US Army Corps of Engineers ®
Wilmington District

# PHILPOTT LAKE, VIRGINIA
# WATER STORAGE REALLOCATION
# INTEGRATED FEASIBILITY STUDY AND ENVIRONMENTAL ASSESSMENT

**APPENDIX B: HYDROLOGIC AND HYDRAULIC ANALYSIS**
**Final Report**
**February 2023**

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## 1.0 General

This study investigated the feasibility of a reallocation within the Philpott Lake from either the conservation (hydropower) pool or the inactive pool to water supply storage that would meet the Henry County Public Service Authority's (HCPSA) projected 50-year water supply shortfall of 4 MGD. A comparative analysis of impacts of the reallocation on Philpott Lake and downstream flows and future conditions without a reallocation was conducted.

No reallocation of flood storage is being evaluated for this study due to Philpott's Dam Safety Action Classification 3 rating. No adverse impacts to flood risk management operations would result from the proposed reallocation of conservation storage.

### 1.1 Scope of Work

The required storage volume for reallocation from conservation (hydropower) storage or inactive storage to water supply storage was determined. Hydrologic analyses were performed to determine impacts on lake levels, water storage, dam releases, and downstream flows for three different conditions: base case (no reallocation or change in operations at Philpott and future river withdrawals by HCPSA up to their currently permitted limit), future conditions with a reallocation from the conservation (hydropower) pool, future conditions with a reallocation from the inactive pool.

### 1.2 Description of Philpott Dam and Lake

Philpott Lake dam (Lat 36° 46' 50", Lon 80° 1' 40") is located on the Smith River in Henry and Franklin Counties in Virginia. Philpott Dam is located about 7 river miles above Bassett, VA and 44.3 river miles above the mouth of the Smith River near Eden, NC. The total drainage area for the Philpott Dam watershed is 212 square miles, and the watershed of the Smith River Basin is 550 square miles. Philpott Dam was authorized for the purposes of flood control, hydroelectric power, water quality and low flow augmentation, recreation, and fish and wildlife enhancement. Philpott Dam was authorized by the 1944 Flood Control Act. Construction began in June 1949 and was complete April 1952. Filling of the reservoir began December 1951 and commercial power operations began in September 1953. The Philpott Lake encompasses approximately 9,600 acres. The Philpott Dam is a concrete gravity structure having a top elevation of 1,015.4 ft-NAVD88 and a length of approximately 920 feet. The maximum height of the dam is approximately 220 feet with a maximum base width of 166 feet. Contained in the width of the dam is a 120 feet long ungated spillway. A walkway enclosed by railing is provided on the non-overflow portion.

The uncontrolled spillway is an Ogee type and is located near the center of the dam with a crest elevation of 984.4 ft-NAVD88. It has a discharge of 70,000 cfs at elevation 1,013.4 ft-NAVD88, the spillway design maximum water level. A concrete stilling basin is provided to help dissipate the energy of the water flowing over the spillway. Concrete training walls are located on each end of the spillway section to direct the flow of the discharged water.

Three sluice gates, equipped with tandem slide gates, 5'-8" width by 10' tall, are provided to discharge water, whenever necessary. The discharge capacity of the sluice gates at pool elevation of 973.4 ft-NAVD88 is approximately 13,000 cfs. Along with the sluice gates there are two 12” gated low flow pipes, equipped with tandem gate valves, provided for low flow release when the power plant turbines are not operating. The combined capacity of these pipes at a pool elevation of 973.4 ft-NAVD88 is approximately 75 cfs.

The powerhouse is located on the right bank of the Smith River. The turbines are vertical-shaft Francis type. The two main units are used for hydropower peaking operations, each of which can generally discharge about 650 cfs when generating. The smaller station service unit typically runs continuously and discharges about 30 cfs. Water is carried to the turbines through steel-lined penstocks located in the power intake section and controlled by the slide gates equipped with fixed cable hoists. Table 1 summarizes the existing physical features and capacities of Philpott Dam and Lake.

**Table 1. Philpott Dam and Lake Physical Features.**

| **Feature** | **Elevation** (Ft-NAVD88) | **Storage Volume** (acre-feet) | **Area** (acres) |
|---|---|---|---|
| Top of dam | 1015.4 | | |
| Spillway design flood | 997.4 | 318,300 | 4,060 |
| Top of flood control pool/spillway crest | 984.4 | 200,400 | |
| Top of conservation (hydropower) pool | 973.4 | 166,200 | 2,880 |
| Top of inactive pool | 919.4 | 55,000 | 1,350 |
| Base of Dam | 815.4 | 0 | 0 |
| Total storage | | 318,300 | |
| Flood control storage | 984.4-973.4 | 34,200 | |
| Conservation (hydropower) storage | 973.4-919.4 | 111,200 | |
| Inactive storage | 919.4-815.4 | 55,000 | |

The 111,200 acres-feet conservation pool is comprised of hydropower storage, although water may also be released from the conservation pool when needed to meet the minimum downstream instantaneous flow requirement of 59 cfs at Stanleytown VA, located about 10 river miles below the dam. Stanleytown does not have a USGS gage, so for monitoring the USGS Smith River stream gage at Bassett, VA, located about 7 river miles below the dam is used (see Figure 1). Other than this minimum downstream flow target, there are no other downstream water quality parameter requirements. Flow from the station service hydropower unit that runs continuously is usually sufficient to meet downstream this downstream flow target without additional flow augmentation. Flows at the Bassett gage are comprised of releases from the dam and local unregulated inflows between the dam and Bassett.

HCPSA is currently permitted to pull up to 6 MGD of water from the river at its downstream intake located about 3 miles below Philpott Dam. No consideration is given for the water supply withdrawal to meet downstream minimum flow requirements. However, future increased withdrawals by HCPSA at its river intake will require extra releases from Philpott to satisfy state resource agency concerns, which will require water supply storage in Philpott Lake.

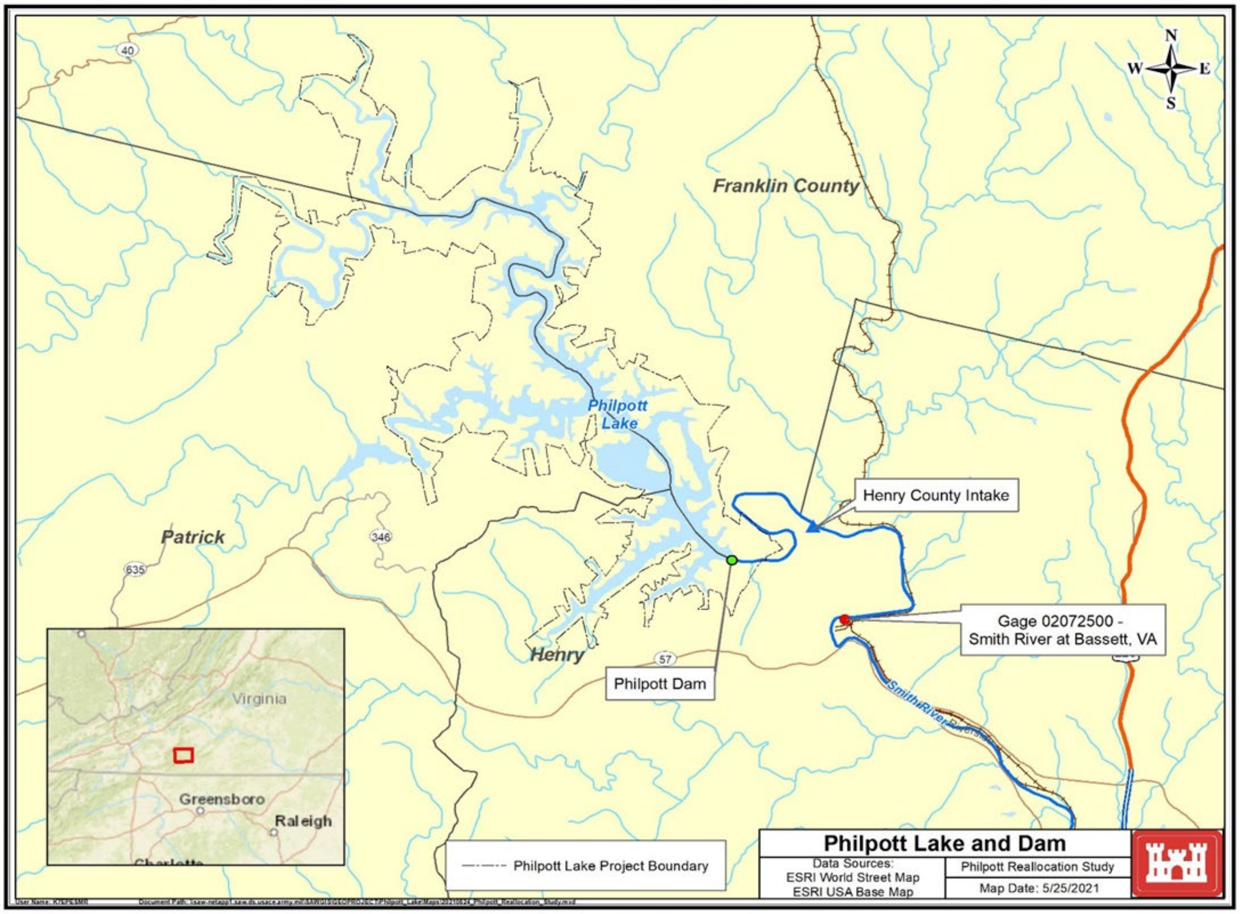


**Figure 1. Study Area Map.**

### 1.3 Methods and Procedures

Input data for the HEC ResSim model were developed from a historical record of data. This data includes daily values for inflow to the lake, historic releases from the dam, and river flows at Bassett. Inflows to the lake are net inflows which include precipitation and evaporation loss/gains. Releases from the dam were subtracted from the river flows at Bassett with a time lag to account for travel time to calculate river loss/gain due to precipitation and evaporation between the dam and the gage at Bassett. It was assumed during this time frame HCPSA was not withdrawing any water from the lake, which led to a conservative over estimation of water loss from the river. Missing data of less than a 2-day gap were linearly interpolated from the surrounding data. For this record there were no gaps larger than 2 days. Historic net inflows and downstream river gain/loss were applied to each of the modeling scenarios. In addition, for the future without reallocation scenario it is assumed that HCPSA is withdrawing 6 MGD, the maximum permitted, and in the future with reallocation scenarios HCPSA is withdrawing 10 MGD, the maximum permitted plus the reallocated release.

Simulated hydropower operations were developed from plan operations data available for 2010-2014. Daily averages were converted to ratios of weekly power flow for each month which were applied to weekly power plan flow volumes from HEC-RESSIM model output. Daily power was then computed and validated using the available plant operations data. Basic hydrologic data for each modeling condition were computed to make the necessary comparisons of the base case (future without reallocation), future with reallocation from the hydropower pool condition, and the future with reallocation from the inactive pool conditions. This data was used to develop annual pool elevation frequency and duration, storage durations, and annual and monthly flow durations for dam releases and downstream river points of interest.

## 2.0 Hydrologic Analysis

### 2.1 General

The reservoir simulation model selected for use in this reallocation study is the HEC-ResSim. The reservoir network consists of the Philpott Reservoir with computation points for Philpott inflows, Philpott outflows, and Smith River at Bassett. Philpott Reservoir physical properties were defined for ungated spillway flow, sluice gate flow, hydropower main unit flow, hydropower house unit flow and an additional leakage term when the pool elevation is above the minimum power pool. The reservoir operations were defined for when the elevation is at the Top of the Dam (1015.4 ft-NAVD88), Top of Flood Control (984.4 ft-NAVD88), Top of the Conservation Pool (973.4 ft-NAVD88), at Guide Curve (seasonal pattern, 970.9-972.9 ft-NAVD88), Bottom of Dependable Power (950.4 ft-NAVD88), Bottom of Power Pool (919.4 ft-NAVD88) and the Inactive Zone (815.4 ft-NAVD88).

The HEC-ResSim model was reviewed and verified numerous aspects of the model deemed critical to successful modeling of Philpott Lake operations for the Philpott Lake Reallocation Study, including:

- Storage pool elevations (inactive/conservation/flood)
- Storage volumes by elevation (and surface area by elevation)
- Minimum release protocols (at dam and at Bassett)
- Routing of flows (travel times, lagging, etc.)
- Critical period inflows

Specific conditions modeled include base case (future without reallocation), future conditions with a reallocation from the hydropower pool to the water supply pool, and future conditions with a reallocation from the inactive pool to the water supply pool.

Modeling is done on a daily time-step, with a constant daily water demand and hydropower releases varying with the monthly minimum energy needs.

### 2.2 Yield-Storage Analysis

A Firm Yield Analysis was conducted using the firm yield simulation within HEC-ResSim. For the Firm Yield analysis all releases from the dam were combined to a single flow to determine the maximum daily release that would lower the lake level to the bottom of the power pool once in the period of record. In addition, a second simulation was run removing the seasonal guide curve, setting the guide curve to the top of the conservation pool (973.4 ft-NAVD88), to test the sensitivity of the firm yield.

### 2.2.1 Seasonal Guide Curve

The Firm Yield simulation using the seasonal guide curve has a lookback period starting January 1, 1958 with the simulation running from January 1, 1960 to January 1, 2020. Res-Sim runs a heuristic and bisection search on the maximum minimum daily release until a firm yield value is determined that is within the release tolerance (1 cfs) and the elevation tolerance (1 ac-ft). The firm yield release was calculated to be 147.2 cfs. A critical period was found from August 24, 1998- June 06, 2003, with the lake level draining to the bottom of the power pool on October 27, 2002 before beginning to refill.

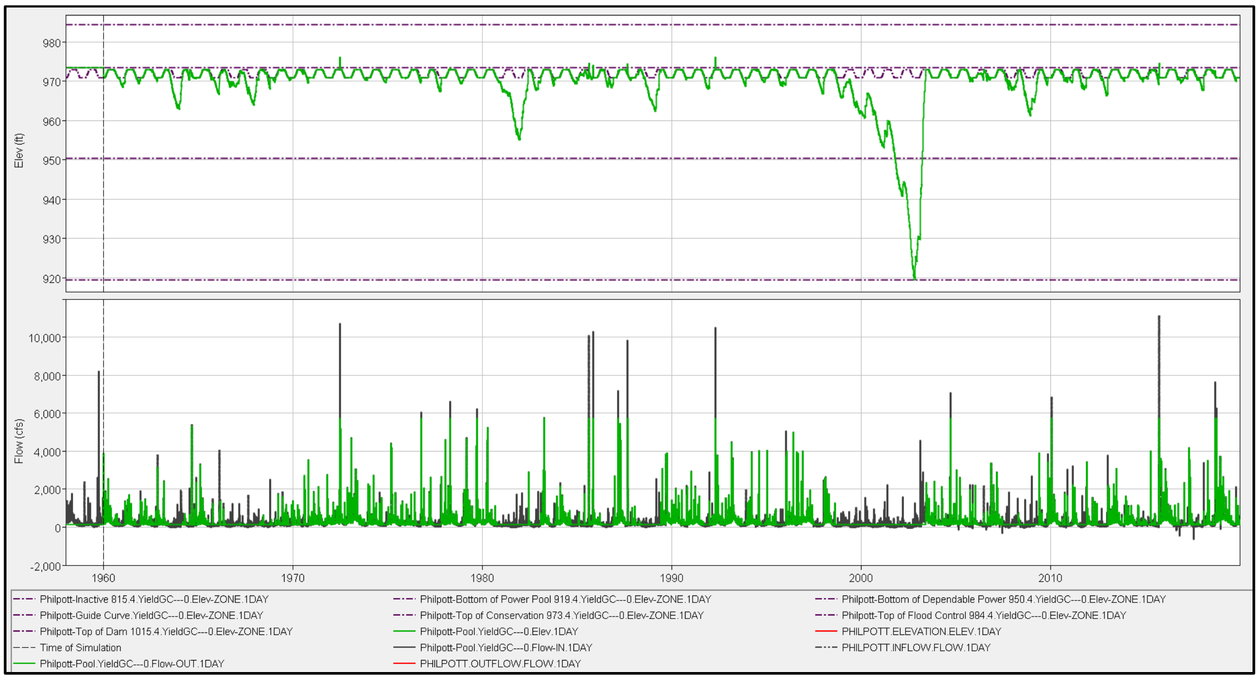


**Figure 2. POR Simulation for Firm Yield Analysis with Seasonal Guide Curve. The top pane shows the lake elevation in green with the dashed lines showing the reservoir operation levels. The bottom pane shows Philpot inflows in black and the releases in green.**

### 2.2.2 No Seasonal Guide Curve

The Firm Yield simulation has a lookback period starting January 1, 1958 with the simulation running from January 1, 1960 to January 1, 2020. Res-Sim runs a heuristic and bisection search on the maximum minimum daily release until a firm yield value is determined that is within the release tolerance (1 cfs) and the elevation tolerance (1 ac-ft). The firm yield release was calculated to be 148.5 cfs. A critical period was found from August 19, 1998- June 07, 2003, with the lake level draining to the bottom of the power pool on October 27, 2002 before beginning to refill.

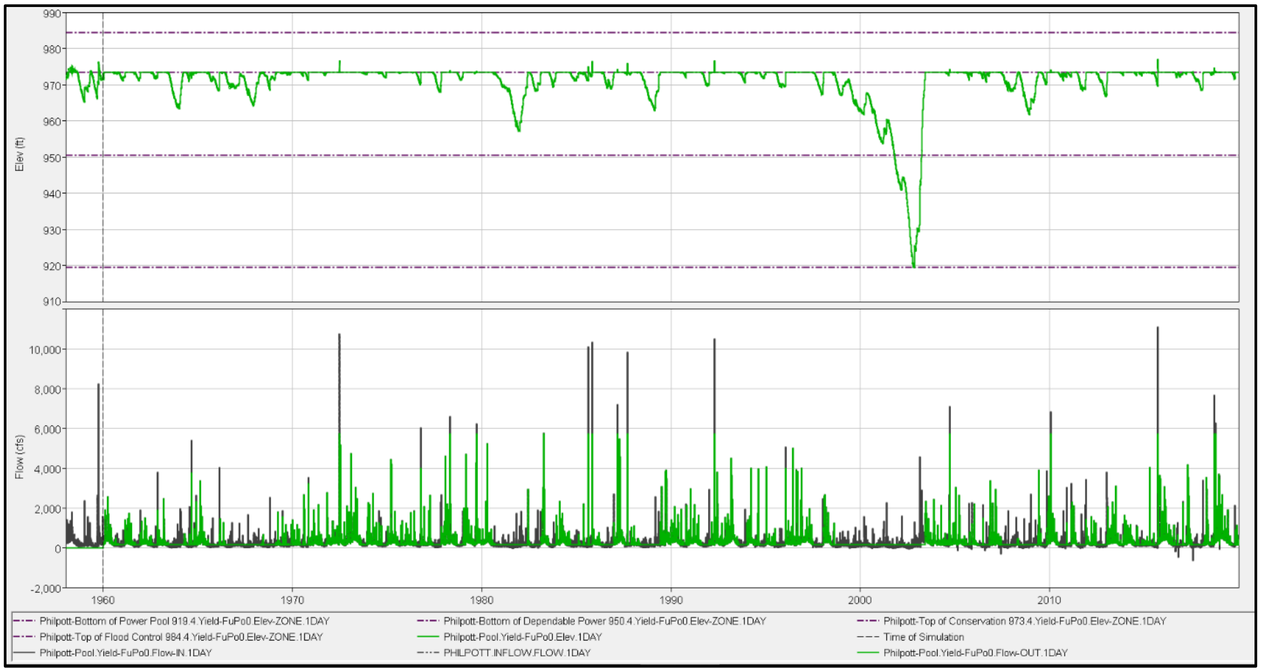


**Figure 3. POR Simulation for Firm Yield Analysis with No Seasonal Guide Curve. The top pane shows the lake elevation in green with the dashed lines showing the reservoir operation levels. The bottom pane shows Philpot inflows in black and the releases in green.**

Removing the seasonal guide curve increases the firm yield of the conservation pool, as expected. The seasonal guide curve lowers the lake during portions of the year, meaning less water is available for release during critical periods. The change in the firm yield is not large, 1.3 cfs or less than 1% of the firm yield with a seasonal guide curve.

### 2.2.3 Storage for 4MGD from the Conservation Pool

A separate analysis was run to determine the conservation pool storage needed to supply HCPSA with 4 MGD for future water supply requirements. The area from the top of the conservation pool to the bottom of the power pool was separated into two different water accounts, the water supply account, and the hydropower account. It was assumed that anything not within the water supply account was part of the hydropower account. A water supply storage account was used to provide 4MGD (6.19 cfs) and normal hydropower operations were assumed from the hydropower storage account. The acreage of the water supply account from the total was iterated until the storage requirement to supply 4MGD (6.19 cfs) was found using a 1.0 ac-ft tolerance for storage and 0.05 cfs tolerance for water supply.

The calculated storage needed to supply 6.19 cfs ± 0.05 cfs is 5,200 ac-ft for a varying seasonal guide curve using a specified storage volume, as shown in Table 2. The critical period is August 21, 1998 through April 07, 2003 with the water supply account emptying October 27, 2002 before beginning to refill.

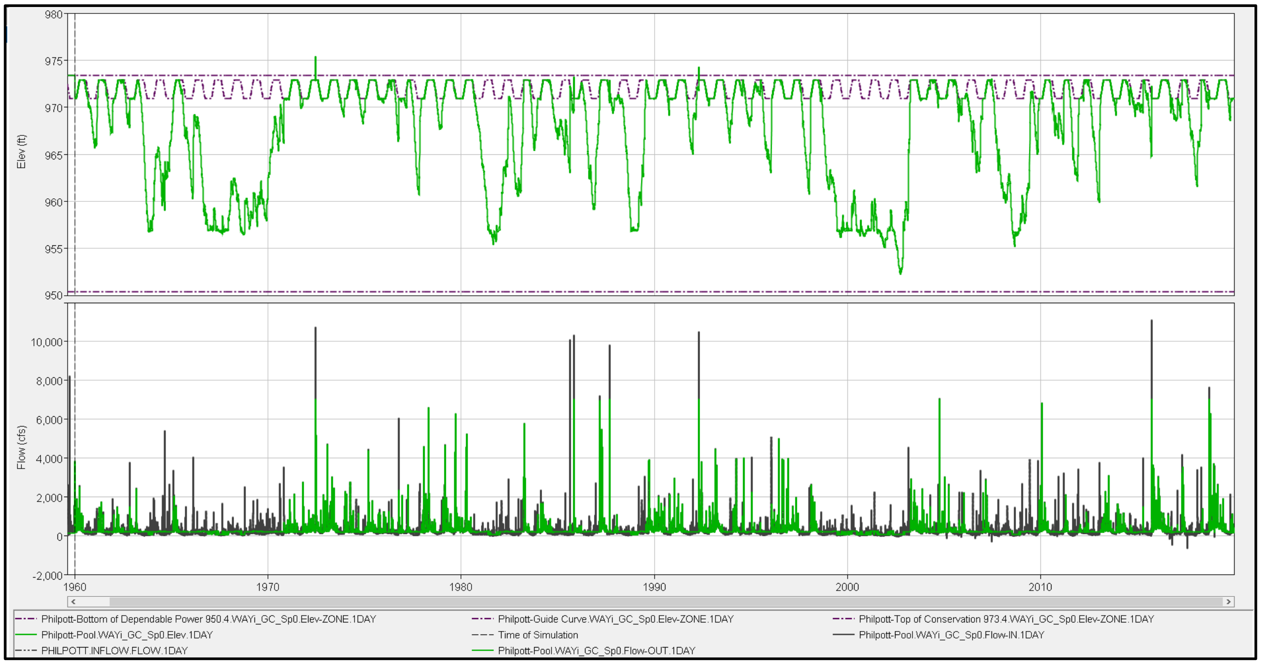


**Figure 4. POR Simulation for Water Account Yield Analysis with Seasonal Guide Curve with reallocation from the Conservation Pool. The top pane shows the lake elevation in green with the dashed lines showing the reservoir operation levels. The bottom pane shows Philpot inflows in black and the total dam releases in green**

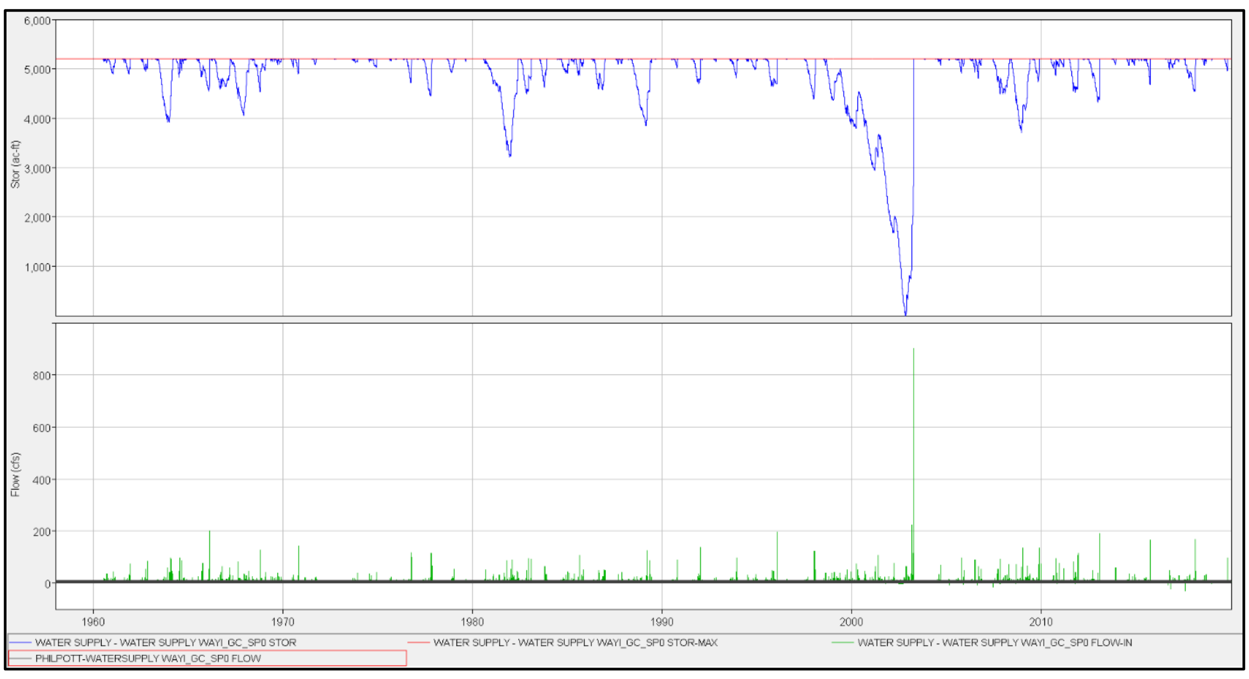


**Figure 5. POR simulation for Water Account Yield Analysis with Seasonal Guide Curve with reallocation from the Conservation Pool. The top pane shows the total storage for the water supply account in red and the available water supply storage shown in blue. The bottom pane shows the inflows to the water supply account in green and the water supply releases in black.**

**Table 2. Yield and Storage Analysis for Conservation Pool Reallocation at Philpott Lake.**

| Water Storage Use | Conservation Pool | | |
|---|---|---|---|
| | Existing Storage (acre-feet) | Proposed Storage (acre-feet) | Proposed Yield (MGD) |
| Water Supply | 0 | 5,200 | 4 |
| Total Conservation Storage | 111,200 | | |

This reallocation of 5,200 AF wholly within the conservation pool from hydropower to water supply reduces the hydropower storage from 111,200 AF to 106,000 AF, and therefore its yield. The reallocation would provide 4.67% of the conservation storage to water supply storage.

### 2.2.4 Storage for 4MGD from the Inactive Pool

A separate analysis was run to determine the inactive pool storage needed to supply HCPSA with 4 MGD for future water supply requirements. The bottom of the power pool was lowered by 5 feet to 914.9 ft-NAVD88. The lowering by 5 feet was chosen through an iterative process in 1-foot increments to increase the storage by a value close to the calculated storage needed to supply 4 MGD, while still having the full reallocation from the inactive pool. The area from the top of the conservation pool to the lowered bottom of the power pool was separated into two different water accounts, the water supply account, and the hydropower account. It was assumed that anything not within the water supply account was part of the hydropower account. A water supply storage account was used to provide 4MGD (6.19 cfs) and normal hydropower operations were assumed from the hydropower storage account. The acreage of the water supply account from the total was iterated until the storage requirement to supply 4MGD (6.19 cfs) was found using a 1.0 ac-ft tolerance for storage and 0.05 cfs tolerance for water supply.

The calculated storage needed to supply 6.19 cfs ± 0.05 cfs is 5,400 ac-ft for a varying seasonal guide curve using a specified storage volume, as shown in Table 3. The critical period is August 21, 1998 through April 20, 2003 with the water supply account emptying October 28, 2002 before beginning to refill.

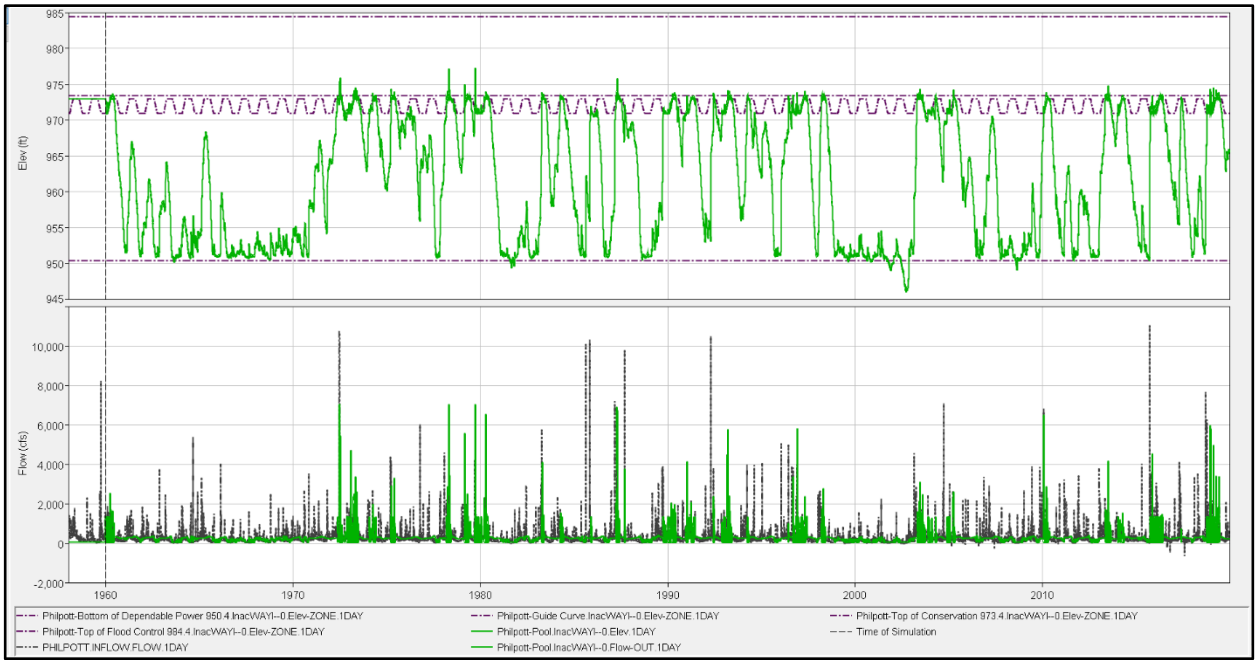


**Figure 6. POR Simulation for Water Account Yield Analysis with Seasonal Guide Curve with reallocation from the Inactive Pool. The top pane shows the lake elevation in green with the dashed lines showing the reservoir operation levels. The bottom pane shows Philpot inflows in black and the total dam releases in green.**

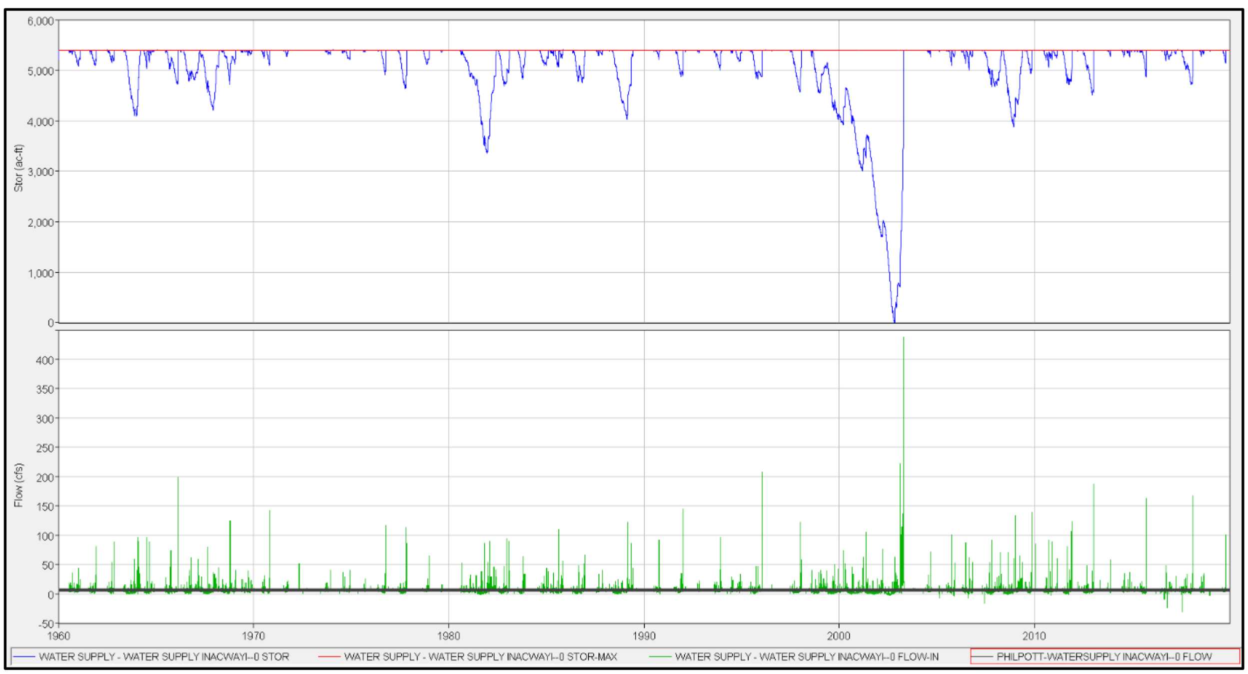


**Figure 7. POR simulation for Water Account Yield Analysis with Seasonal Guide Curve with reallocation from the Inactive Pool. The top pane shows the total storage for the water supply account in red and the available water supply storage shown in blue. The bottom pane shows the inflows to the water supply account in green and the water supply releases in black**.

**Table 3. Yield and Storage Analysis for Inactive Pool Reallocation at Philpott Lake.**

| Water Storage Use | Conservation Pool | | |
| --- | --- | --- | --- |
| | Existing Storage (acre-feet) | Proposed Storage (acre-feet) | Proposed Yield (MGD) |
| Water Supply | 0 | 5,400 | 4 |
| Total Conservation Storage | 117,500 | | |

This reallocation of 5,400 ac-ft to water supply storage increased the conservation pool from 111,200 ac ft to 117,500 ac-ft, and increases the hydropower storage to 112,100 ac-ft. The reallocation would provide 4.59% of the new conservation pool to water supply storage.

### 2.3 Frequency and Duration Data

Daily pool elevations, conservation storage volumes (hydropower pool and water), outflows from dam, and downstream river flows were determined using the HEC-ResSim model for the base case conditions (future without reallocation), future with reallocation from the conservation (hydropower) pool conditions, and future with reallocation from the inactive pool conditions. Frequency of reservoir drawdown was determined for each modeling condition for comparison. Impacts on frequency of reservoir rise were not evaluated since there are no changes to normal pool levels or flood operations.

Numerous duration analyses were conducted using the HEC-ResSim modeling results, including annual pool elevation duration, annual water supply storage duration, and annual and monthly dam outflow duration and downstream flow-duration.

## 3.0 Hydraulic Analysis

No hydraulic modeling (HEC-RAS) was necessary for determining water surface elevations along the downstream reaches of the Smith River for comparison of flood damage impacts since no changes to normal pool levels, flood storage, or flood operations associated with the proposed reallocation.

## 4.0 Results

### 4.1 Pool Elevations

Daily pool elevations are shown below (Figure 8) for the 1960-2019 simulation period for the base case (future without reallocation), future with reallocation from the conservation (hydropower) pool, and future with reallocation from the inactive pool. All three simulations show similar trends with minor deviations in lake levels.

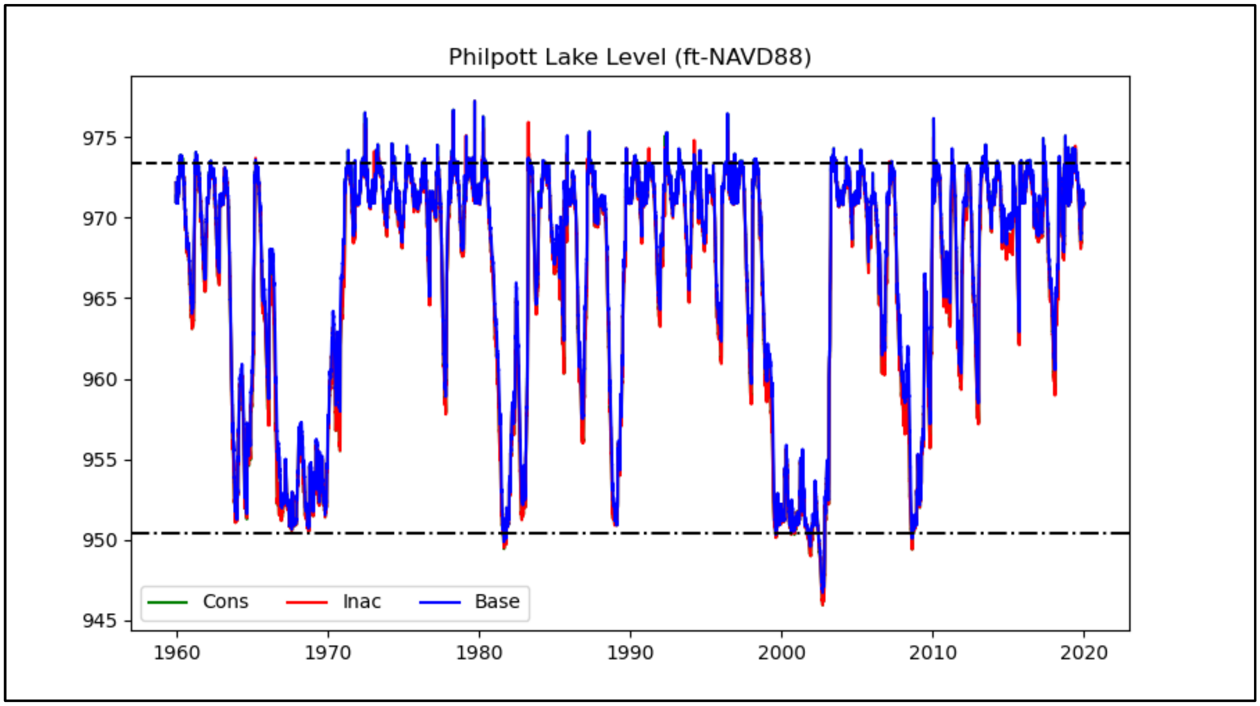


**Figure 8. Modeled Elevations for All Conditions for the 59-year Analysis Period**

Minimum annual pool elevations for Philpott Lake for the 1960-2019 modeling period were compared for the three simulations (see Figure 9). Comparing the base case (future without reallocation) condition to the reallocation from the conservation pool condition, the minimum annual pool elevations for the reallocation are lower than those for the base case in every year, with an average decrease of 0.78 feet. The decrease in the minimum annual pool elevations with the reallocation from the conservation pool are due to the constant release of water from the water supply storage account in addition to the hydropower generation releases, which lowers the lake levels quicker. Comparing the base case condition to the reallocation from the inactive pool condition, the minimum annual pool elevations are very similar to the reallocation from the conservation pool, with the reallocation elevations decreasing an average of 0.79 feet. In every modeled year except for one, the reallocation from the conservation pool has minimum annual pool elevations at or above those for both the base case and the reallocation from the inactive pool.

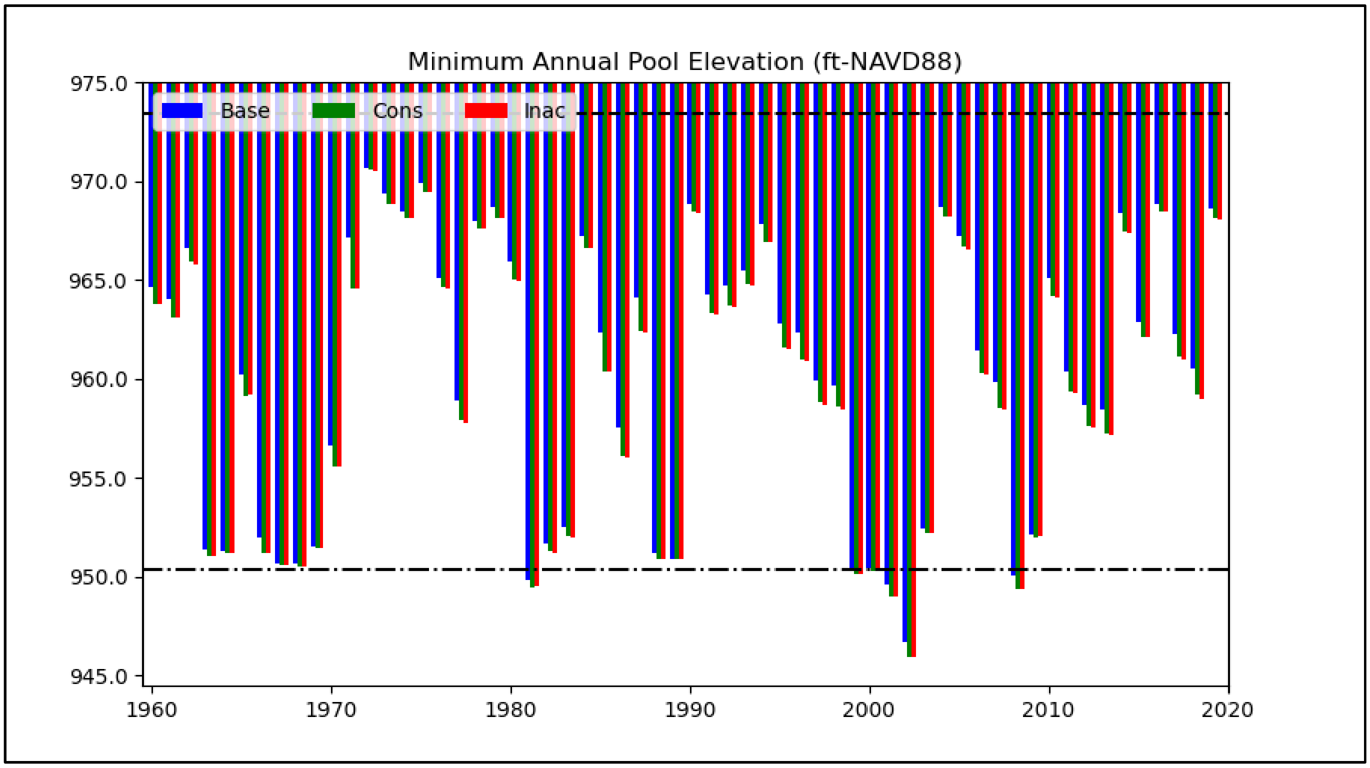

**Figure 9. Philpott Lake Minimum Annual Pool Elevation for All Model Conditions**

The drawdown frequency analysis (Figure 10) indicates similar relative pool elevation differences between modeled conditions. For recurrence intervals less than 5 years the drawdown differences are less than 4 feet. Beyond 5-year recurrence intervals, the drawdown differences between all conditions begin to decrease significantly. The drawdown recurrence interval for the base case shows a higher pool elevation at the same recurrence intervals for the reallocation from the conservation pool and reallocation from the inactive pool.

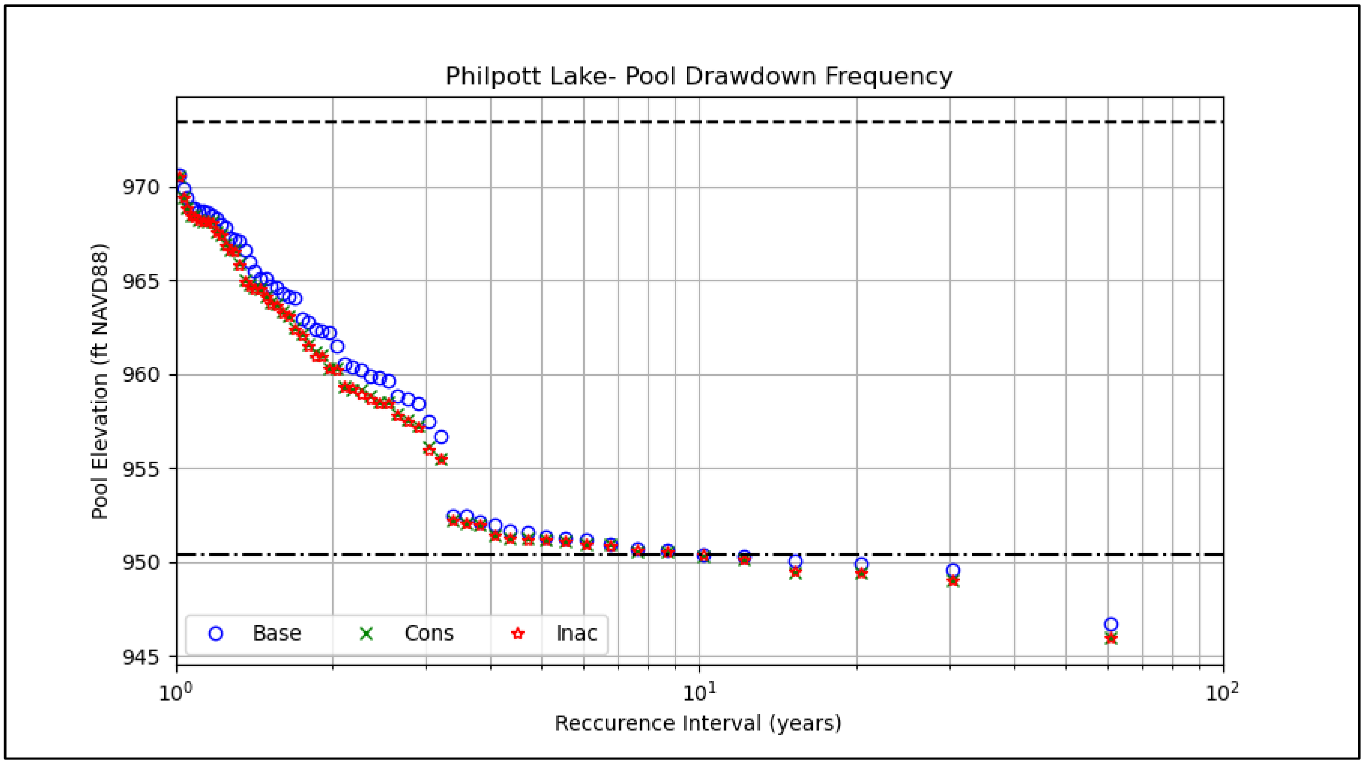


**Figure 10. Philpott Lake Frequency of Reservoir Drawdown for All Model Conditions**

The duration plot below (Figure 11) confirms that only pool elevations below the top of conservation pool (973.4 ft-NAVD88) are affected by the proposed reallocation. Under base conditions, lake levels are expectedly higher in the conservation pool for a greater percentage of the time since water demands are less; however, there is generally no more than a 2% difference in duration for any pool level. For example, lake levels are at or above summer guide curve (elevation 972.9 ft-NAVD88) about 11.29% of the time under base conditions, compared to 11.65% of the time for reallocation from the conservation (hydropower) pool and 11.11% of the time for the reallocation from the inactive pool. Lake levels are at or above elevation 950.4 ft-NAVD88 (bottom of the dependable power pool) about 96.3% of the time under base conditions, compared to 97.1% of the time for reallocation from the conservation (hydropower) pool and 96.3% of the time for reallocation from the inactive pool.

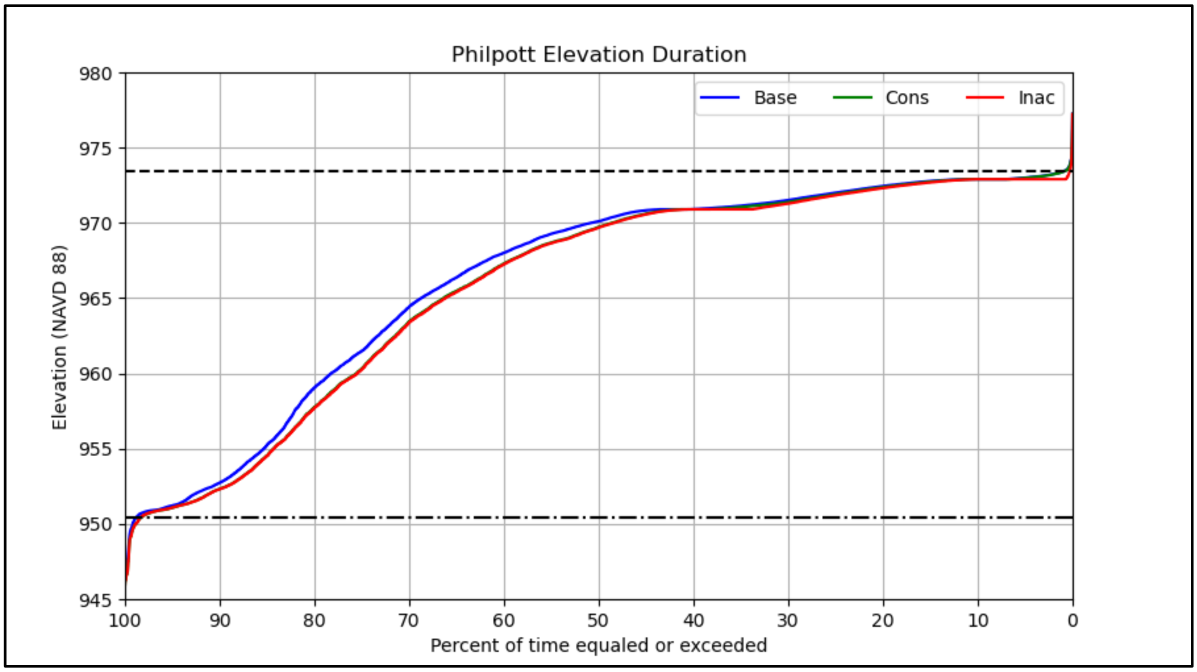

**Figure 11. Philpott Lake Pool Elevation Duration for All Model Conditions**

### 4.2 Water Supply Storage

Minimum annual water supply storage for the 1960-2019 modeling period were compared for reallocation from the conservation (hydropower) pool and reallocation from the inactive pool (see Figure 12), while there is no water supply storage in the base case. Reallocation from the conservation (hydropower) pool would require 5,200 ac-ft of storage while reallocation from the inactive pool would require 5,400 ac-ft of storage to meet the additional 4 MGD HCPSA water supply needs. In both cases the modeled minimum water supply storage occurred in 2002, which was found to be the critical period. As shown in Figure 13, water supply storage remains above 85% for 90% of the time and only drops below 60% remaining during 3 of the modeled 59 years. There is very little difference in the modeled water supply between the two reallocation methods.

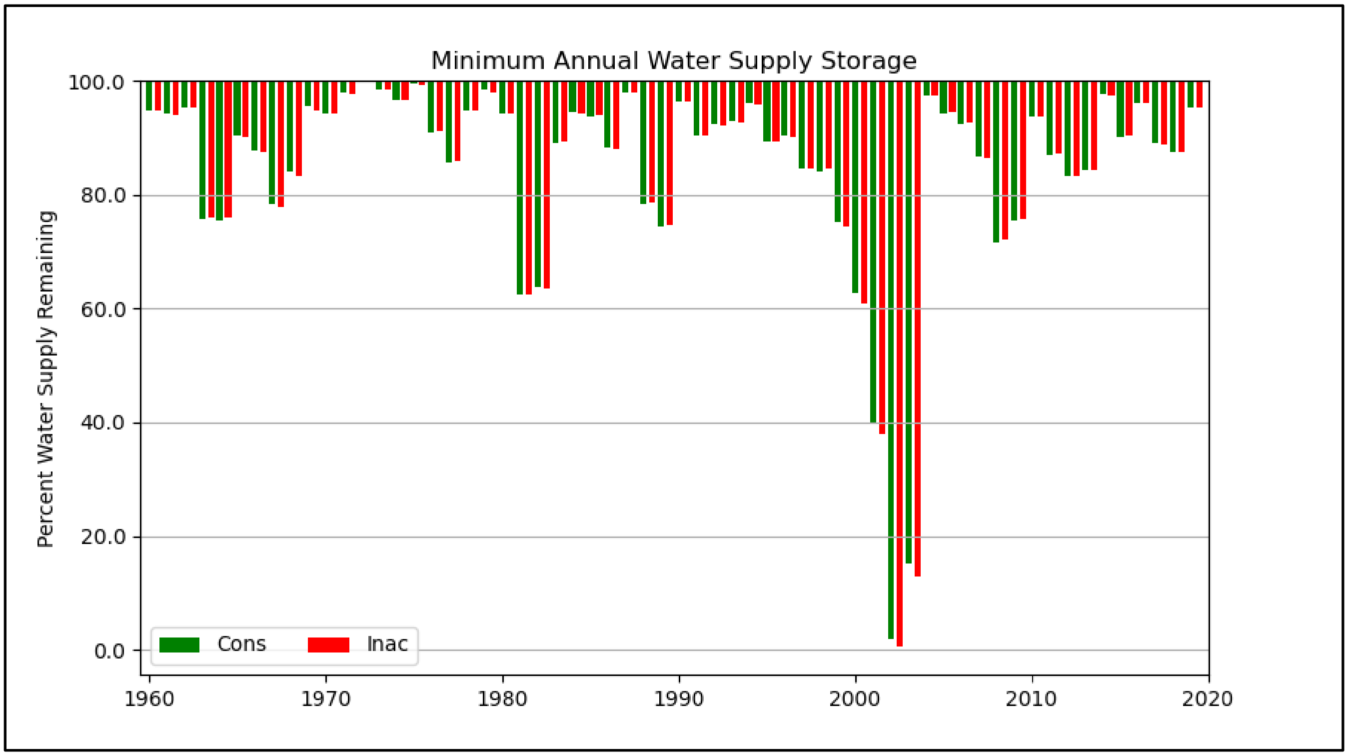


**Figure 12. Philpott Lake Minimum Annual Water Supply Storage for All Model Conditions.**

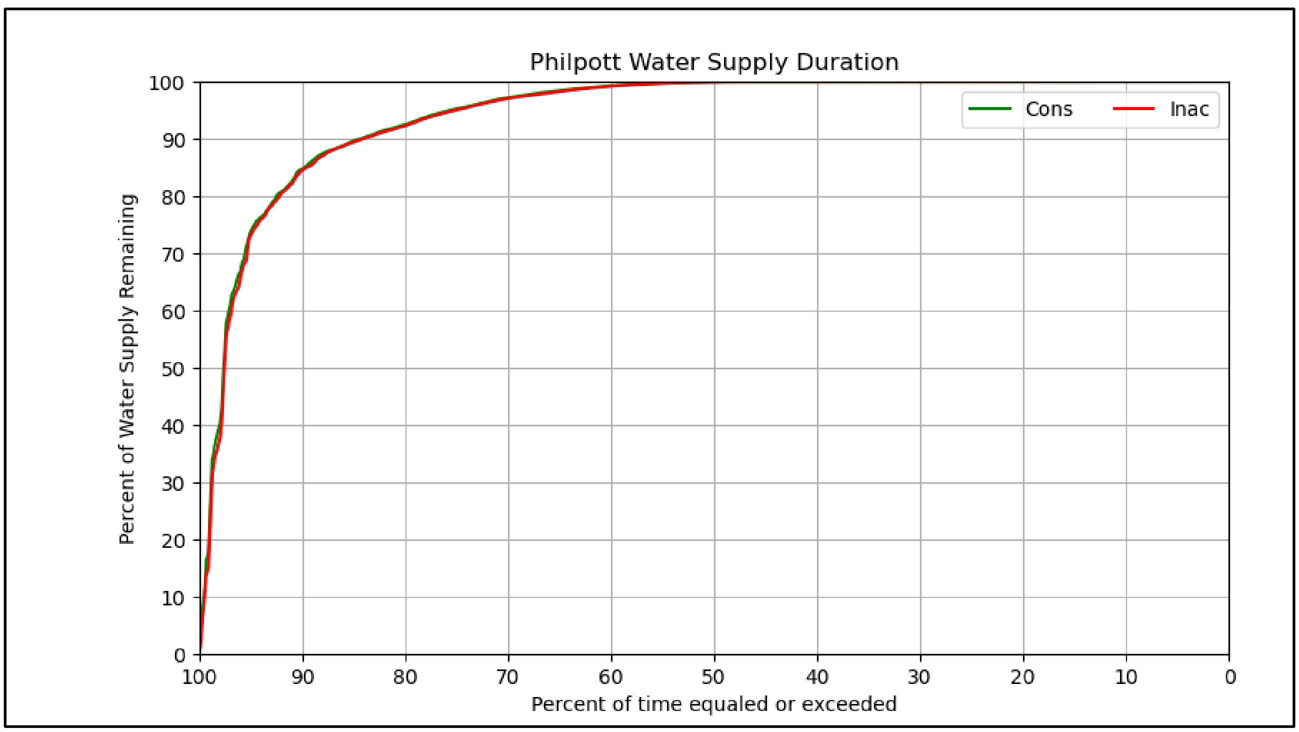


**Figure 13. Philpott Lake Water Supply Storage Duration for All Model Conditions**

### 4.3 Releases from Philpott Dam

Hydropower releases from conservation storage (main unit generation and continuous station service unit operation) also ensure that minimum flows at the dam and downstream flow targets at Bassett are maintained. The proposed reallocation has no effect on flood releases from the dam. The main effect the proposed reallocation will have on releases from Philpott Dam is that slightly more water will be released from Philpott Dam to meet Henry County's increased water demand. The increased water will be withdrawn from the river upstream of the Basset stream gage, so minimal changes are expected downstream of the HCPSA water intake. The results shown below (Figure 14 and Figure 15) depict annual duration curves for releases from Philpott Dam.

The annual outflow duration curves (Figure 14) for the full range of releases appear quite similar, with nearly identical duration curves for the both future conditions; however, there is a distinguishable offset for the base (future without reallocation) conditions curve above 10% exceedance and between 75%-65% exceedance. Figure 15 is a detailed view of durations for flows below 1000 cfs; minimum releases (~50 cfs, depending on month) are made about 30% of the time under existing conditions and reallocation from the conservation pool compared to about 25% of the time under reallocation from the inactive pool.

Table 4 shows the percentage of time releases from Philpott Dam and flow at Basset are less than 100 cfs, 75 cfs, and 50 cfs for the base case (future without reallocation), reallocation from the conservation pool, and reallocation from the inactive pool. There were 6791 days out of the 59-year modeling period with releases from the dam at or below 100 cfs for the base (future without reallocation) condition, compared to 6922 days for the reallocation from the conservation pool condition and 5355 days for the reallocation from the inactive pool condition.

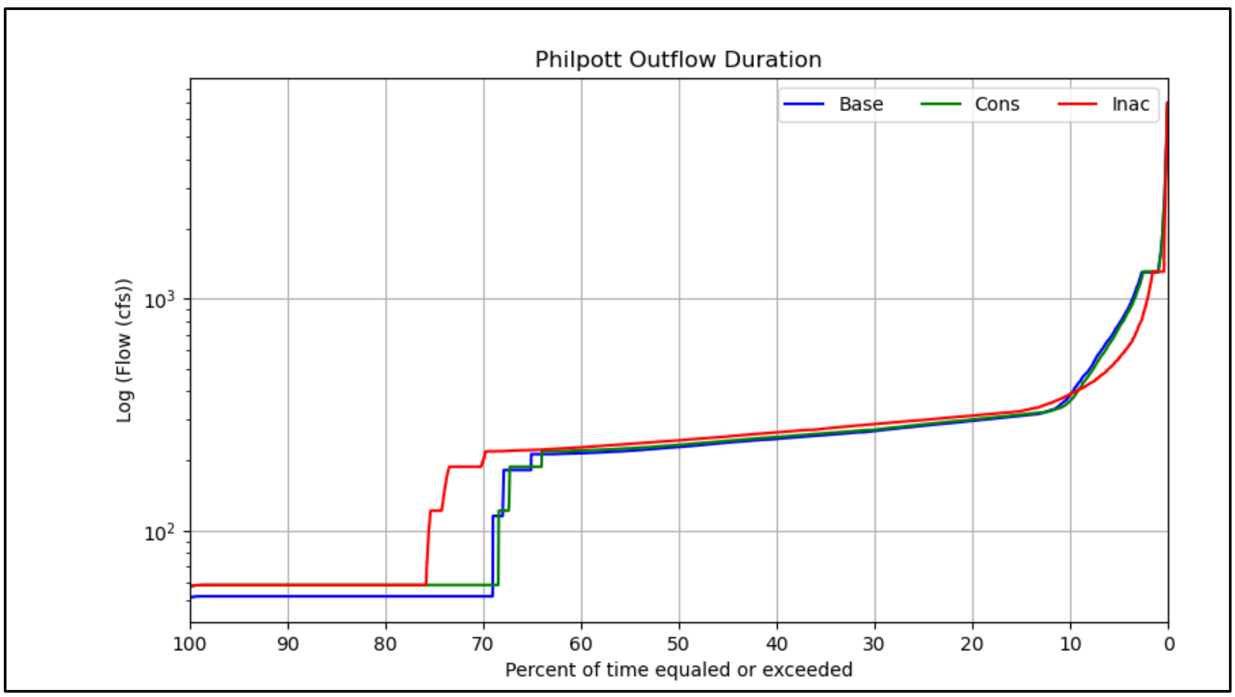


**Figure 14. Philpott Lake Annual Outflow Duration, y-axis is in log scale.**

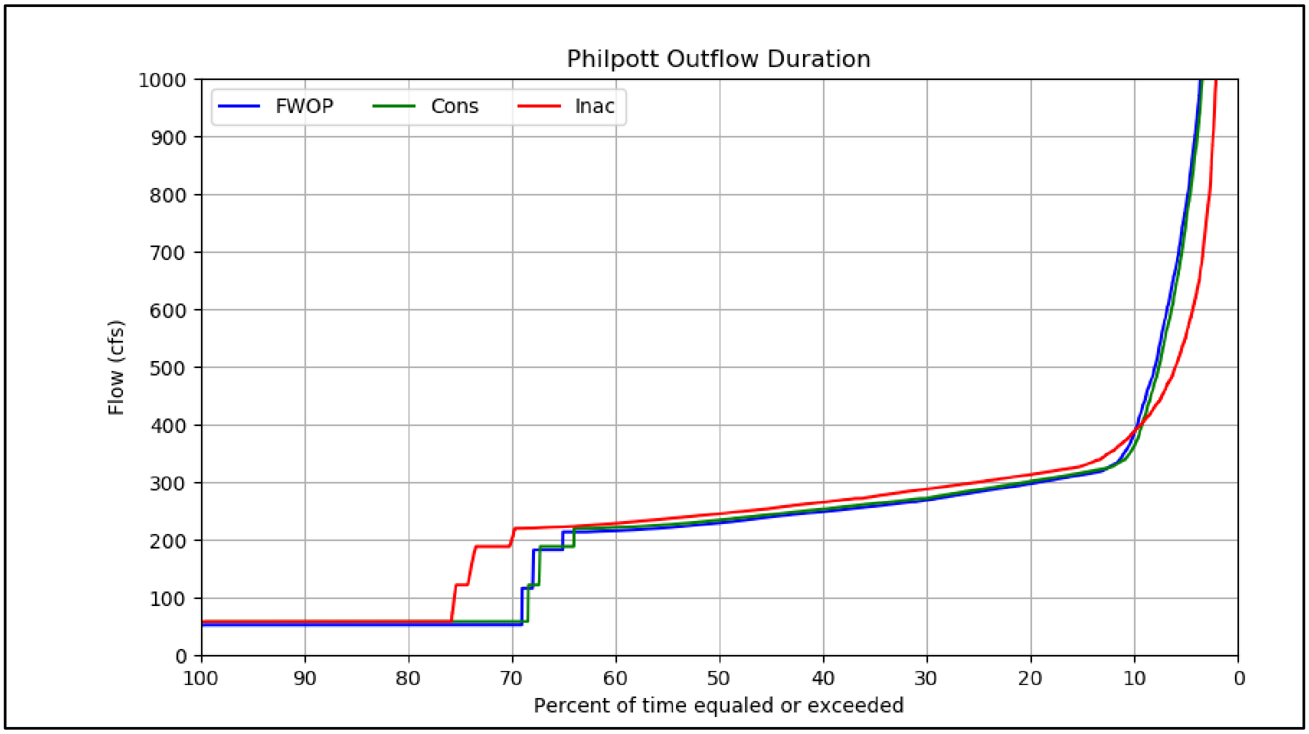


**Figure 15. Philpott Lake Annual Outflow Duration (Detail below 1000 cfs).**

**Table 4. Percent of Time Daily Flows are Less Than Indicated Flow for All Model Conditions.**

| | | Annual | | | Apr | | | Jun | | | Aug | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Base | Cons | Inac | Base | Cons | Inac | Base | Cons | Inac | Base | Cons | Inac |
| <100 | Philpott Release | 31% | 32% | 24% | 27% | 27% | 14% | 30% | 30% | 22% | 35% | 36% | 36% |
| | Bassett | 21% | 20% | 13% | 12% | 13% | 6% | 19% | 21% | 11% | 29% | 24% | 22% |
| <75 | Philpott Release | 31% | 32% | 24% | 27% | 27% | 14% | 30% | 30% | 22% | 35% | 36% | 35% |
| | Bassett | 8% | 9% | 9% | 2% | 4% | 5% | 7% | 7% | 8% | 16% | 13% | 16% |
| <50 | Philpott Release | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| | Bassett | 1% | 0% | 2% | 1% | 0% | 1% | 1% | 0% | 3% | 1% | 1% | 5% |

## 4.4 Downstream Flows

Smith River flows downstream of Philpott Dam were analyzed at the control point of Basset. Table 4 shows the percentage of time flow at Basset was below 100 cfs, 75 cfs, and 50 cfs. Figure 16 shows the annual minimum flow at Bassett for the model time period. The minimum instantaneous flow target at Stanleytown, VA is 59 cfs, however the stream gage is located about 3 miles upstream at Bassett, VA and a prorated minimum target flow of 52 cfs was used for modeling. Under base (future without reallocation) conditions, flow at Bassett is below 50 cfs 191 days within the entire 59-year model period. With reallocation from the conservation pool, the flow at Bassett is below 50 cfs 29 days out of the model period. With reallocation from the inactive pool the flow at Bassett is below 50 cfs 420 days out of the 59-year model period.

Historically any shortfall in the minimum flow target and associated impacts have been minor. Coordination with resource agencies is done to determine if slightly higher releases are needed or if downstream flows are still adequate for instream flow needs.

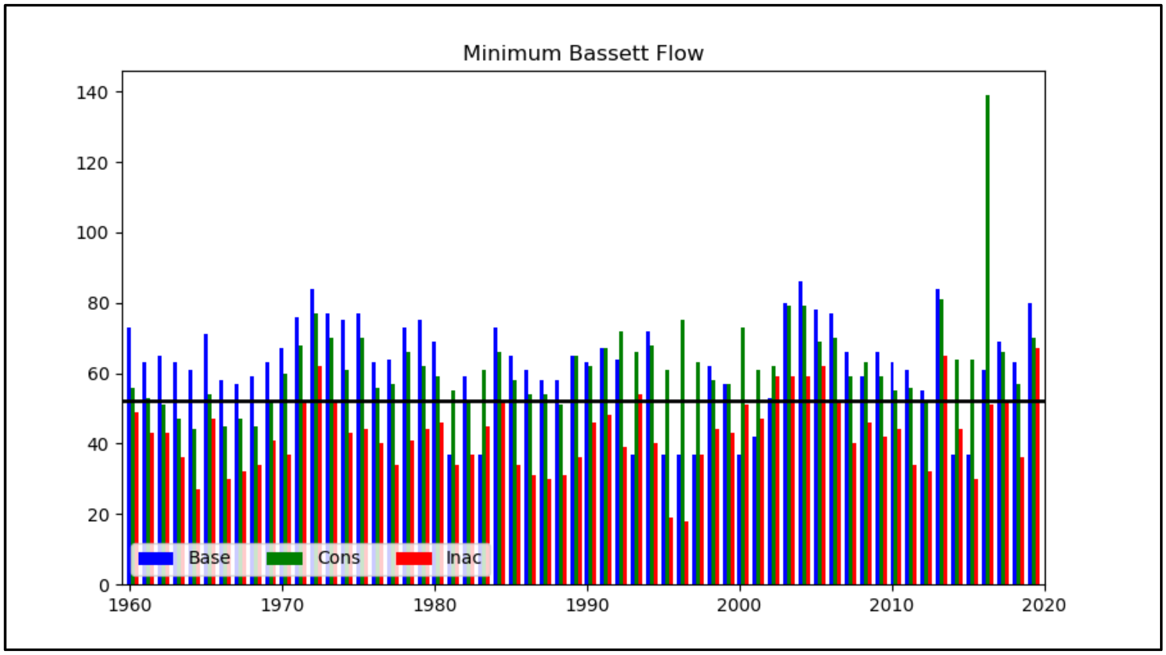

**Figure 16. Annual Minimum Flow at Bassett.**

## 5.0 Conclusions

The reallocation of 4 MGD of water storage from the conservation pool at Philpott Lake will provide a firm yield (dependable yield) of 5,200 AF. When combined with the currently permitted 6 MGD withdrawal from Smith River, this reallocation is adequate to meet the Henry County's projected average daily demand of 10 MGD. This reallocation will not have a significant hydrological impact on the remaining conservation (hydropower) storage or the ability to meet downstream flow requirements, nor have a significant impact on downstream flows between Philpott Dam and the downstream flow target location at Bassett. No other aspects of project operations, namely flood risk management, will be impacted.

The reallocation of 4 MGD of water storage from the inactive pool at Philpott Lake will provide a firm yield (dependable yield) of 5,400 AF. When combined with the currently permitted 6 MGD withdrawal from Smith River, this reallocation is adequate to meet the Henry County's projected average daily demand of 10 MGD. This reallocation will not have a significant hydrological impact on the conservation (hydropower) storage or the ability to meet downstream flow requirements, nor have a significant impact on downstream flows between Philpott Dam and the downstream flow target location at Bassett. No other aspects of project operations, namely flood risk management, will be impacted.

Reallocation from the conservation pool shows slightly less pool elevation impacts than reallocation from the inactive pool.

## 6.0 References

EM 1110-2-1420 Hydrologic Engineering Requirements for Reservoirs, 31 October 1997.

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ER 1165-2-119 Modifications to Completed Projects, 20 September 1982.

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