River Management Forecasting
Overview

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TVA’s Commitment

TVA is here to serve the people of Tennessee Valley to make life better

• Affordable Energy
  Generate safe, clean, reliable, and affordable power
  Flexible & renewable energy

• Environmental Stewardship
  Natural resources stewardship, water quality

• Economic Development
  New investments = New jobs
  Recreation, Water Supply, Navigation, Flood Protection
Integrated Resource Management

River system assigned multipurpose role through TVA Act in 1933

(section 9a) …to regulate the stream flow primarily for the purposes of promoting navigation and controlling floods. So far as may be consistent with such purposes, ...for the generation of electric energy...

“Father of TVA,” Senator George Norris
• 41,000 mi² Drainage Basin
• 652 Miles Tennessee River Miles
• Over 900 Miles including tributaries
Integrated Tennessee River System Provides Multiple Benefits

- Navigation
- Flood Damage Reduction
- Power Generation
- Water Supply
- Recreation
- Water Quality
The River Forecast Center

- Staffed 24/7/365
- Teams issue 2-4 forecasts per day
- Data validation
- Modeling

- System monitoring
- Emergency response
- Hydropower scheduling
- Interaction with stakeholders
• Average annual rainfall is about 51 inches
• Average annual runoff is about 22 inches
• Approximately 60 percent of the average annual runoff occurs from January through April
Monthly Average Rainfall and Runoff

Inches

Rain
Runoff

JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC

Rainfall and runoff data for each month are shown in the bar chart. The rainfall is represented in blue, and the runoff is represented in green. The chart indicates the average rainfall and runoff for each month from January to December.
Flood Control

- Use tributary dams to store water during flood to reduce downstream flooding
- TVA’s River Forecast Center issue flood forecasts for major areas along the Tennessee River through partnerships with the National Weather Service
- Release water at non-flood rate once levels below dams have receded
- Annual average flood damages averted are $280 million ($8.6 billion to date)
- Add’l $17M averted on the Ohio and Mississippi Rivers
OVER $1.6 BILLION IN DAMAGES AVERTED
FEBRUARY 2019

- Kingsport: $20,100,000
- Clinton: $66,900,000
- Lenoir City: $111,000,000
- Knoxville: $2,380,000
- Elizabethton: $2,390,000
- Chattanooga: $1,420,000,000
- Decatur: $22,400,000
- South Pittsburg: $62,000,000
- Savannah: $3,300,000
- Fayetteville: $29,900,000
- Shelbyville: $203,000
Challenges

- Balancing the competing demands on the system and the overall value to the public
- Understanding of the trade-offs associated with various scenarios
- Example: Can you keep my reservoir higher, longer?
The Value of Forecasts to TVA

• TVA is a forecast-driven agency due to the expensive and long-term nature of our capital investments

• We forecast
  • Load growth
  • Gas prices
  • Coal prices
  • River flows
  • Budget spends
  • Equipment life….

• For TVA, better forecast = lives saved, more $$$. better decisions.
Forecasting & Decision Support

- 200 Rain Gages
- 60 Stream Gages
- Data Management (FEWS)
- Inflow and Runoff Modeling (SAC-SMA)
- Reservoir Storage Routing and Simulation (Riverware)
- Hydraulic Modeling (HEC-RAS)
- Hydropower Optimization (Riverware)
- Information Dissemination (Varies)
Decision Horizons and Tools

Historic

- Observed Values (-) 14 Days
- Real-time data, Hourly Models, radar

Today

- Hourly Economic Modeling, Hourly Reservoir Simulation, 6-hour Reservoir Simulation
- 2 Days

Future

- 6-hourly Reservoir Simulations & Optimization, Economic Models, Load Forecasts, NWS QPF, Planned Constraints
- 14 Days

- Planning Models, Long-term power studies, Capacity Constraints, Resource Strategy
- Months - Years
Quantitative Precipitation Estimates
- NOAA Multi-Radar Multi-Sensor (MRMS)
- Lower Mississippi River Forecast Center (LMRFC)
- Station Based (TVA and USGS precipitation gages)

Quantitative Precipitation Forecasts
- NWS Weather Prediction Center (WPC) 0-10 Days
- WPC Backup 0-7 Days
- 95% Max and Min 0-3 Days
- NWS Weather Prediction Center (WPC) 0-10 Days
- North American Ensemble Forecast System (NAEFS) 0-16 Days
- NOAA HRRR 0-18 hours
- NOAA HRRR Extended 0-37 hours
- European Centre for Medium-Range Weather Forecasts (ECMWF) 0-10 Days
February Rain
Selected QPF - 02/23/2019 24:00:00 CDT
Mean Error

24 hour total, 1 day leadtime for the selected QPF
- Event was convective in nature
River Stages

Chattanooga

Level (FT)


RAS_All_Forecast: [1] Mainstem HEC-RAS 03-15-2019 11:00:00 CDT Current
Copy_Naturals_Forecast: [2] Show Naturals in RAS Plots 03-15-2019 11:00:00 CDT Local

Management of the Tennessee River system using our integrated system of 49 dams across the region resulted in $1.6 billion in flood damages. After the wettest February and fourth wettest month on record, we continue to manage high river and lake conditions to minimize flood impacts.

River Update: We are increasing releases out of tributary dams to recover flood storage and prepare for the next rain event, as you can expect to see above normal river flows below those dams. (1-3)

Incredible site! Wilson Dam near Pigeon Forge. Heavy rainfall has resulted in high water levels on the Tennessee River. We are storing water at tributary and mainstem reservoirs to help reduce downstream flood levels. (1-3)
Social Media Impact

Facebook:
Number of Posts: 35
Number of Impressions: 7,610,058
Number of Users Reached: 2,755,040
Number of Link Clicks: 17,700
Number of Video Views: 2,210,756
Avg. Reach Per Post: 141,286.63 < Very impressive
Engagement Rate: 9.76% (Compared to the national average of 0.17%)

We gained 9,387 Facebook followers over the 18 days a 9.85% growth. We now have 104,718 followers Facebook.

Twitter:
Number of Tweets: 88
Impressions: 996,400
Overall Reach 1,684,800
Retweets 1,896
Engagement Rate: 4.1% (National average is 0.05%)

We gained 1,200 new Twitter follower over the period, a 6.26% growth. We now have 20,800 Twitter followers.
www.tva.com

- Release schedules
- Current reservoir elevations
- Operating guides
- Tailwater improvements
- Monitoring results

TVA Lake Info App
Thank You

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