The 2026 Smith Mountain Lake Drawdown

An Evidence-Based Reconstruction of the 2026 Smith Mountain Lake Water Level Crisis

ABSTRACT

As of July 9, 2026, Smith Mountain Lake sits roughly 5.6 feet below full pond. This paper reconstructs the drawdown from live monitoring data, USGS stream gauges, PJM market data, and the project's FERC license, to separate what drove it from what the operator, Appalachian Power (APCo), controlled. The dominant cause is hydrologic: a record-dry year drove natural inflow (~330 cfs in July) below the license's 400 cfs minimum release, so the reservoir had to decline. Within that, APCo's operation was largely constrained by the license — releases were cut after two drought triggers, downstream targets were met, and the elevated April releases met a mandated spawning flow — but it was not beyond criticism: in early April the project released measurably above the required target, and the plan leaves its deepest conservation tool unavailable in summer. The picture is a drought forced through a rigid rulebook, with a modest margin the operator could have managed better.

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DOCUMENT	Technical White Paper · Operational Hydrologic Management and Compliance Analysis
SUBJECT	The 2026 Smith Mountain Lake Drawdown
FACILITY	Smith Mountain Pumped Storage Project (636 MW) · FERC No. 2210-169
DATA SOURCES	Water Level Data (AEP) · USGS Gauges · PJM Market Data · FERC License
VERSION / DATE	1.5 · July 14, 2026
CLASSIFICATION	Informational Analysis — not hydrologic or legal advice

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Executive Summary

As of July 9, 2026, Smith Mountain Lake sits roughly 5.6 feet below its 795-foot full pond, prompting public concern — and some direct assertions — that the operator, Appalachian Power (APCo), a subsidiary of American Electric Power (AEP), has mismanaged the project's water level. This paper reconstructs the drawdown from the measured record and the FERC license to separate what caused it from what the operator could control. The lake is low because a record-dry year drove natural inflow below the minimum outflow the project is legally required to release downstream. Whenever inflow drops below the mandated release, the lake must decline — irrespective of the quality of day-to-day operations.

Five findings anchor the analysis. (1) April–July 2026 inflow (~561 cfs) is the lowest in the seven-year record — roughly 45% of a normal year — and July inflow (~330 cfs) has fallen below the license's 400 cfs absolute minimum release. (2) The reservoir's water balance turned negative in April and has stayed negative, losing 190–620 cfs each month. (3) Outflow was actively reduced by roughly half after two drought triggers were declared and now runs below its normal summer release level. (4) Downstream flow targets at the Brookneal compliance gauge are being met or exceeded. (5) The one month of elevated releases — April — corresponds to a federally mandated striped-bass spawning flow, not discretionary generation, though in early April the project released measurably above even that mandated target. Taken together, the drawdown was driven mainly by drought acting through a rigid set of flow rules, with the operator's own discretionary contribution small but not zero.

Because the binding constraint is the rulebook rather than day-to-day operation, the recommendations that follow (Section 8) focus on changing the rules. The central proposals would give the Water Management Plan the drought tools it now lacks — a summer deep-conservation stage, a firm lake-level floor on the order of 792 feet, and a cap holding releases to inflow so the reservoir cannot drain through its own outflow — supported by earlier, better-calibrated drought forecasting, a drought-contingent review of the spring spawning drawdown, clearer public communication during a crisis, and a documented account of the drawdown's economic toll on the region. Because each shifts water from downstream flow toward reservoir storage, they would be pursued through the license's five-year adaptive-management review or, where mandated flows are affected, a formal FERC license amendment with the concurrence of Virginia DEQ, DWR, and the U.S. Fish and Wildlife Service.

1. Background: The Smith Mountain Project

1.1 Facilities and operation

The Smith Mountain Project is a 636-megawatt (MW), two-dam, two-reservoir combined pumped-storage and conventional hydroelectric project on the Roanoke River in Bedford, Campbell, Franklin, and Pittsylvania counties, Virginia. It is licensed to Appalachian Power (APCo), a subsidiary of American Electric Power (AEP), under FERC Project No. 2210-169. The upper development — Smith Mountain — is a 235-foot-high, 816-foot-long concrete arch dam with a crest elevation of 812.0 feet NGVD, impounding the roughly 20,260-acre Smith Mountain Lake at a full pond elevation of 795.0 feet. Its powerhouse holds five generating units: two conventional and three reversible pump/turbine units, giving the 586-MW pumped-storage capability. The lower development — Leesville — is a 50-MW conventional plant impounding Leesville Lake (full pond 613.0 feet), which also re-regulates the pulsed releases from Smith Mountain before water continues downstream.

Under normal operation the project uses up to a 2-foot drawdown in Smith Mountain Lake and up to a 13-foot drawdown in Leesville Lake. Under high-inflow conditions, APCo coordinates with the U.S. Army Corps of Engineers for flood control, operating Leesville to limit flood flows at Altavista, Virginia to 20,000 cfs. Under low-flow conditions — when inflow is less than outflow — the level of Smith Mountain Lake drops while generation continues, which is precisely the regime observed in 2026.

1.2 The pumped-storage cycle

Functionally, the project is a large grid-scale battery. During peak electricity demand, water is released through the Smith Mountain turbines into Leesville Lake, generating power; during off-peak hours (typically overnight), the reversible units pump water back uphill from Leesville into Smith Mountain, ready to generate again. As a result, the two lake levels rise and fall daily, and the difference between the actual and "adjusted" Smith Mountain level — the latter being what the level would be if the water held in Leesville for pump-back were returned — can be several inches. The net water that permanently leaves the system does so at Leesville Dam, and the project's downstream flow obligations are therefore measured downstream, on the Roanoke River at the USGS Brookneal gauge.

1.3 Licensing and the Water Management Plan

FERC issued the current 30-year license on December 15, 2009, effective April 1, 2010. Central to it is the Water Management Plan (WMP), developed by a multi-party Water Management Working Group that included APCo, Virginia DEQ, Virginia DGIF (now DWR), Virginia DCR, the U.S. Fish and Wildlife Service, the Army Corps, the lake associations, and Dominion. The WMP governs downstream releases through a set of monthly minimum-flow targets and a drought-response protocol of escalating "triggers," driven by the Roanoke River Basin Reservoir Operations Model — a probabilistic forecast of Smith Mountain Lake elevation re-run at least every three days. The license also requires a five-year adaptive-management review, which is the formal channel through which the flow rules can be revisited.

2. Question and Method

This paper asks a single question — is the low lake level at Smith Mountain Lake the product of operational choices or of hydrology — and answers it from the measured record cross-referenced with the license. The data spans 2020 to present at up to 15-minute resolution and were queried live from the project monitoring database.

2.1 Data sources

Lake Levels — forebay elevation for Smith Mountain and Leesville, against the 795 ft and 613 ft full ponds.

Inflow — SML+ estimation model applied to four USGS tributary discharge gauges (see Section 2.2).

Outflow — measured Leesville Dam tailwater release, in cfs.

Downstream Flow — USGS 02062500, Roanoke River at Brookneal, the license compliance point.

Rainfall — daily basin precipitation from 23 active PRISM/GHCND stations across the watershed.

PJM Energy Prices — AEP-zone locational marginal price ($/MWh), for dispatch economics.

FERC License — Smith Mountain Project 2210-169 order and Water Management Plan: trigger definitions, target flows, and minimum-release provisions.

2.2 The inflow model

Natural inflow to the project is not gauged directly; it is estimated from tributary discharge using the SML+ linear algorithm, inflow ≈ 1.296 × (sum of four gauged flows) + 13 cfs. The four gauges are the Roanoke River at Niagara, Back Creek near Dundee, the Blackwater River near Rocky Mount, and the Pigg River near Sandy Level (identifiers in Appendix A). The downstream Roanoke gauge at Altavista and Goose Creek are excluded, as they lie below the reservoirs. All inflow figures in this paper are monthly means of this model; because it is an estimate, inflow carries more uncertainty than the measured level, outflow, and Brookneal gauged flow.

3. Findings

3.1 Lake-level trajectory

Monthly average lake level rose to 792.6 ft in March on late-winter runoff, then slid to roughly 789.4 ft by July 9 — a drop of roughly 3 feet in four months, and about 5.6 feet below the 795 ft full pond. The steepest decline came in April and May, coinciding with the drought-trigger declarations. Even so, the reservoir remains well above its all-time record low of 787.60 ft, set in January 1970.

Image 1 - Smith Mountain Lake Water Level (April 1st through July 9th, 2026). Includes Trigger 1 declared on April 27th, 2026 and Trigger 2 declared on May 11th, 2026.

3.2 Natural inflow collapsed — a record-dry year

Estimated inflow fell from 1,311 cfs in February to 397 cfs in June and 330 cfs in July, a decline of roughly 75%. Set against the prior six years, 2026 is a stark outlier.

Year (Apr–Jul)	Estimated inflow (cfs)
2020	4,545
2021	1,340
2022	1,253
2023	1,491
2024	891
2025	1,253
2026	**561**

Table 1 - April–July mean inflow by year. 2026 is the lowest in the record — ~45% of a typical year and well below even the prior dry year (2024). Meteorologists have estimated the watershed is roughly 12 inches of precipitation below normal.

3.3 The water balance turned negative in April

Placing inflow, outflow, and level side by side reveals the mechanism directly. Through the wet winter the reservoir gained water; from April onward, outflow exceeded inflow every month and the lake lost water accordingly. April's −618 cfs was the year's worst monthly deficit, and the deficits since have been sustained rather than transient.

Month	Inflow (cfs)	Outflow (cfs)	Net (cfs)	SML level (ft)
Jan	602	893	−291	791.58
Feb	1,311	767	+544	791.10
Mar	1,031	802	+229	792.64
Apr	634	1,252	**−618**	792.20
May	661	855	−194	790.32
Jun	397	621	−224	790.31
Jul	330	584	−254	789.75

Table 2 - 2026 monthly water balance. Positive net = lake gains water; negative = lake loses water. Inflow modeled; outflow and level measured.

3.4 Historical drought context

Drought is a recurring feature of this watershed, not a novel event. Under the Water Management Plan, releases have previously been reduced during the droughts. Smith Mountain Lake historically experiences drought roughly every five to seven years, occasionally lowering levels by as much as five to seven feet. What distinguishes this year in the monitoring record is the depth of the inflow deficit rather than the operational response, which follows the same protocol used in prior droughts.

The table below lists the ten lowest water-level readings in the recorded history of Smith Mountain Lake, combining Appalachian Power (APCo) published annual minimum reservoir elevations, available going back to 1966, with high-resolution readings from the SML+ database for the years beyond APCo's published coverage. Elevations are in feet above mean sea level (NGVD 29 datum), where full pond is 795.0 ft.

Rank	Min. Elevation (ft)	Below Full Pond (ft)	Date	Source
1	787.60	7.40	Jan. 23, 1970	APCo
2	788.30	6.70	Oct. 21–22, 1977	APCo
3	788.52	6.48	Nov. 28, 2001	APCo
4	788.64	6.36	Jul. 7, 2026	SML+ Database
5	788.70	6.30	Oct. 18, 1968	APCo
6	788.83	6.17	Jan. 11, 2002	APCo
7	789.03	5.97	Nov. 29, 2012	APCo
8	789.11	5.89	Dec. 9, 1998	APCo
9	789.30	5.70	Jan. 17, 1981	APCo
10	789.40	5.60	Dec. 5, 1980	APCo

Table 3 - The 2026 figure is drawn from the live gauge in the SML+ database and reflects the ongoing drought; it is the lowest reading recorded through July 10, 2026; the 788.64 ft trough was reached July 7 at 21:58 EDT.

3.5 Operations responded: releases were cut

The Smith Mountain Project declared Trigger 1 on April 27 and Trigger 2 on May 11. Following the triggers, monthly outflow was reduced from its April peak of ~1,252 cfs to ~855 (May), ~621 (June), and ~584 cfs (July) — roughly a 50% reduction. The daily record shows the reduction concretely: around June 24 the Leesville release steps down from ~658 cfs to ~575 cfs and holds there, below the 650 cfs weekend recreation-release level — a reduction permissible only because the triggers are active. Meanwhile the lake continues its slow decline, because even the reduced release exceeds the collapsed inflow.

Date	Leesville release (cfs)	SML level (ft)
Jun 18	658	790.19
Jun 20	658	790.09
Jun 22	634	790.01
Jun 24	575	790.04
Jun 26	607	789.56
Jun 28	574	790.00
Jun 30	576	789.88
Jul 2	597	789.68
Jul 4	620	789.54
Jul 6	496	789.43
Jul 8	499	789.12

Table 4 - Daily Leesville release and Smith Mountain level, mid-June through July 8. The step-down to ~575 cfs is the operational response to Trigger 2; APCo reports exceeding required releases only twice in the prior year, both mandated PJM capacity tests.

3.6 The regulatory framework: triggers, minimum flows, and water quality

The license constrains outflow through several overlapping provisions. Downstream flow targets at Brookneal step down by trigger stage (Table 5). Beneath all of them sits an absolute minimum Leesville release of 400 cfs (March–October) and 375 cfs (November–February). Additional obligations govern water quality and fish: the license requires operating the Smith Mountain units from July through September to meet Virginia's 4.0 mg/L dissolved-oxygen standard downstream (drawing from higher in the water column), and it mandates elevated spring flows for striped-bass spawning.

Month	Normal	Trigger 1	Trigger 2	Trigger 3
Jan	1,100	990	990	770
Feb	1,100	990	990	770
Mar	1,100	935	825	770
Apr	1,500	1,275	1,200	1,050
May	1,500	1,275	1,200	1,050
Jun	900	765	765	630
Jul	700	595	560	490
Aug	650	570	570	420
Sep	550	550	550	385
Oct	600	570	570	420
Nov	700	595	560	490
Dec	800	720	720	560

Table 5 - Brookneal target flows (cfs) by month and trigger stage, per FERC Condition D.7. The 400 cfs absolute minimum release applies beneath all values. Orange shading indicates months where Trigger 3 is not available.

The trigger definitions (Condition D.5) act on the adjusted, pump-back-corrected lake level: **Trigger 1** at a ≥20% chance of dropping below 790.5 ft within 16 weeks; **Trigger 2** at a ≥2% chance of dropping below 790.0 ft within 10 weeks; and **Trigger 3** — critically date-locked — only in two circumstances: when the adjusted level drops below 791.0 ft after September 30, or when Trigger 2 is already in effect and the adjusted level is below 795 ft (full pond) between December 1 and March 31. **Because Trigger 3 can only be activated between fall and early spring, the**

deepest conservation stage cannot be declared during a summer drought, leaving the strongest water-saving tool unavailable at exactly the season of peak evaporation and recreation demand.

The core arithmetic follows directly: July inflow (~330 cfs) is below the 400 cfs absolute floor. The project cannot legally release less water than nature is delivering, so the lake must decline regardless of management quality. The triggers can slow the decline; they cannot reverse a deficit driven by inflow below the mandatory release.

3.7 Downstream targets are being met

The Brookneal gauge confirms compliance as well as data integrity. Flows meet or exceed the applicable trigger-reduced target every month except May, which lands ~2% under the spawning-season target during the trigger-transition month — a shortfall well within the plan's target-flow and estimated-accretion tolerances.

Month	Applicable trigger	Target (cfs)	Actual (cfs)	Result
Jan	Normal	1,100	1,174	**Meets**
Feb	Normal	1,100	1,481	**Meets**
Mar	Normal	1,100	1,329	**Meets**
Apr	Normal	1,500	1,628	**Meets**
May	Trigger 2	1,200	1,180	**~2% under**
Jun	Trigger 2	765	788	**Meets**
Jul	Trigger 2	560	744	**Exceeds**

Table 6 - Actual Brookneal flow (USGS 02062500) vs. the applicable FERC target, 2026. Targets are flows the operator works to meet at Brookneal using estimated tributary accretion.

The daily accretion check underlying these figures is shown below. In July, Brookneal runs ~745 cfs against a Trigger 2 target of only 560 — downstream is well served with margin, not shorted, which is inconsistent with a theory of the operator starving the river to hoard water.

Date	Leesville (cfs)	Brookneal (cfs)	Intervening (cfs)
Jun 23	604	816	212
Jun 25	577	746	169
Jun 27	599	719	120
Jun 29	574	785	211
Jul 1	576	749	173
Jul 2	597	723	126
Jul 4	620	780	160
Jul 6	496	603	107
Jul 8	499	629	130

Table 7 - Leesville release vs. Brookneal flow, with the implied intervening tributary accretion. The consistently positive gap validates the gauge and the compliance comparison.

3.8 The April releases and the spawning mandate

April's ~1,252 cfs outflow — the year's highest, during already-low inflow, producing the worst monthly deficit just before Trigger 1 — was the single data point most consistent with over-releasing. The license accounts for it. April–May is striped-bass spawning season, for which the plan mandates a 1,500 cfs Brookneal target (1,200 under Trigger 2) and requires surcharging the lake to elevation 795.3 ft by April 15 to supply the spawning run. The elevated April releases therefore met a required environmental flow rather than reflecting discretionary generation — though, as Section 4 examines, the project released somewhat above even that mandated level.

3.9 Pumped-storage economics

Because the operator is financially incentivized to generate when power is valuable, one might suspect economic over-generation is draining the lake. The price data argues otherwise. The AEP-zone PJM real-time price averaged about $45.50/MWh over April–May and roughly $54.50 in June, spiking as high as $544–$930/MWh in scarcity hours; at full 636 MW output a $500/MWh hour is worth on the order of $318,000. But during drought the reduced head between the reservoirs constrains generation, and the water leaving the system is set by the mandated downstream minimum rather than by price opportunity. In short, the flows are regulatory, not opportunistic — discretionary generation is not what is emptying the reservoir.

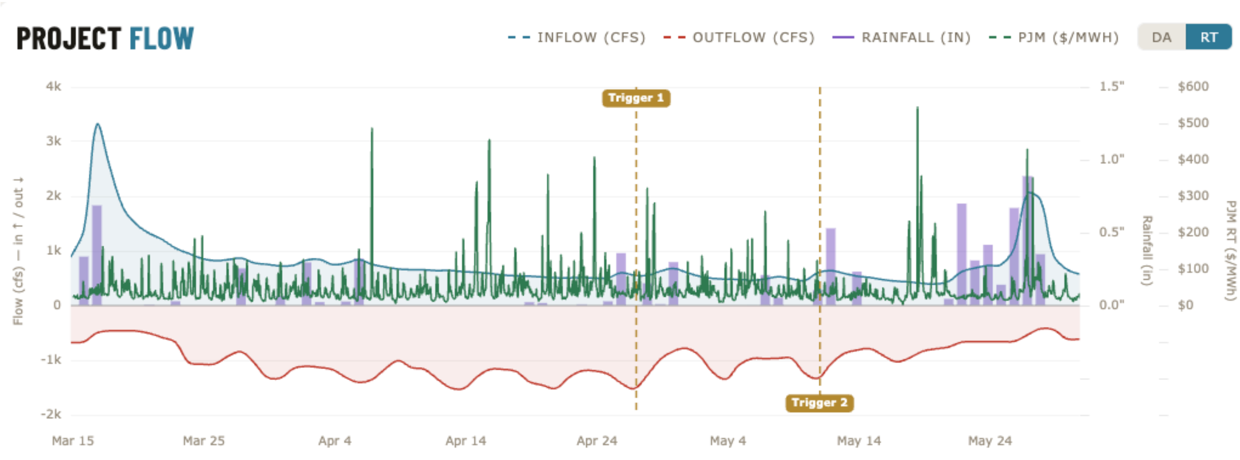

Image 2 - Smith Mountain Project flow (March 15th through May 31st, 2026). Includes PRISM historical rainfall data and PJM locational price ($/MWh).

4. What could the operator have done differently within the existing rules?

A separate and more pointed question is whether APCo, operating entirely within the rules as they stood, could have managed operations differently. Three observations, in decreasing order of how firmly the data supports them.

First, and most concretely, in the first half of April the project released measurably more water than the mandated spawning flow required. The normal April target is 1,500 cfs at Brookneal, and no drought trigger was yet in effect; yet actual Brookneal flow ran 1,600–1,900 cfs on most days from April 1–15. Because trimming the Leesville release lowers Brookneal nearly one-for-one, the excess above the 1,500 cfs target totaled roughly 2,876 cfs-days — about 0.29 ft of lake elevation — released above what the license required. This point does not depend on reducing the spawning mandate; it is simply that the target could have been met rather than exceeded. It must, however, be bounded honestly: the tributary inflow between Leesville and Brookneal was elevated and variable as the mid-March storm receded (200–780 cfs day to day), and that flow is estimated in real time, so some overshoot is an unavoidable artifact of aiming at a downstream target through a noisy signal. Crediting a reasonable estimation buffer, the clearly discretionary excess is smaller, on the order of 0.14 ft. The defensible conclusion is a range: with tighter real-time targeting, roughly 0.15 to 0.3 ft of the drawdown was avoidable within the existing rules.

Second, APCo released rather than banked the mid-March storm. A large rain event lifted the lake to its yearly peak of 793.2 ft on March 31; rather than retaining that windfall as inflow began to fade, the project drew the lake back down through early April to meet and exceed the spawning flow. A more drought-anticipatory operator, reading the same declining-inflow signal, might have held more of that water against the summer. This is a judgment about operating philosophy, not a rule violation, and it overlaps with the over-target releases above rather than adding cleanly to them.

Third, the timing of the drought response can be questioned even if it cannot be conclusively faulted. Inflow fell steadily through April — a legible warning — yet full spawning releases continued until Trigger 1 was declared on April 27. As Section 5 shows, earlier conservation would have banked one to one-and-a-half feet. Whether earlier action was warranted turns on APCo's OASIS forecast model, which is not in the record; the trigger is forecast-driven, and flow data alone cannot show its threshold was crossed sooner. This remains an open question the operator is positioned to answer and the public is not.

Set against these is what the data does not support: a broad indictment. The project captured the mid-March storm rather than passing it through, cutting releases to roughly 475 cfs during a 3,300 cfs inflow spike; its releases tracked the flow targets rather than power prices, so it was not generating opportunistically; and the two instances of releasing above requirement over the year were mandated grid-reliability tests. The critical verdict is therefore specific rather than sweeping: APCo's spring operation was defensible but not optimal, and sharper, more drought-aware operation could plausibly have preserved a fraction of a foot — or, if the trigger timing is also faulted, which the data cannot settle, perhaps a foot. That margin is real and worth pressing. But it sits atop a far larger drawdown driven by the mandated spawning flow and the structural absence of any deep-conservation option in summer — the rules themselves, which are the proper target of the recommendations that follow.

5. What if Analysis: What If the Drought Triggers Had Been Invoked Earlier?

The finding that April's elevated releases were a mandated spawning flow (Section 3.8) invites a natural question: how much higher would the lake stand today if the drought triggers — which reduce the required spawning flow — had been invoked before, rather than during, the April–May spawning window? Because the triggers were declared on April 27 and May 11, most of that window ran at the normal, unreduced spawning target. This section estimates the counterfactual and pressure-tests it against the daily flow record.

5.1 Method

Reducing the downstream release keeps that water in the project; because Smith Mountain Lake holds nearly all of the project's storage, retained water raises its level. For each trigger stage, the water retained is the amount by which the actual daily flow at Brookneal exceeded that stage's target, summed over April and May, and capped so that the Leesville release never falls below its 400 cfs absolute floor. The retained volume (in cfs-days) is converted to acre-feet (1 cfs-day ≈ 1.98 acre-feet) and then to feet of lake rise using the reservoir's surface area (~19,000–20,260 acres; the range reflects the surface shrinking as the level falls). Inflow and all post-April releases are held at their actual measured values — this is a water-accounting counterfactual, not a re-run of the forecast model or the trigger logic.

5.2 Results

Two features of the daily record shape the outcome. First, the 400 cfs floor barely binds: the lowest actual daily release across April and May was 423 cfs, so even the deepest Trigger 3 reduction loses only ~3% of its potential water to the floor. Second, although May's average flow sat below the Trigger 1 and 2 targets, individual high-flow days in May still exceeded them — so May contributes modestly under every scenario, a contribution that the monthly averages had concealed. The water retained, and the resulting rise, are summarized below.

Scenario	Spawn target (Brookneal)	Water retained (cfs-days)	Acre-feet	Lake rise
Trigger 1	1,275 cfs	11,935	~23,700	**~1.2 ft**
Trigger 2	1,200 cfs	14,700	~29,200	**~1.5 ft**
Trigger 3	1,050 cfs	21,520	~42,700	**~2.2 ft**

Table 8 - Water retained and resulting lake rise, by trigger stage applied through the April–May spawning window. Retained water is measured (daily flow above target, floor-capped); the rise is that volume divided by the lake's surface area.

Carried forward — the retained water stays in the lake through the summer — these translate into the counterfactual mid-summer levels below, each compared against the actual measured level.

Month-end	Actual (ft)	Trigger 1 (ft)	Trigger 2 (ft)	Trigger 3 (ft)
April 30	791.05	~792.1	~792.4	~792.8
May 31	790.92	~792.1	~792.4	~793.1
July 9 (now)	**789.39**	**~790.6**	**~790.9**	**~791.6**

Table 9 - Actual vs. counterfactual lake level (month-end). The retained water accrues through April and is fully banked by May, then carries forward at a roughly constant offset.

Three conclusions follow. First, and consistent with Section 6, even the most aggressive case does not refill the lake: under Trigger 3 the level today would be about 791.6 ft — roughly 2 feet higher than actual, but still some 3 feet below the 795 ft full pond. Across all three stages the answer sits in a narrow band of about one to two feet. Early conservation of the spawning flow meaningfully slows the drawdown; it does not reverse a drought-driven deficit.

Second, the Trigger 3 case is legally distinct. Trigger 1 and Trigger 2 were available during the spawn — the only question is timing, since they were declared in late April and mid-May rather than at the start of April. Trigger 3, however, is date-locked to fall and winter and cannot be declared in spring under the current license. Its ~2.2-foot result is therefore not something that could have been done under today's rules; it is the quantified payoff — and ceiling — of the summer-conservation gap identified in Recommendation 1. There is also a compounding benefit: holding the lake near 792 ft through the summer would have kept it clear of the 790.5 ft and 790.0 ft trigger thresholds entirely, rather than chasing them downward.

Third, the pressure test surfaced a loss the counterfactual cannot address. The actual drawdown runs somewhat larger than the inflow-minus-release balance alone predicts — by roughly 0.3 ft in April — a gap consistent with summer evaporation off ~20,000 acres of surface and/or uncertainty in the modeled inflow. This does not change the counterfactual difference (retaining water raises the level by the same amount regardless), but it is a real loss term that no release policy can offset, reinforcing the paper's central conclusion.

Finally, the tradeoff must be stated plainly: the retained water is striped-bass spawning flow. The 1,050–1,275 cfs targets are the Water Management Plan's own drought-reduced spawning flows, so the Trigger 1 and 2 scenarios stay within the plan's contemplated range; but Trigger 3's 1,050 cfs is roughly a 35% cut to the spawning flow — the deepest of the three — which is precisely why the license confines that stage to non-spawning months. This analysis quantifies the water side of that tradeoff, not its ecological cost, which the license exists to balance.

6. What Would It Take to Refill Smith Mountain Lake?

The scale of the deficit clarifies why recovery depends on weather rather than operations. Smith Mountain Lake covers roughly 20,260 acres, so raising the level one foot requires about 20,260 acre-feet of net storage gain. One cfs sustained for a day adds about 1.98 acre-feet, so a one-foot rise over 30 days requires a net balance (inflow minus outflow) of roughly +340 cfs sustained for a month. With releases near the recent ~580 cfs, that implies inflow of ~920 cfs; even at the absolute 400 cfs floor, it implies ~740 cfs — roughly two to three times the current ~330 cfs. Recovering the full ~5.6-foot deficit would require on the order of 57,000 cfs-days of net positive balance, i.e., several months of well-above-current inflow or a series of large storm pulses. This is an order-of-magnitude estimate (surface area and the cfs-to-acre-foot conversion are approximate), but the conclusion is robust: no feasible reduction in releases substitutes for sustained, above-normal rainfall.

Translated into rainfall, the same deficit stays daunting. Smith Mountain Lake drains a watershed of roughly 1,000 square miles — about thirty times the lake's own ~32-square-mile surface — and, across the project's own record, only about 40% of the precipitation falling on that basin returns as inflow (in 2025, ~42 inches of basin precipitation yielded the equivalent of ~16 inches of runoff). The ~113,000 acre-feet needed to erase the 5.6-foot deficit amounts to only about two inches of runoff spread over that watershed, which at ~40% efficiency implies roughly five inches of basin-wide rain — but only if none of it continued downstream. Because the mandated releases keep drawing the lake throughout any refill, incoming water must cover both the storage gain and the outflow that continues during recovery; over a realistic two-to-three-month wet period that roughly doubles the figure, to something on the order of eight to eleven inches of above-normal rainfall across the basin — comparable to the ~12-inch precipitation deficit the watershed has already accumulated. Because this figure rests on the measured precipitation-to-inflow relationship rather than on the assumed basin area, it is insensitive to the exact size of the watershed.

Put differently, raising the level 5.6 feet is nominally ~67 inches of water spread over the lake surface alone; it is the roughly thirty-to-one ratio of watershed to lake that lets a much smaller basin-average rainfall do the work. The basin must essentially rain its way back to normal before the lake can return to full pond — which reinforces the section's conclusion from the opposite direction: the operative lever is sustained regional weather, not any single storm and certainly not any adjustment to releases.

7. Conclusion

The drawdown was driven principally by drought acting through the project's flow rules. Inflow is at a multi-year low and has fallen below the mandatory downstream release; releases were cut following the triggers and now run below the normal summer level; downstream targets are being met; and the elevated April releases met a required spawning flow. APCo's operation was largely constrained by the license rather than freely chosen — but not beyond criticism: in early April the project released measurably above the required target (Section 4), and its drought response could have begun sooner. The lake is low because the watershed delivered less water than the project is legally obligated to send downstream, through a rulebook that provides no deep-conservation option in summer. The dominant lever for recovery is sustained rainfall. The remaining levers all involve reallocating a scarce resource — holding more water in the lake means sending less downstream — which is a values tradeoff between lake recreation and downstream environmental uses, not a purely technical decision. Seven recommendations follow, six of them central: open the plan's summer conservation gap so the deepest stage can be used when it is needed most; set a firm lake-level floor — on the order of 792 feet — below which the project shifts to maximum conservation; cap releases at inflow during a declared drought so the reservoir cannot drain through its own outflow; conserve earlier by sharpening the drought forecast; revisit the spring spawning drawdown in drought years; communicate the operating picture openly throughout the crisis; and document the economic toll the drawdown has inflicted on the region's businesses and their employees, as a supporting measure that shows the agencies what the current rules cost.

8. Recommendations

These recommendations are ordered by priority. The first six are the central calls to action of this paper — each supported directly by the evidence above — and the last one is a supporting measure. Their tradeoffs and the process required to pursue each are noted.

1. **Update the Water Management Plan to allow deep conservation during summer droughts.** The plan's deepest conservation stage, Trigger 3, is date-locked to fall and winter and cannot be declared during a summer drought — precisely the season when evaporation and recreation demand peak. Section 5 quantifies the cost of that gap: a Trigger 3-level reduction through the spawn would have retained on the order of 2.2 feet, the largest single lever available. The recommendation is to petition — through the license's five-year adaptive-management review, or a formal license amendment — to add a summer emergency stage, or to permit Trigger 3-level reductions during extreme summer droughts. This is the highest-impact structural change, and also the largest

tradeoff: it reduces the flows that protect downstream aquatic life and dissolved oxygen, and would require the concurrence of Virginia DEQ, Virginia DWR, and the U.S. Fish and Wildlife Service.

2. **Establish an absolute minimum lake-level floor of 792 feet.** Beyond a forecast-driven summer stage, the plan should define a firm elevation — on the order of 792 feet — below which the project shifts to maximum feasible conservation. At about three feet below full pond, that floor sits above the existing Trigger 1 and Trigger 2 threshold levels (790.5 and 790.0 feet on the adjusted level) and above the level reached in most recorded droughts, which have drawn the lake down five to seven feet; it would therefore act as an earlier, firmer backstop than the current forecast-driven triggers, engaging conservation before a deep drawdown rather than during one. Because the lake now sits near 789.4 feet — already below that mark — the floor is necessarily prospective: it would bind in the next drought and require conservation to begin far sooner than it did this year. The central tension, developed in Section 3, is that holding 792 feet through a severe drought cannot be achieved by trimming discretionary releases alone; once inflow falls below the mandated minimum downstream release, defending the floor means releasing below that minimum. The recommendation is to advocate for a defined lake-level floor through the five-year adaptive-management review and, because it modifies the mandated flows, a formal FERC license amendment — one that reorders the license's priorities toward reservoir protection during declared drought emergencies, with the concurrence of Virginia DEQ, Virginia DWR, and the U.S. Fish and Wildlife Service.
3. **Cap releases at inflow to prevent net draining during drought.** The most direct structural safeguard against drawing the reservoir down indefinitely is a balance rule: once a drought stage is declared, outflow may not exceed inflow, so the project cannot lose storage to its own releases. This targets the mechanism documented in Section 3 — that the lake falls whenever the mandated release exceeds the collapsed inflow. The same arithmetic is what makes the rule a major change: with July inflow near 330 cfs at the start of the month, below the license's 400 cfs absolute minimum, an outflow-cannot-exceed-inflow rule would in those conditions require releasing beneath the mandated floor and curtailing the striped-bass spawning and dissolved-oxygen flows the license now guarantees. Adopting it is therefore an explicit choice to prioritize lake storage over downstream flow during extreme drought. The recommendation is to advocate for this cap through the adaptive-management review and, as needed, a FERC license amendment — paired with a clear drought-emergency trigger to activate it and reasonable protections for critical downstream health — recognizing that it trades downstream aquatic protection for reservoir stability at exactly the moment both are most stressed.
4. **Conserve earlier and improve trigger timing.** The counterfactual in Section 5 shows that holding the April–May spawning releases to a trigger-reduced level would have left the lake roughly one to one-and-a-half feet higher today — water that was released before the triggers took effect on April 27 and May 11. This does not, by itself, prove the triggers should have fired sooner: they are forecast-driven, and the predictive model governs their timing. But it does establish two things firmly — that earlier conservation would have measurably helped, and that the accuracy and timing of the forecast is therefore the single most important thing to get right. The priority is a better-calibrated, earlier-warning precipitation and inflow forecast, built on the tributary gauges, precipitation forecast, and the Brookneal gauged outflow, together with a formal review of how the trigger thresholds and the sixteen-week forecast horizon performed in this event. Early action compounds over months, and this is the lowest-conflict lever — it requires no change to the downstream-flow obligations themselves.
5. **Revisit the spring spawning drawdown in drought years.** The April–May spawning flows are the year's highest targets and consume substantial water immediately before summer. A drought-contingent provision that scales back the spawning obligation when a drought is already forecast could bank water for the recreation season. The tradeoff is to striped-bass reproduction downstream, and any change would require agency buy-in.
6. **Make operational communication a priority during a water-management crisis.** Much of the public concern that the project has been mismanaged stems not from the operations themselves — which this analysis finds to

be within the license — but from the absence of a clear, public account of the drought-versus-obligation picture. During a crisis like the current one, proactive communication is not a courtesy; it is a core part of water management. APCo should publish, and keep current, an accessible operating picture: lake level against full pond, the inflow-versus-outflow balance, the active trigger and what it requires, and actual downstream flow against target. Making the mandatory-minimum arithmetic visible — that inflow has fallen below the flow the project must legally release — would replace speculation with evidence and equip the community to engage the five-year review on substance rather than sentiment.

7. **Document the regional economic impact and put it before the agencies.** A drawdown of this depth is not merely an inconvenience; it is an economic event. Smith Mountain and Leesville Lakes are the economic engine of a four-county region — Franklin, Bedford, Pittsylvania, and Campbell. The 2026 drawdown has forced a broad and involuntary loss on the businesses that depend on it and the people they employ. Short-term rentals sit canceled or unbookable; home sales have stalled and waterfront values softened; restaurants customers can no longer reach by water have lost covers and bar sales; boat sales are deferred; marina, fuel, and retail volume are down; and a tourism season, once missed, cannot be recovered. These losses fall hardest on the hourly and seasonal workforce, which absorbs them as lost shifts rather than as a soft quarter. The Water Management Plan balances downstream environmental flows against generation, but it carries no mechanism for weighing this: the regional economy is governed by the plan without being represented in it. The recommendation is that the lake communities and the four-county region compile a documented, sector-by-sector account of the 2026 losses and place it before FERC, Virginia DEQ, and Virginia DWR through the review process and the P-2210 docket. Recommendations 1 through 6 ask the agencies to reallocate a scarce resource; evidence of what the current allocation costs the region is what that case requires, and it is the one input no agency can supply on the region's behalf.

9. Limitations

This analysis draws on operational monitoring data and the license text; it is not a hydrologic or legal review, and no professional hydrologic, engineering, or legal opinion should be inferred from it. Inflow is a modeled estimate rather than a measured quantity. The Brookneal targets are flows the operator works to meet using an estimated intervening-flow component, so the monthly comparisons here constitute a strong consistency check rather than a line-by-line compliance audit. The exact reduced-flow caps applicable at each trigger stage, and any license amendments issued after the 2010 effective date, should be confirmed against the current FERC eLibrary record before any recommendation is formally advanced. Finally, any change to the flow rules is a policy decision reserved to FERC, APCo, and the resource agencies; this paper aims to inform that decision, not to substitute for it.

Appendix A - Data Sources and Identifiers

Role	Station / Node	Identifier	Source
Inflow Gauge	Roanoke River at Niagara, VA	USGS 02056000	https://waterdata.usgs.gov/monitoring-location/USGS-02056000
Inflow Gauge	Back Creek near Dundee, VA	USGS 02056650	https://waterdata.usgs.gov/monitoring-location/USGS-02056650
Inflow Gauge	Blackwater River near Rocky Mount, VA	USGS 02056900	https://waterdata.usgs.gov/monitoring-location/USGS-02056900
Inflow Gauge	Pigg River near Sandy Level, VA	USGS 02058400	https://waterdata.usgs.gov/monitoring-location/USGS-02058400
Downstream Compliance	Roanoke River at Brookneal, VA	USGS 02062500	https://waterdata.usgs.gov/monitoring-location/USGS-02062500
Downstream Reference	Roanoke River at Altavista, VA	USGS 02060500	https://waterdata.usgs.gov/monitoring-location/USGS-02060500
Price Node	AEP transmission zone (PJM)	pnode 8445784	https://dataminer2.pjm.com
Historical Water Level	Smith Mountain Lake	Minimum Elevation	https://www.smithmtn.com/lake-levels/ https://sml.plus
Precipitation	23 active basin stations	PRISM / NOAA GHCND	https://prism.oregonstate.edu/

Table A1 - Gauges, pricing node, water level, and precipitation network used in the analysis.

Sources: SML+ monitoring database (levels, inflow model, Leesville release, Brookneal gauge, PJM prices), queried July 10, 2026; FERC Order Issuing New License, Appalachian Power, Project No. 2210-169 (Dec. 15, 2009) and the associated Water Management Plan; USGS National Water Information System; PRISM historical precipitation; PJM Data Miner. Prepared as an informational analysis.

Appendix B - Key License Provisions Referenced

1. **Absolute minimum Leesville release:** 400 cfs (Mar–Oct), 375 cfs (Nov–Feb).
2. **Summer recreation release (weekends/holidays):** 650 cfs from Leesville for 12 hours on Saturdays, Sundays, and the Memorial Day, July 4, and Labor Day holidays (June–August); biological targets at Brookneal apply otherwise.
3. **Striped-bass spawning:** elevated flows mid-April to June 1; surcharge to 795.3 ft by April 15; 1,500 cfs Brookneal target.
4. **Dissolved oxygen:** operate Smith Mountain units July–September to meet Virginia's 4.0 mg/L DO standard downstream.
5. **Drought triggers (Condition D.5):** probabilistic thresholds on the adjusted lake level; Trigger 3 confined to fall/winter.
6. **Monitoring & reporting (Condition G):** annual report tabulating trigger status, adjusted elevation, mean daily Leesville release, and target flow.
7. **Adaptive management:** five-year review cycle for the Water Management Plan.