9
Nottely	1772.85	1770.64	1771.9
Hiwassee	1514.35	1509.45	1511.4
Blue Ridge	1687.83	1682.83	1682.8

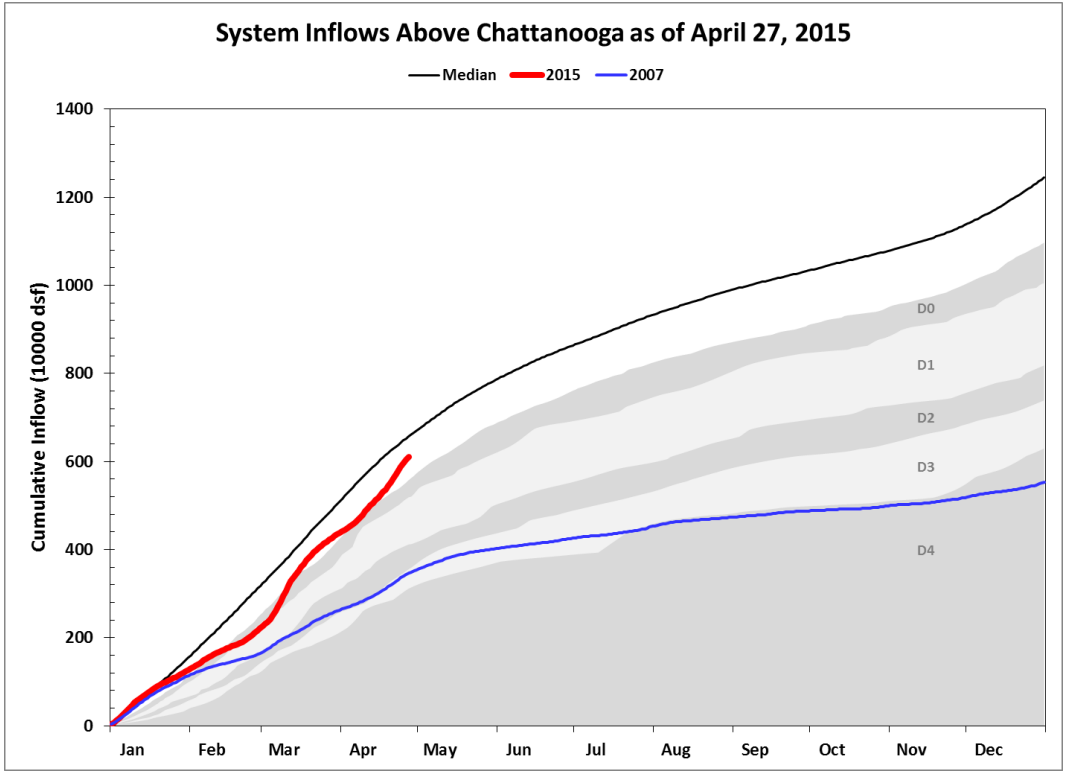
	Tributary System Storage (million acre-feet)
April 27, 2015	7.72
SMOG	6.86
Median	7.13
Flood Guide	7.48
% of Normal	108%

Cumulative Rainfall	Inches	% of average
Above Chattanooga	16.48	95
Below Chattanooga	19.09	100

Cumulative Runoff	Inches	% of average
Above Chattanooga	10.97	89
Below Chattanooga	12.91	96

TVA's TVWP Report

System Inflows Above Chattanooga



Drought Classifications:

D0 – Abnormally Dry
30-20% of Normal

D1 – Moderate Drought
20-10% of Normal

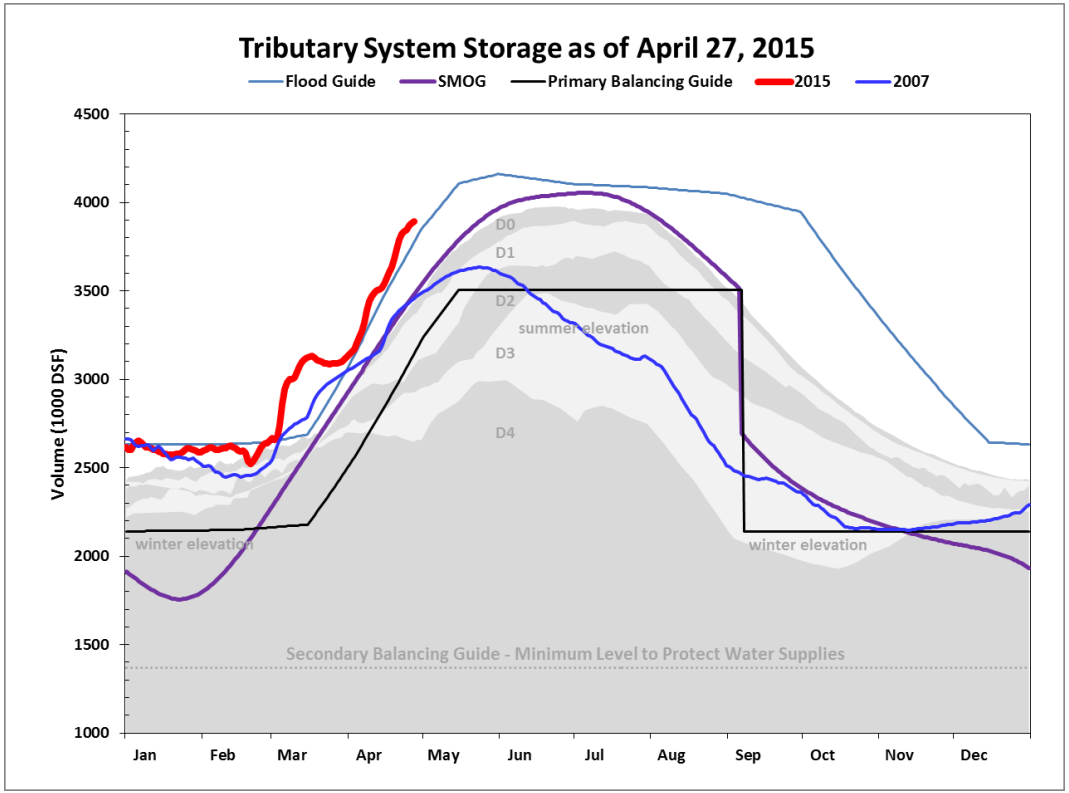
D2 – Severe Drought
10-5% of Normal

D3 – Extreme Drought
5-2% of Normal

D4 – Exceptional Drought
2-0% of Normal

TVA's TVWP Report

Tributary System Storage



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TVA's River Forecast Center

Knoxville, TN


TVA