

Cumberland River Basin May 2010 Flood Event

Bob Sneed

Chief, Water Management Section

Nashville District

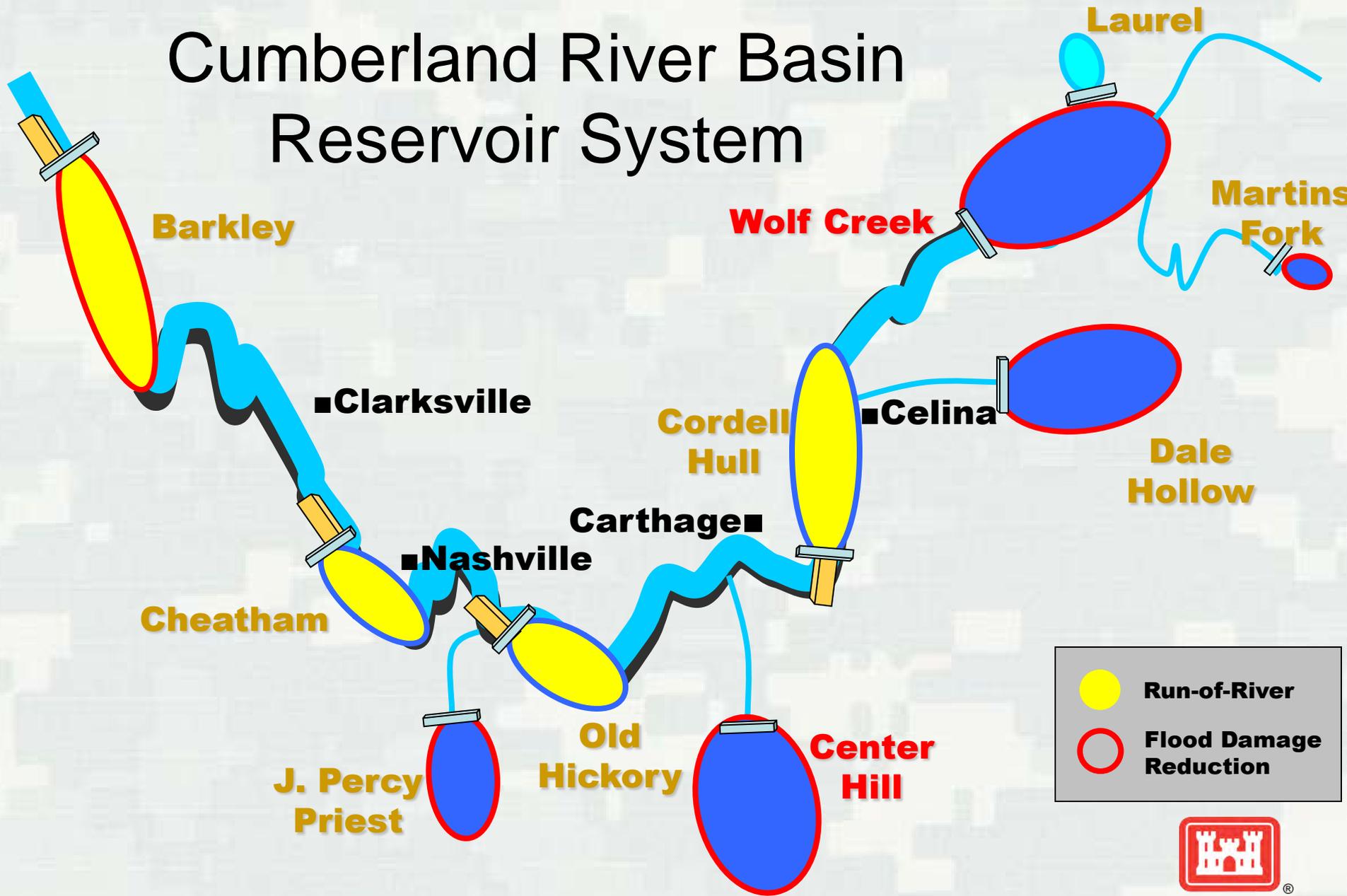
16 June 2010



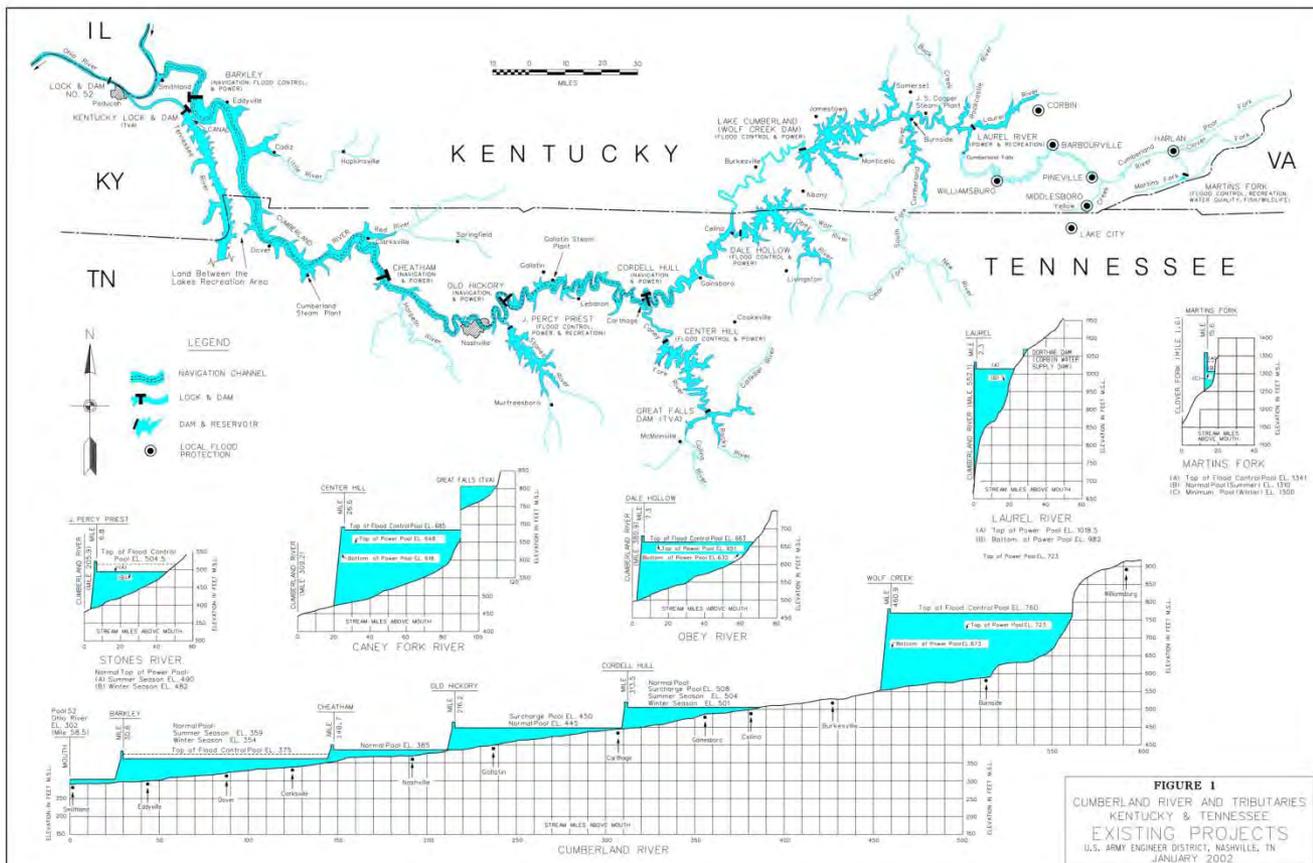
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US Army Corps of Engineers
BUILDING STRONG®

Cumberland River Basin Reservoir System



Cumberland River Basin Reservoir System



Barkley Dam



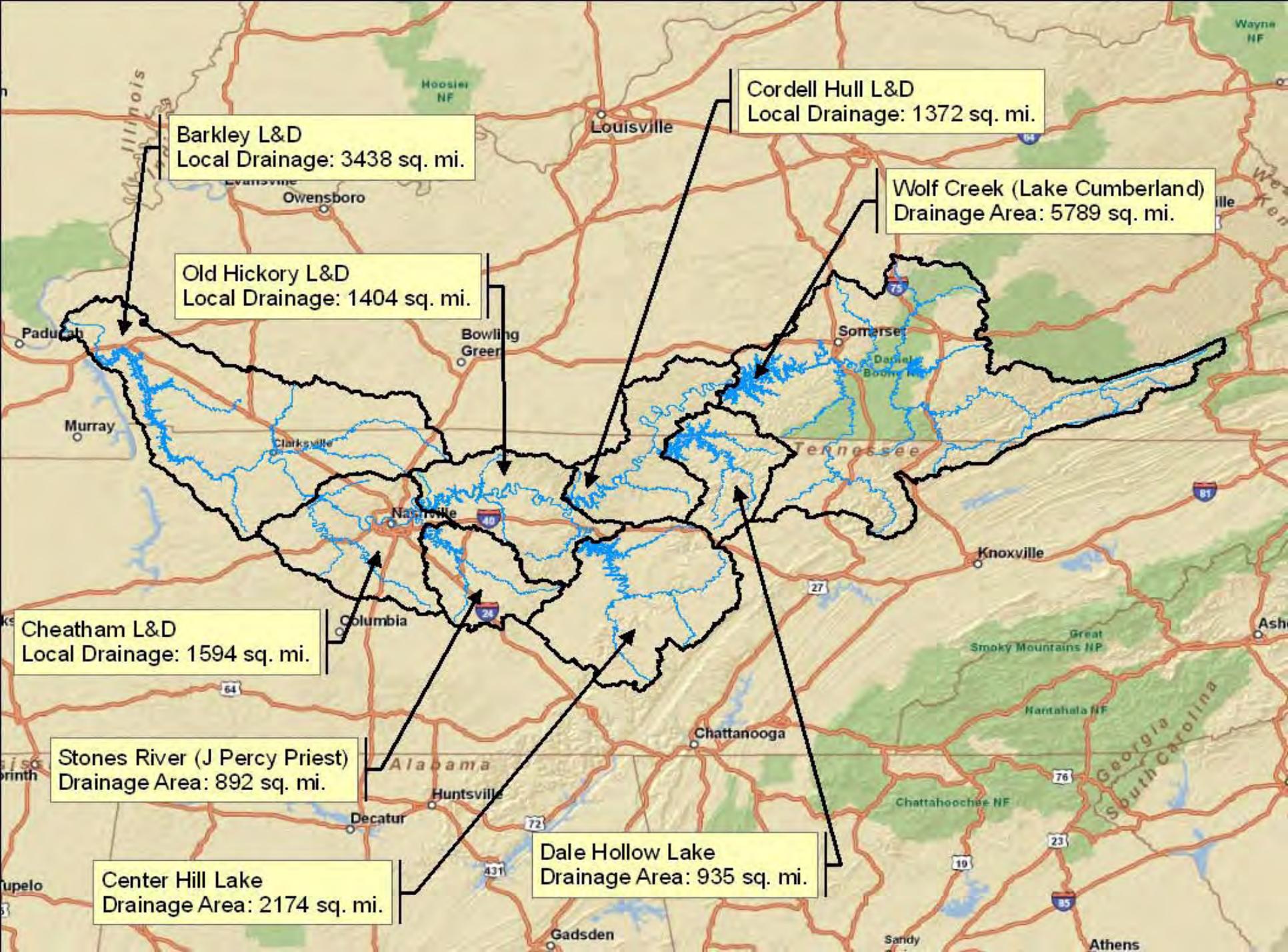
Congressionally Authorized Project Purposes

Project	Flood Damage Reduction	Commercial Navigation	Hydropower	Recreation
Wolf Creek Dam	Green	Red	Green	Red
Dale Hollow Dam	Green	Red	Green	Red
Cordell Hull Lock & Dam	Red	Green	Green	Green
Center Hill Dam	Green	Red	Green	Red
Old Hickory Lock & Dam	Red	Green	Green	Red
J. Percy Priest Dam	Green	Red	Green	Green
Cheatham Lock & Dam	Red	Green	Green	Red
Barkley Lock & Dam	Green	Green	Green	Red

Project not designed for this purpose	Red
Project primarily designed for this purpose	Green



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Barkley L&D
Local Drainage: 3438 sq. mi.

Old Hickory L&D
Local Drainage: 1404 sq. mi.

Cordell Hull L&D
Local Drainage: 1372 sq. mi.

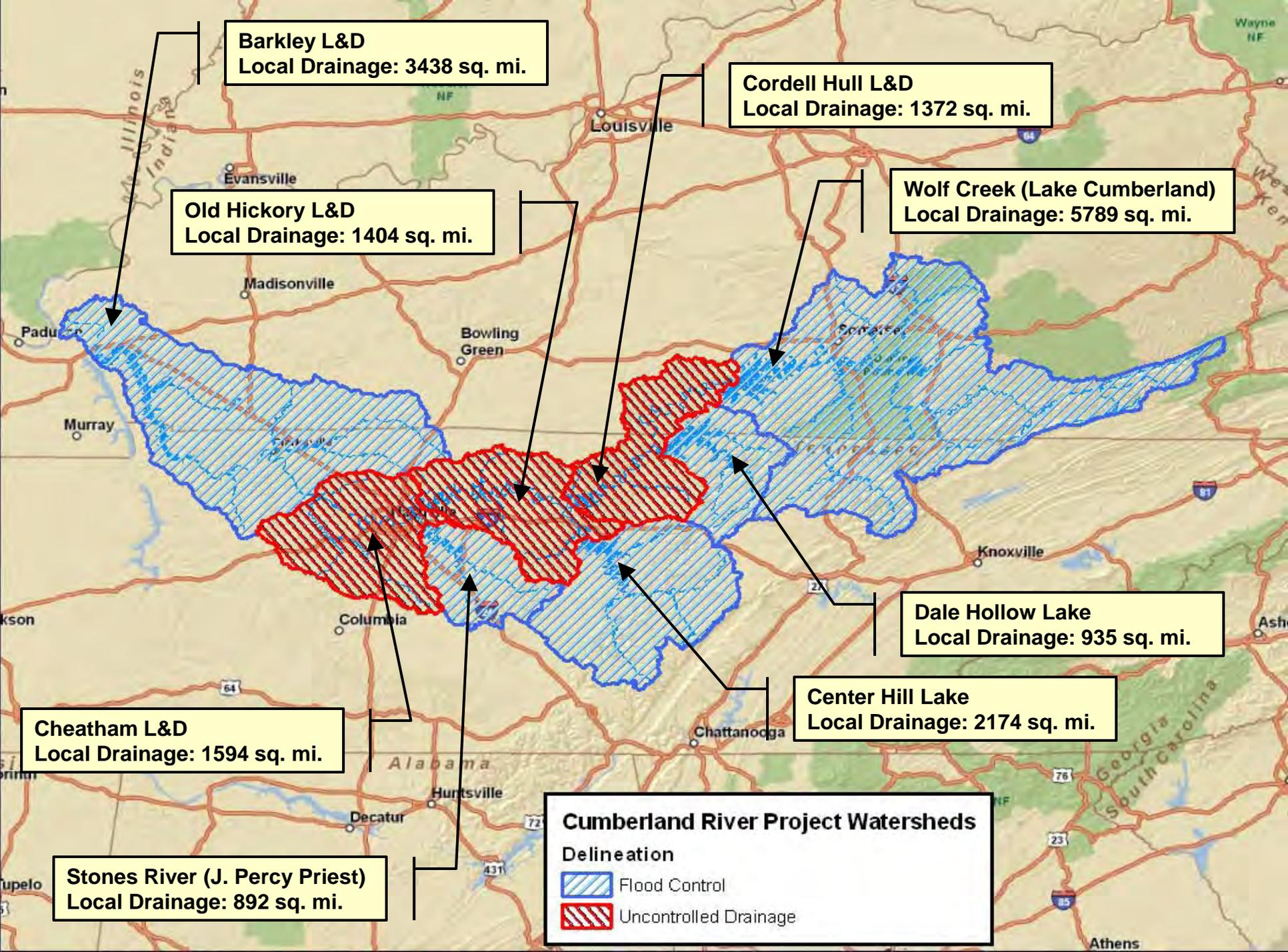
Wolf Creek (Lake Cumberland)
Drainage Area: 5789 sq. mi.

Cheatham L&D
Local Drainage: 1594 sq. mi.

Stones River (J Percy Priest)
Drainage Area: 892 sq. mi.

Center Hill Lake
Drainage Area: 2174 sq. mi.

Dale Hollow Lake
Drainage Area: 935 sq. mi.



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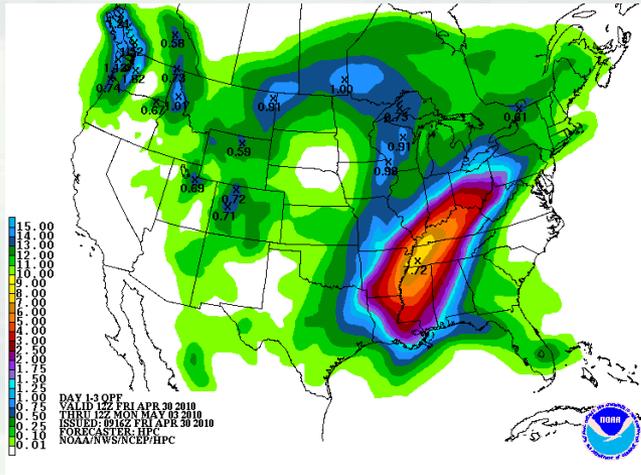
Center Hill Lake
Local Drainage: 2174 sq. mi.

Cumberland River Project Watersheds

Delineation

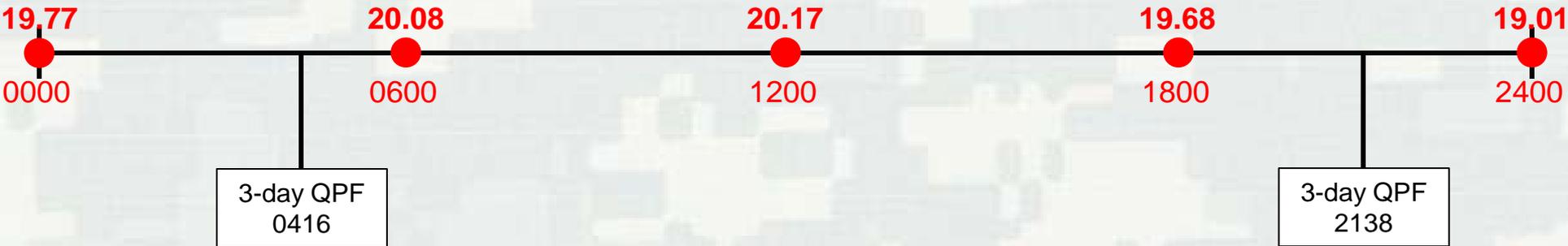
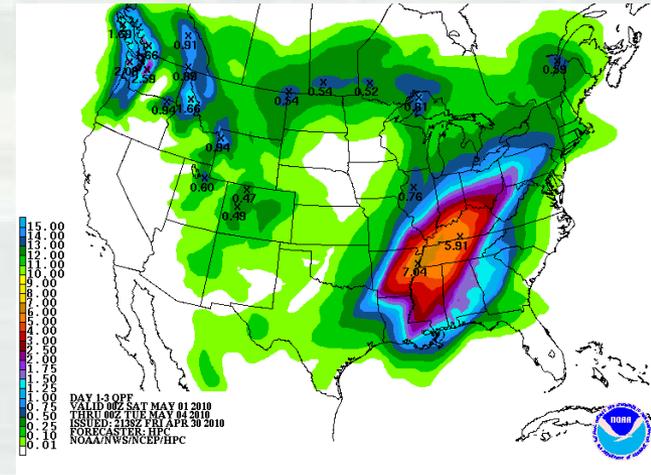
-  Flood Control
-  Uncontrolled Drainage

Friday - 30 April 2010



Completed lowering of
pools at mainstem
projects to prepare for
forecasted rain

Cordell Hull ~ 0.5 ft
Old Hickory ~ 0.5 ft
Cheatham ~ 1.0 ft



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1 May 2010
Radar Precipitation Totals

Barkley Dam

Cheatham
Lock & Dam

Old Hickory
Lock & Dam

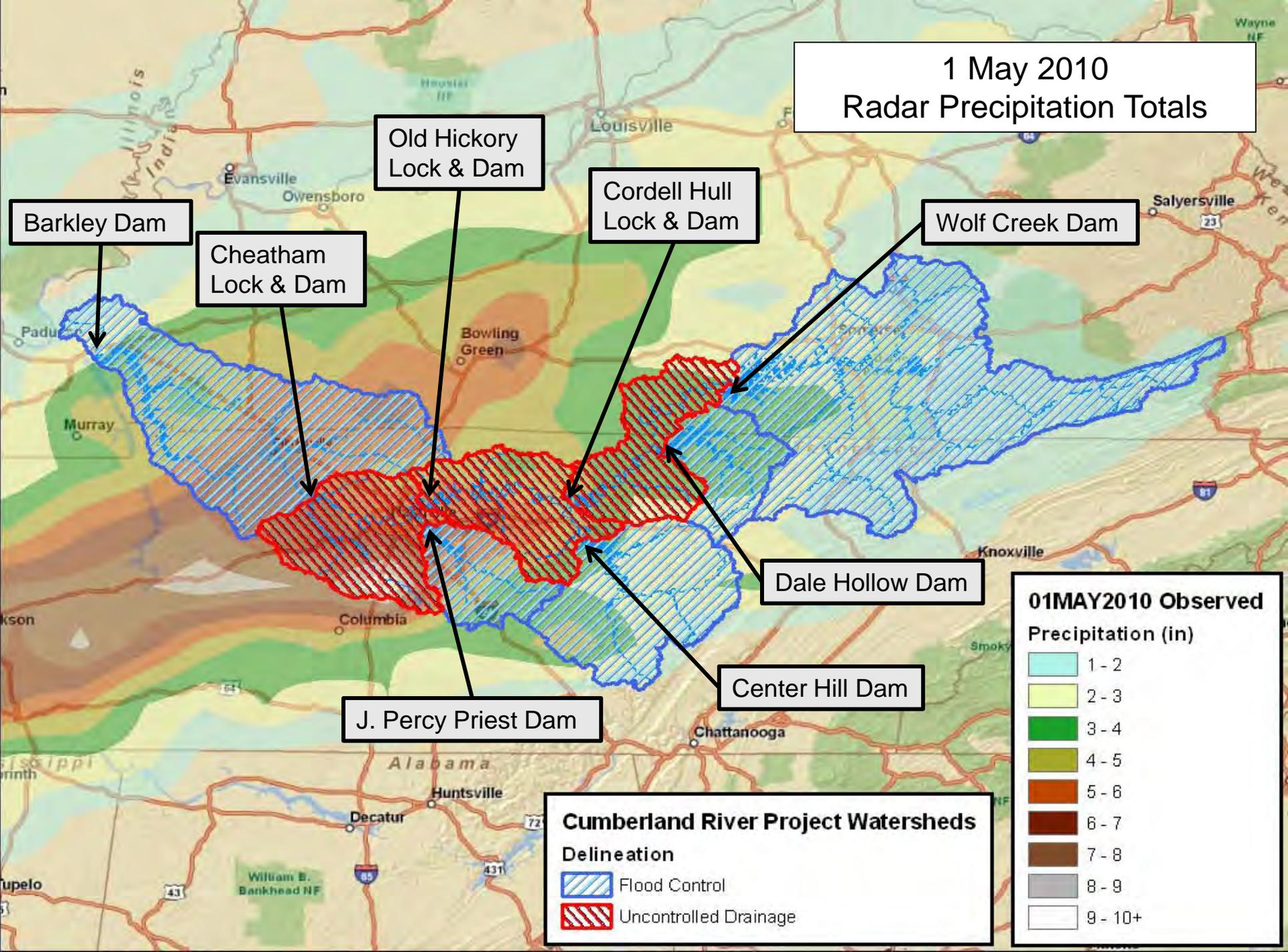
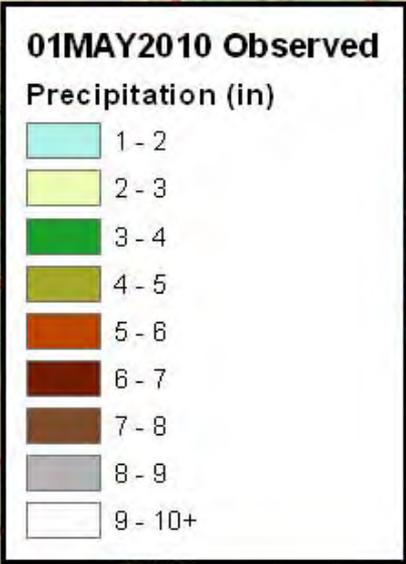
Cordell Hull
Lock & Dam

Wolf Creek Dam

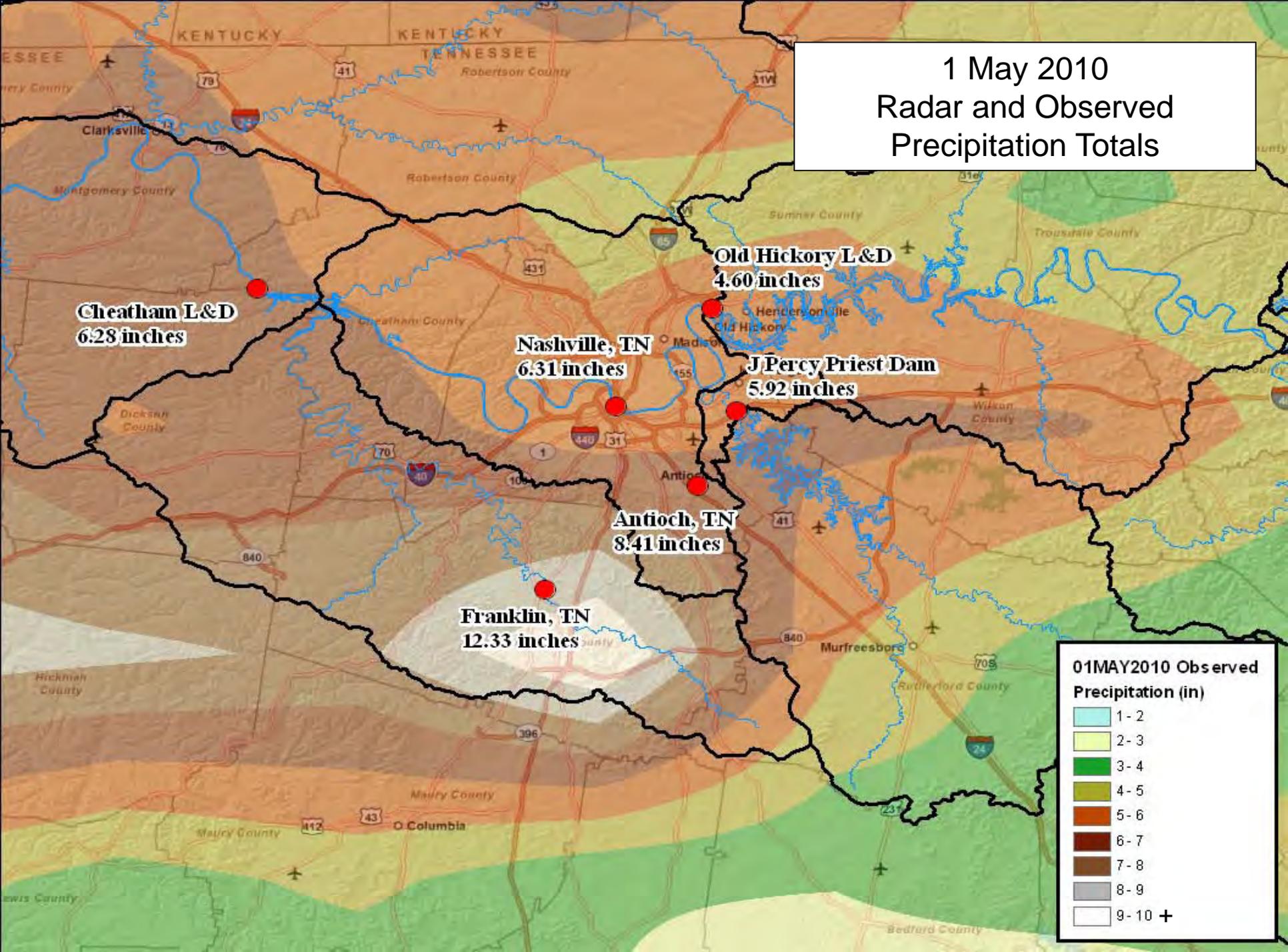
Dale Hollow Dam

J. Percy Priest Dam

Center Hill Dam



1 May 2010
Radar and Observed
Precipitation Totals



Cheatham L&D
6.28 inches

Nashville, TN
6.31 inches

Old Hickory L&D
4.60 inches

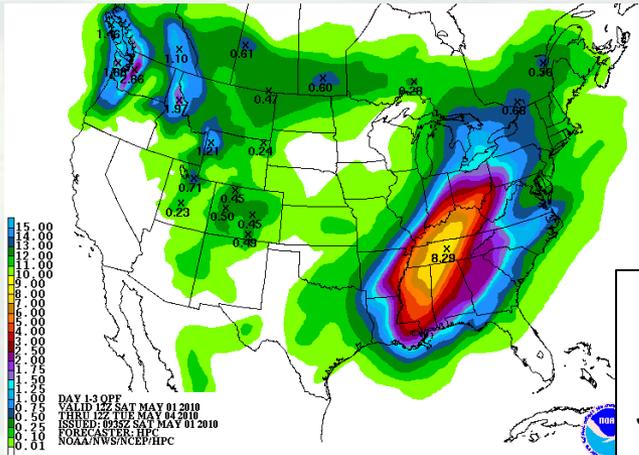
J Percy Priest Dam
5.92 inches

Antioch, TN
8.41 inches

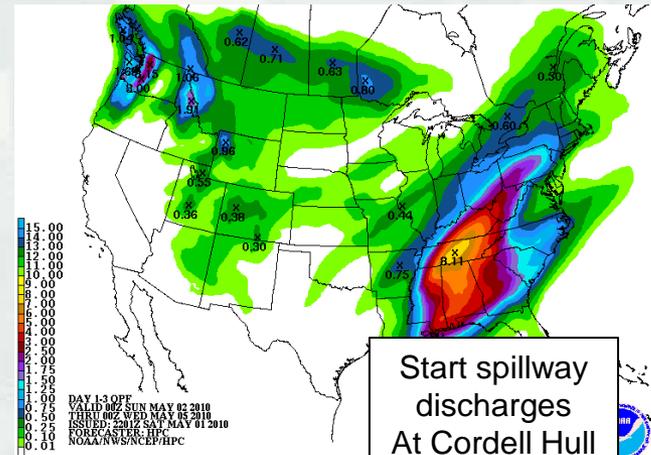
Franklin, TN
12.33 inches



Saturday - 1 May 2010



Start hydropower releases at J. Percy Priest 1000



Start spillway discharges At Cordell Hull 1730



Start spillway discharges At Old Hickory 1200

Nashville Water Management increased staff Cheatham goes to free flow 1900





2 May 2010
Radar Precipitation Totals

Barkley Dam

Cheatham
Lock & Dam

Old Hickory
Lock & Dam

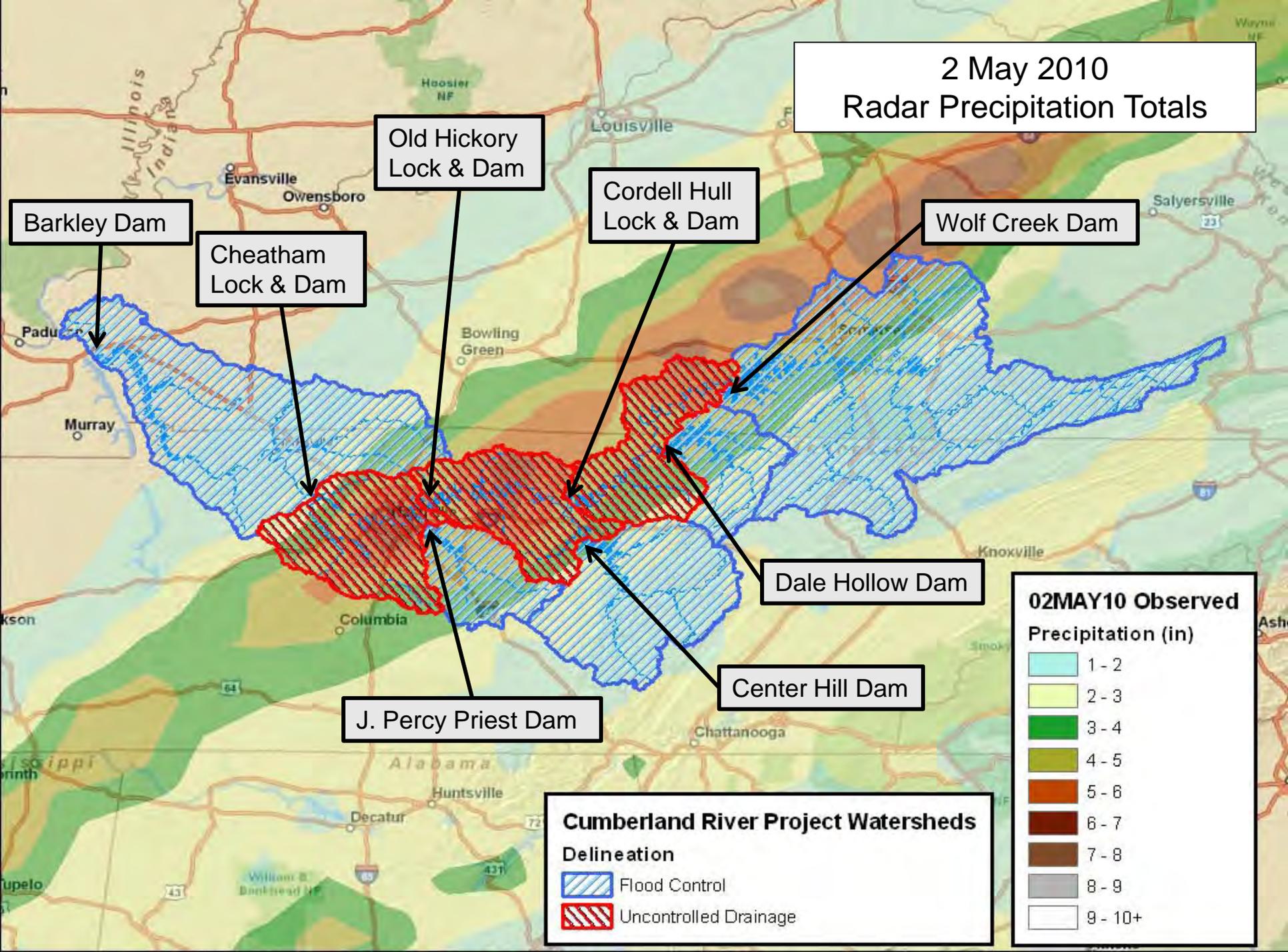
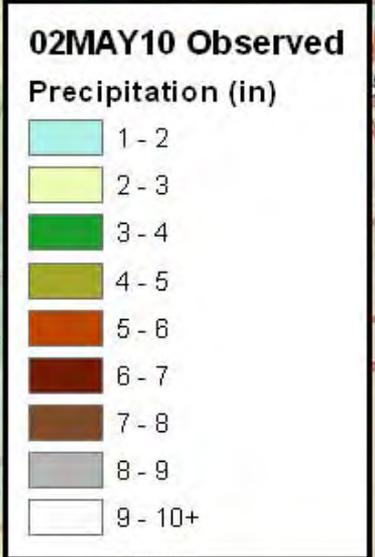
Cordell Hull
Lock & Dam

Wolf Creek Dam

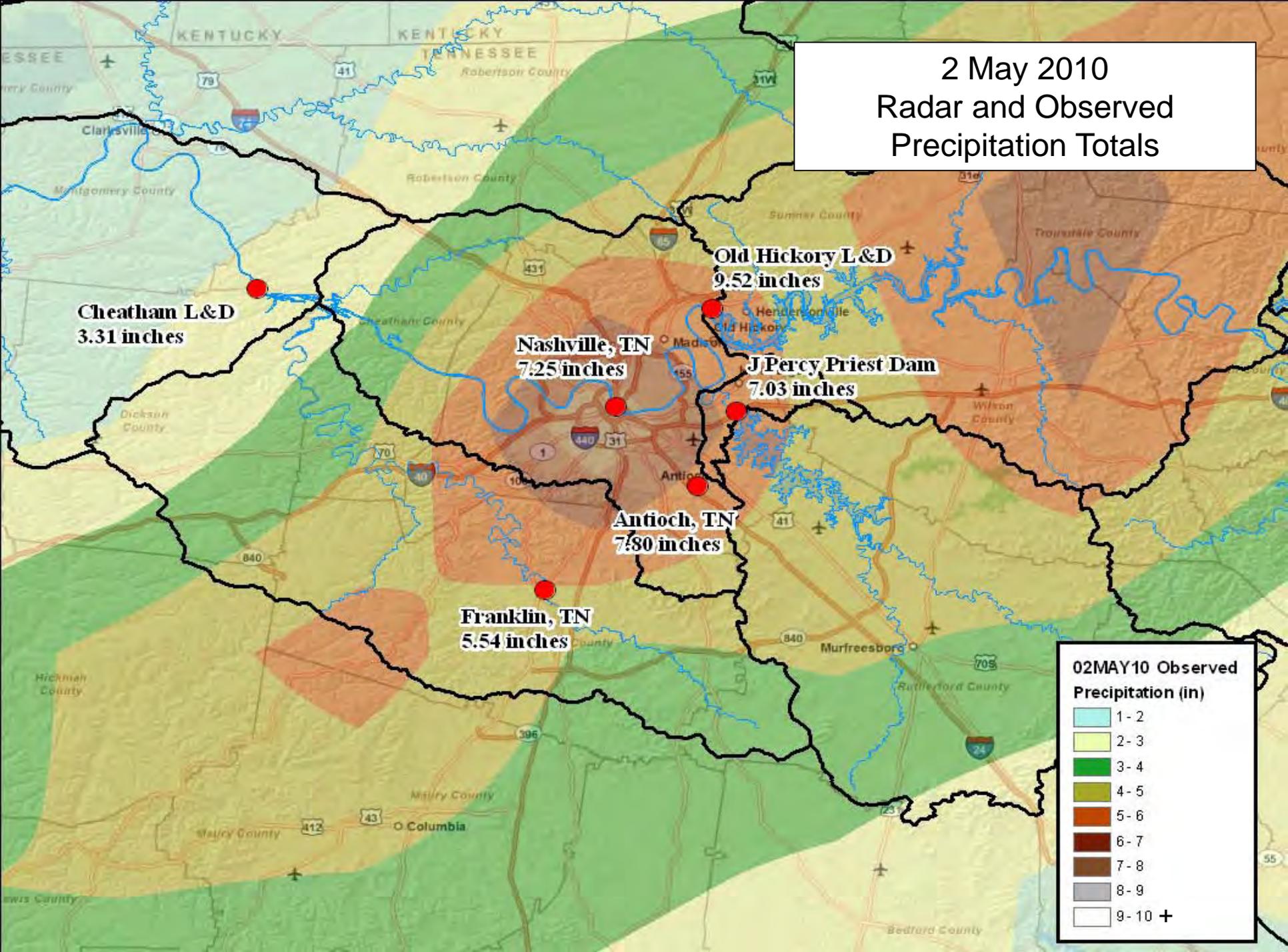
Dale Hollow Dam

J. Percy Priest Dam

Center Hill Dam



2 May 2010
Radar and Observed
Precipitation Totals



Cheatham L&D
3.31 inches

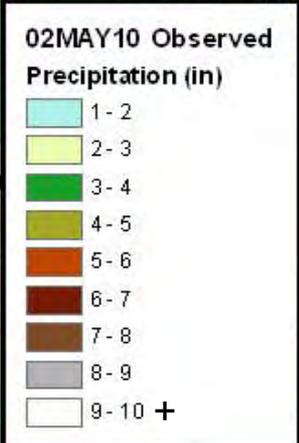
Nashville, TN
7.25 inches

Franklin, TN
5.54 inches

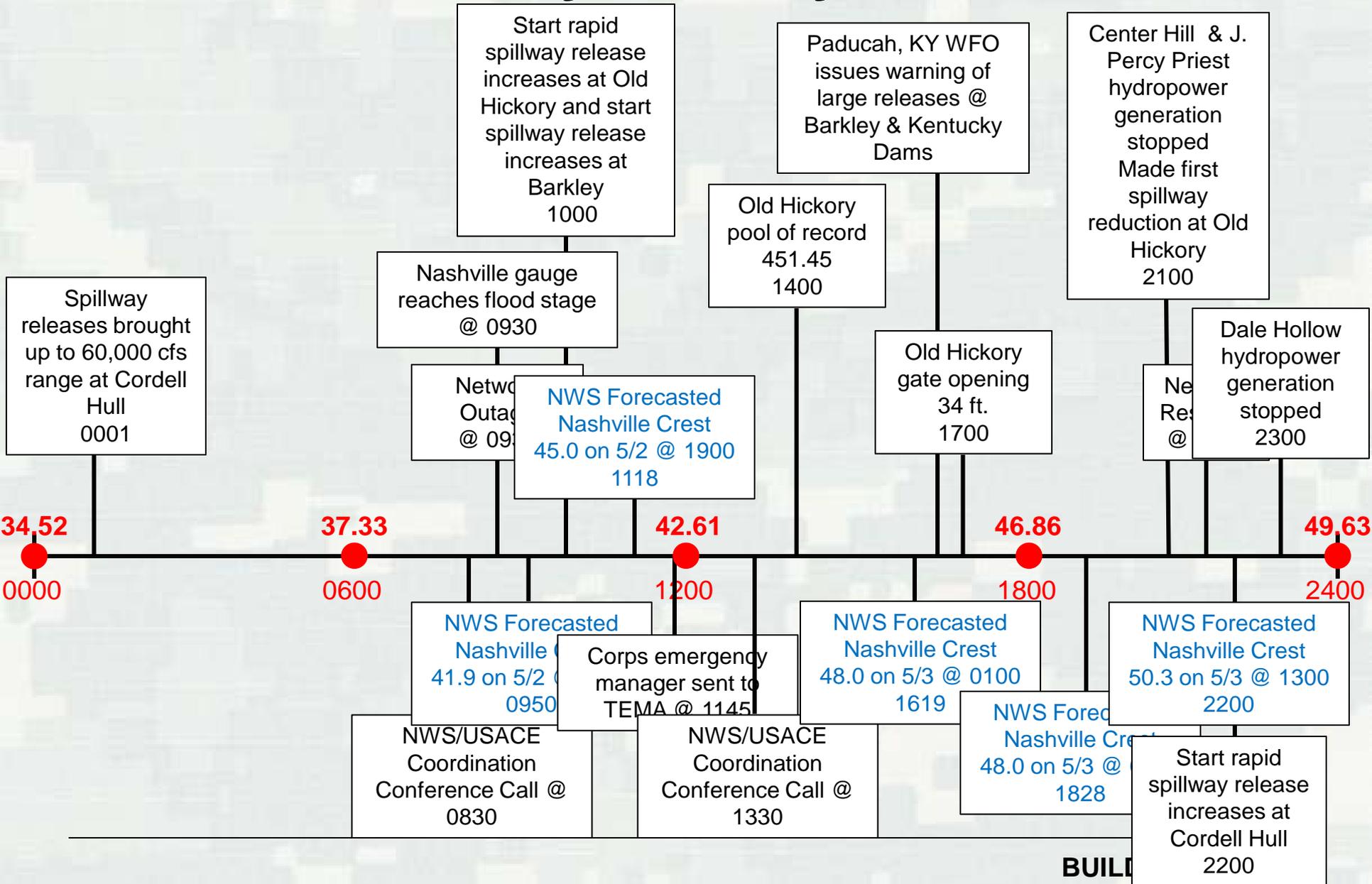
Antioch, TN
7.80 inches

Old Hickory L&D
9.52 inches

J Percy Priest Dam
7.03 inches



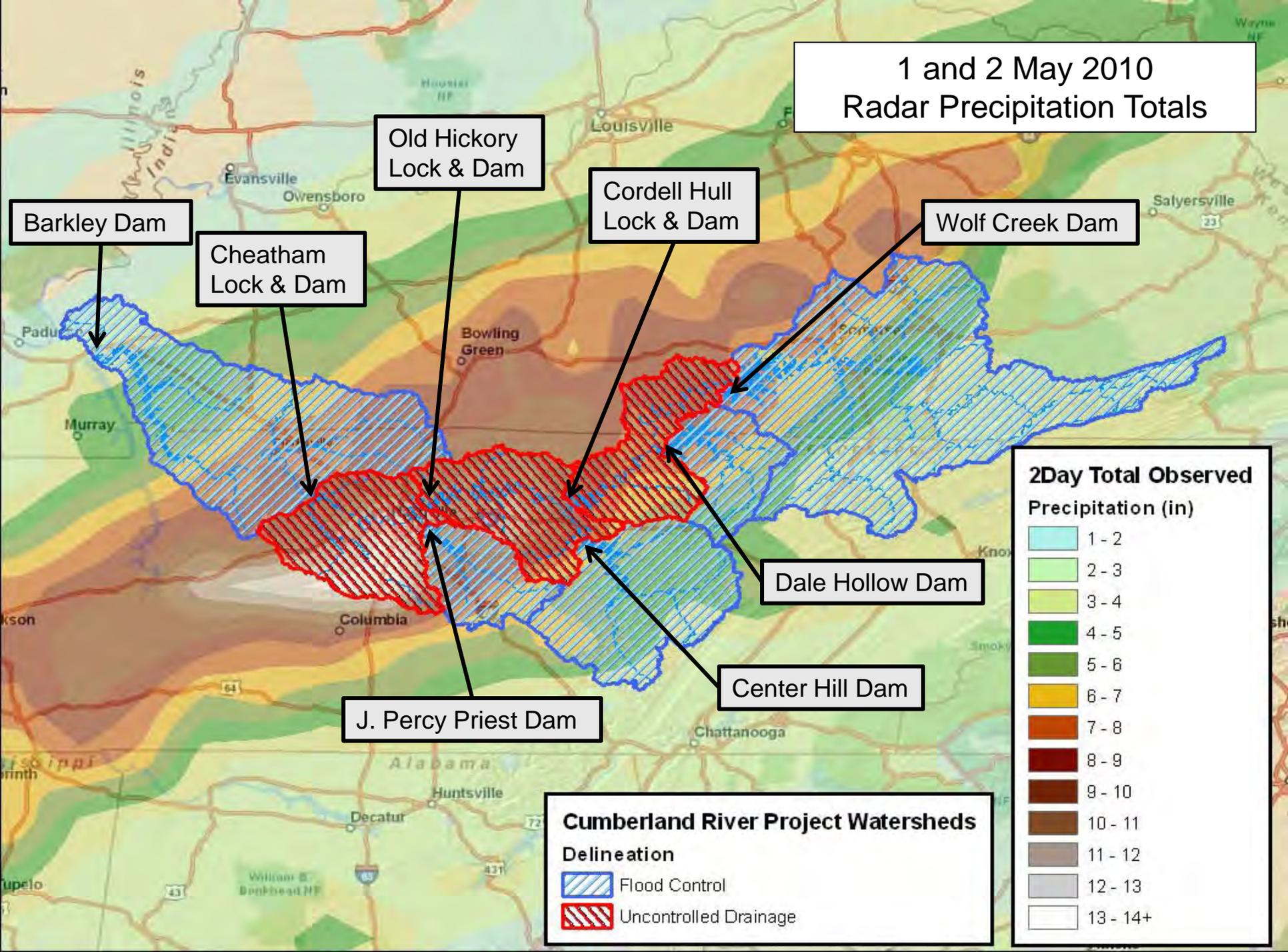
Sunday- 2 May 2010



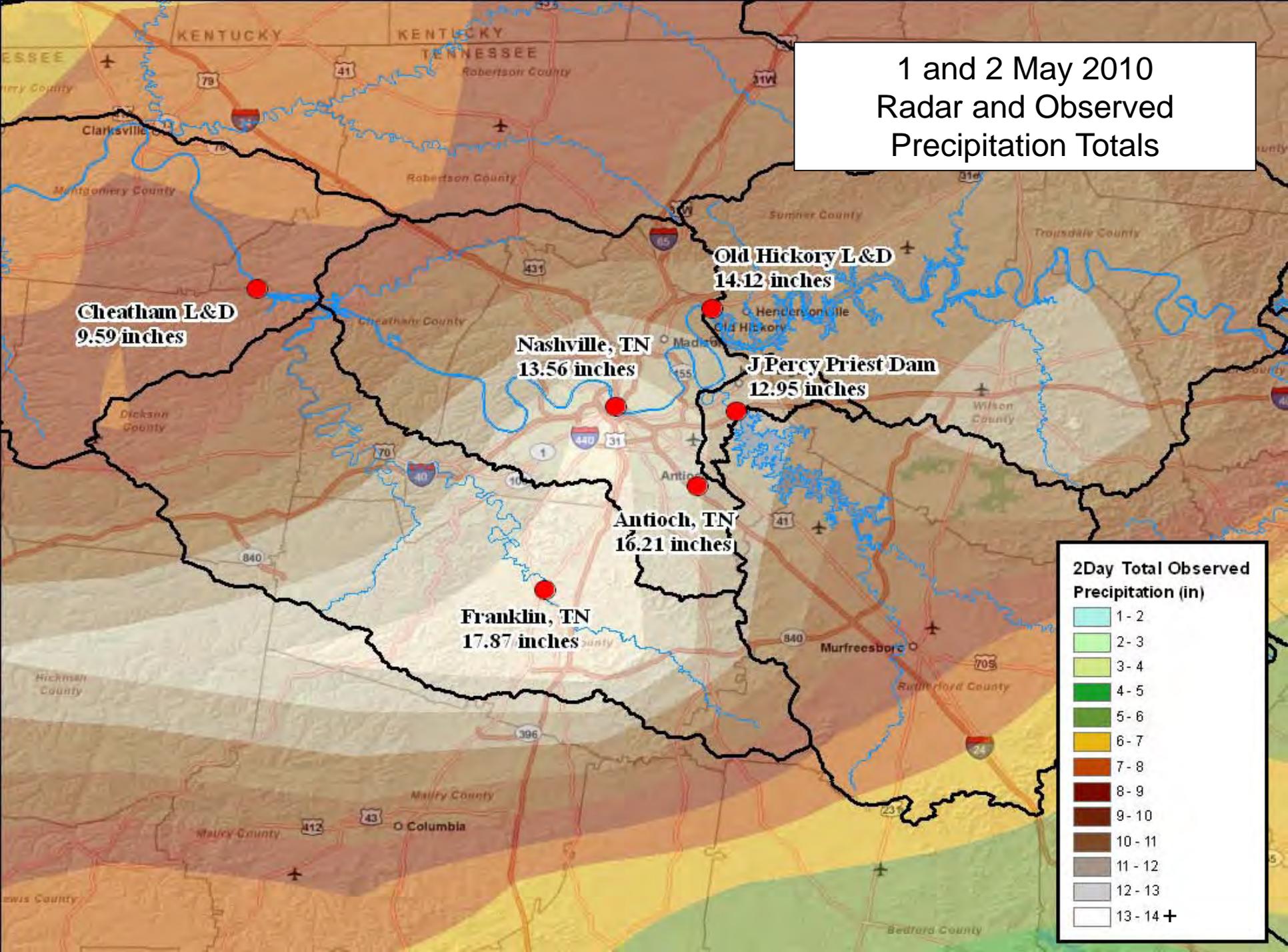
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1 and 2 May 2010 Radar Precipitation Totals



1 and 2 May 2010
Radar and Observed
Precipitation Totals

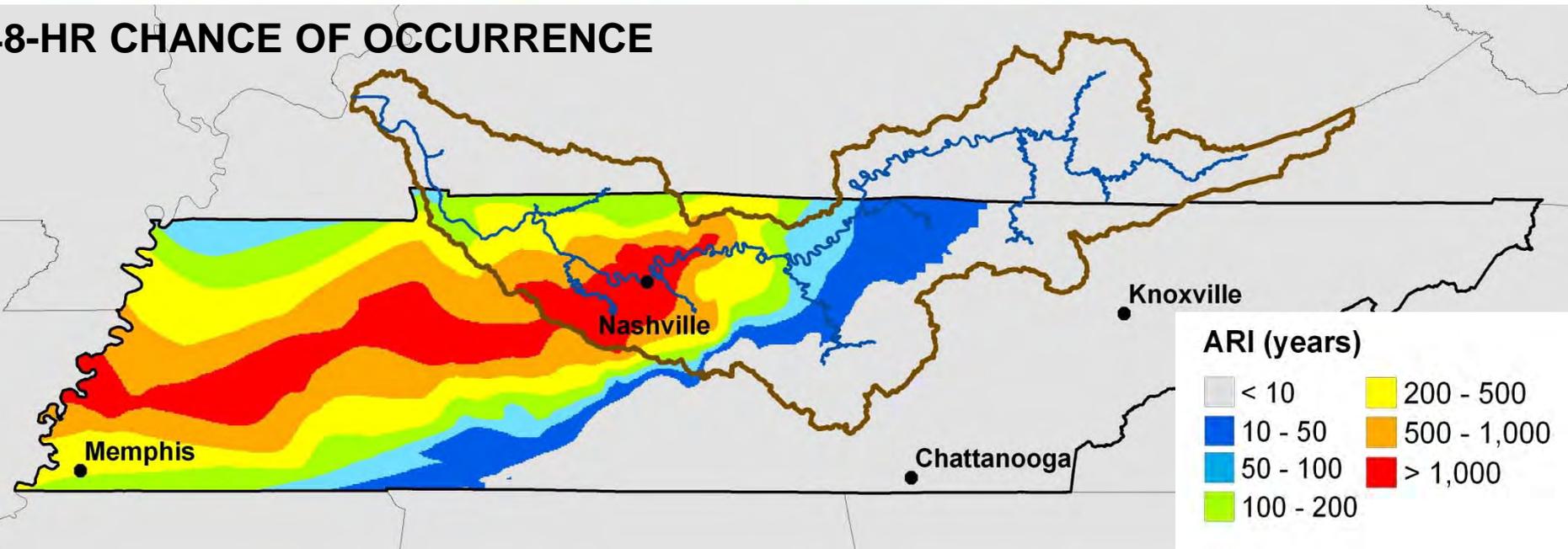


Observed Rainfall May 1-2 and Chance of Occurrence

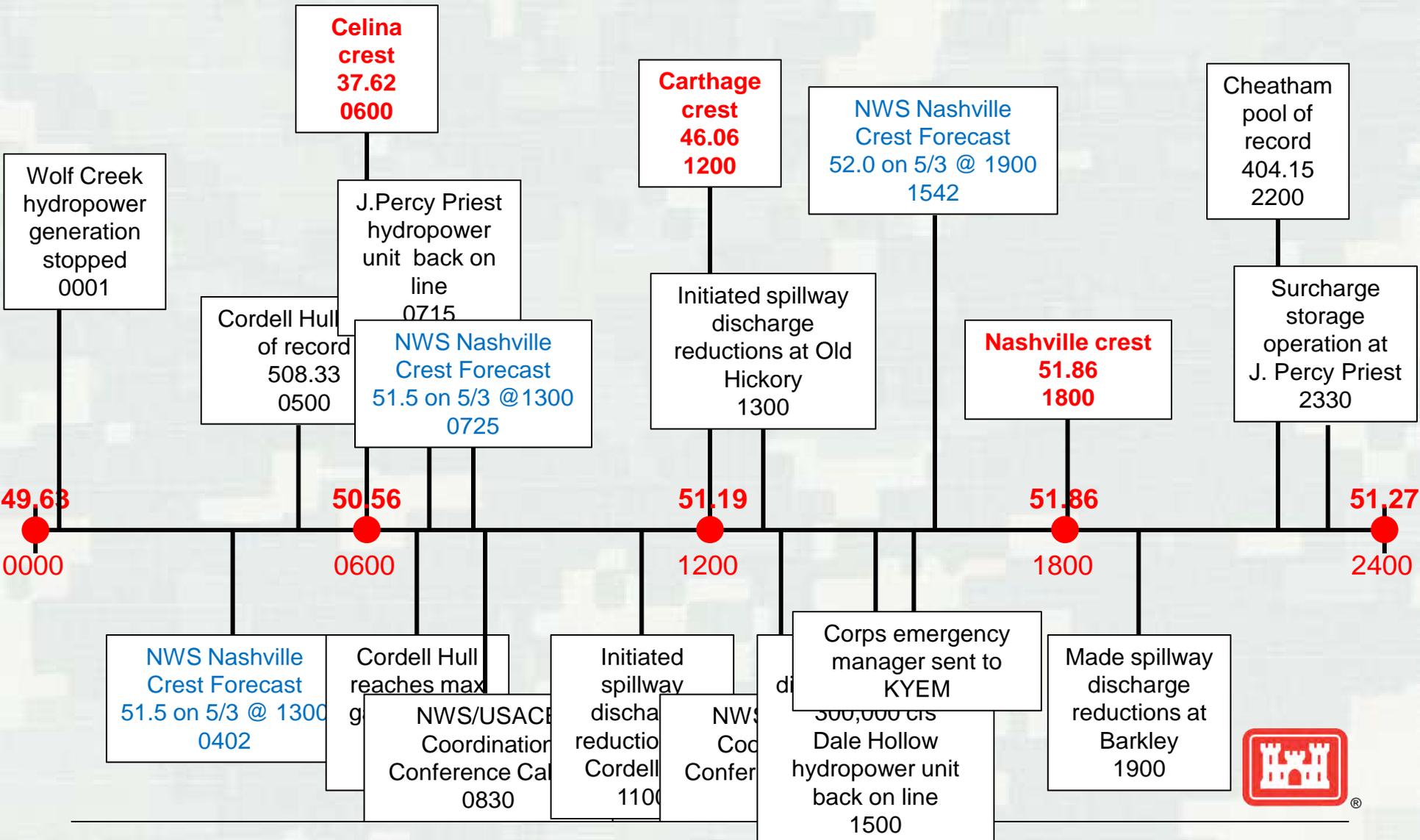
48-HR TOTAL PRECIPITATION



48-HR CHANCE OF OCCURRENCE



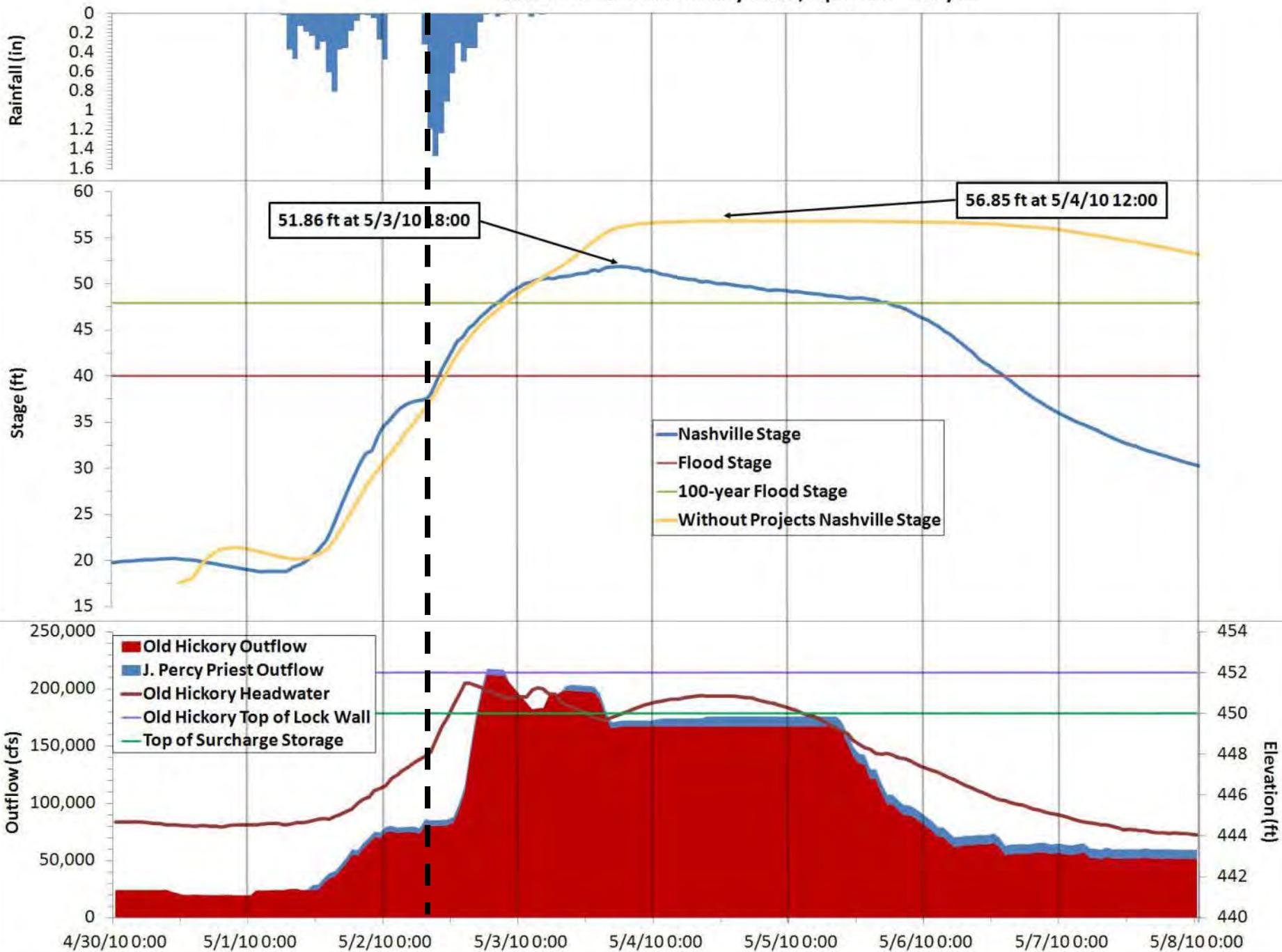
Monday - 3 May 2010





CHEATHAM

Nashville & Old Hickory Lake, April 30 - May 8



Water Stored During May 2010 Flood

Project	Headwater (0600 Saturday)	Headwater Crest	Water Stored (acre-feet)
Wolf Creek¹	682.94	703.86	867,000
Dale Hollow	650.16	657.34	204,000
Center Hill¹	630.44	646.76	279,000
J. Percy Priest	489.36	504.90	278,000
Total			1,628,000²

¹ Wolf Creek and Center Hill Dams have been classified as DSAC 1 dams and are under pool restrictions to assure the stability of the dams.

² This volume of water is roughly equivalent to 530 trillion gallons of water or if stacked on a football field it would be over 1 million feet (207 miles) high.



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Peak Stages and Discharges at Select Uncontrolled Streams

Stream Name	Gauge Name	Peak Stage (ft)	Flow (cfs)	Contributing Drainage Area (mi ²)
Smith Fork Creek	Temperance Hall, TN	26.86 (5/3 @ 0400)	21,020	214
Mill Creek	Woodbine, TN	21.37 (5/1 @ 2030)	28,600	64
Whites Creek	Bordeaux, TN	25.82 (5/2 @ 1130)	~14,000	51
Richland Creek	Nashville, TN	19.99 (5/2 @ 1100)	~9,000	24
East Fork Stones River	Lascassas, TN	32.38 (5/3 @ 0700)	22,517	262
Harpeth River	Kingston Springs, TN	46	~85,000	681
Red River	Port Royal, TN	49.48 (5/3 @ 1000)	~63,000	935



A Tale of Two Floods

Rainfall

Sub-Watershed	11-14 March 1975	1-2 May 2010
Above Wolf Creek Dam	5.9	4.6
Above Dale Hollow Dam	8.1	6.3
Above Center Hill Dam	7.3	4.7
Above J. Percy Priest Dam	8.1	9.6
Cordell Hull Local Drainage Area	7.7	7.2
Old Hickory Local Drainage Area	7.4	9.2
Cheatham Local Drainage Area	7.4	12.1
Barkley Local Drainage Area	6.1	6.3
Total Cumberland Basin Rainfall	6.7	6.4



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Cheatham Local Drainage Area	7.4	12.1
Barkley Local Drainage Area	6.1	6.3
Total Cumberland Basin Rainfall	6.7	6.4



A Tale of Two Floods

Project Data

Location	Elevation (ft)		Discharge (cfs)	
	March 1975	May 2010	March 1975	May 2010
Cordell Hull	508.30	508.33	123,850	130,100
Old Hickory	450.11	451.45	159,000	212,260
Cheatham	398.30	404.15	204,000	240,000
Barkley	361.20	369.00	209,000	303,200



A Tale of Two Floods

Flood Crest

Location	11-14 March 1975	1-2 May 2010
Celina	38.15	37.62
Carthage	46.95	46.06
Nashville	47.64	51.86
Clarksville	57.05	62.58



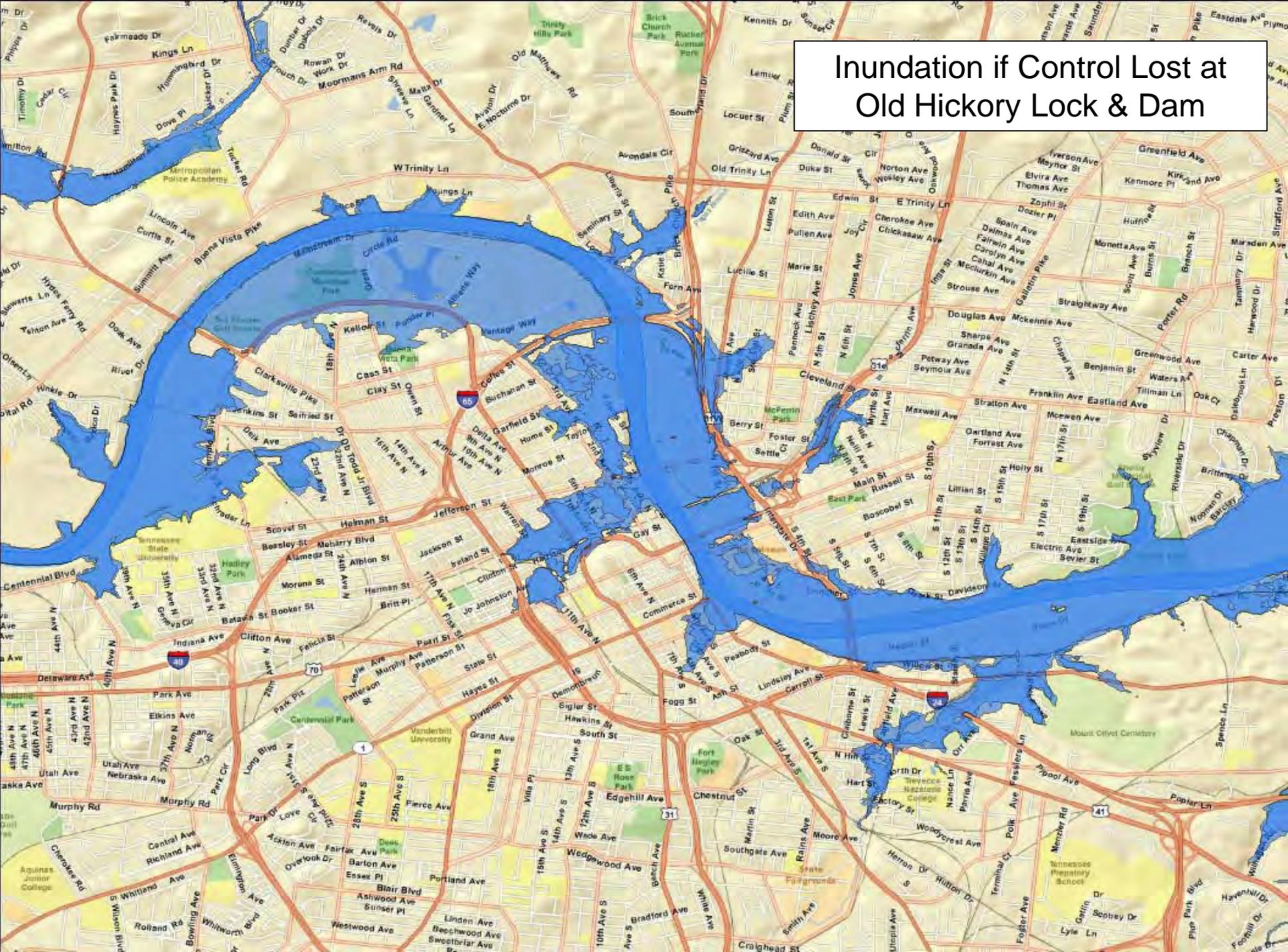
Nashville Area Base Condition



Peak Stage Inundation May 2010 Flood



Inundation if Control Lost at Old Hickory Lock & Dam



Inundation Without Dams Natural Flow Computations



Peak Stage Inundation May 2010 Flood



May 2010 Flood Event

- Rainfall
 - ▶ Greater than 1:1,000 year event over large area
 - ▶ More than double previous 2-day total for Nashville
 - ▶ Produced a flash flood on a major river
- Science pushed to the limit
 - ▶ Rainfall forecasts
 - ▶ Hydrology and hydraulic modeling
- Reservoir system pushed to the limit
 - ▶ Record lake levels at several Cumberland River projects
 - ▶ Record project discharges
 - ▶ Record flood crest for regulated system
 - Nashville - 51.86
 - Clarksville – 62.58
- Lessons Learned
 - ▶ NWS – Service Assessment
 - ▶ Corps of Engineers – After Action Review



Questions?

