

# Duskytail Darter Endangered Species Act Consultation, Big South Fork National River and Recreational Area, Lake Cumberland, Kentucky

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US Army Corps of Engineers  
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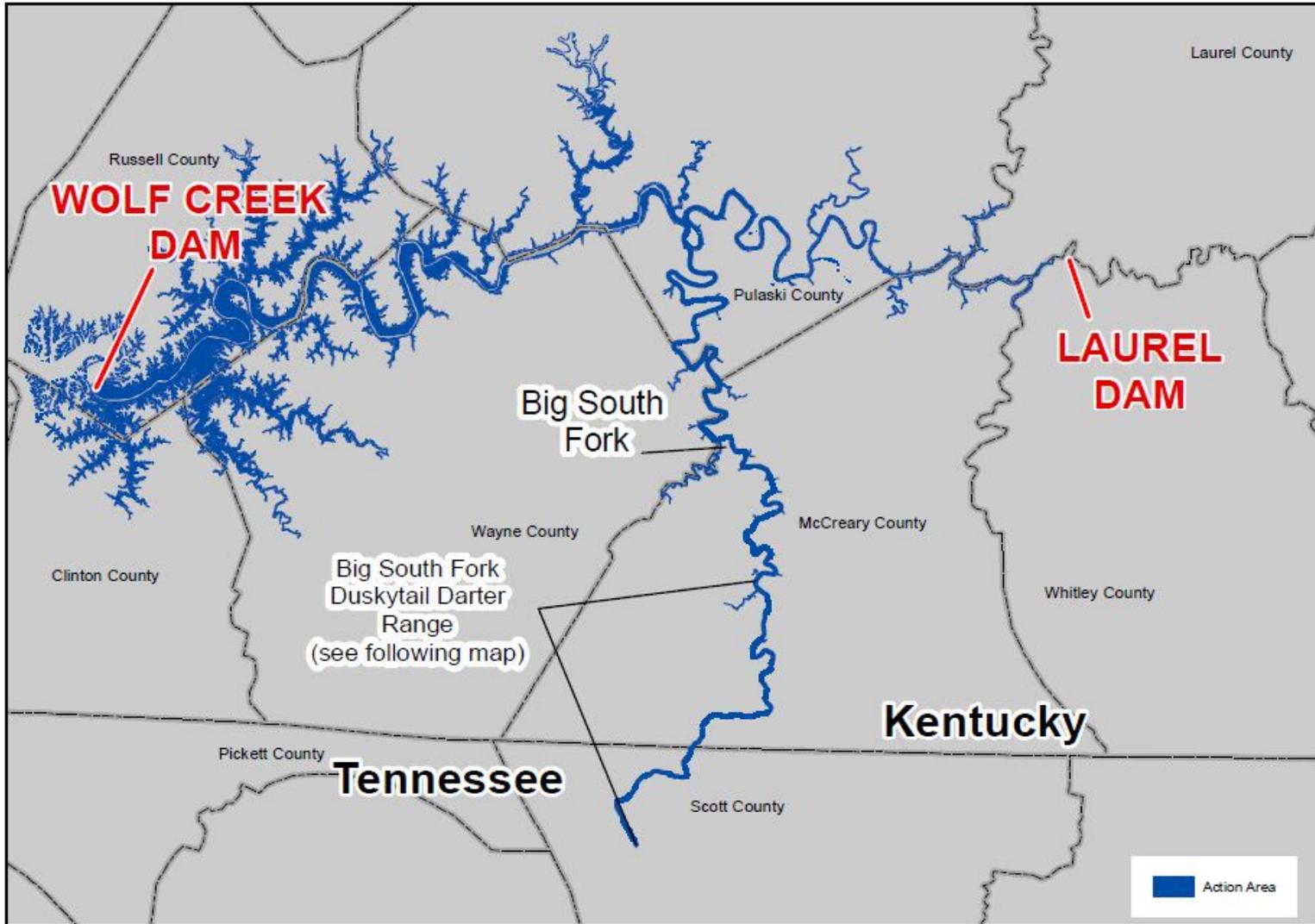


# Outline

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- Overview of Lake Cumberland pool drawdown in association with the seepage rehabilitation project
- Duskytail Darter - Endangered Species Act compliance





# Lake Cumberland

- Drainage Area 5,789 mi<sup>2</sup>
- Total Volume at max flood storage el. 760 = 6,089,000 acre-feet)

Embankment 3,940 ft

Concrete Dam 1,796 ft

Trout Hatchery →

↑ Switchyard

↑ Powerhouse

- **Flood Control** - \$34M/yr
- **Hydropower** - \$77M/yr, Largest in 1991 = \$232 million
- **Recreation**
  - 5M visitors/yr
  - \$129M impact to local economy
- **Water Supply between 100k and 200k users**
- **Water Quality**
  - Whole Cumberland River System for Cool, Oxygenated Water
  - USFWS Trout Hatchery Downstream over \$1M per year

# Emergency Drawdown in 2007

Due to the risk imposed on downstream populations by the dam's instability...

January 19, 2007 - The Corps made an emergency decision to lower the target pool elevation at Lake Cumberland from an operating band between 723 and 692 to a year round target of 680 ft

The Corps completed an Environmental Impact Statement (EIS) as part of the alternative arrangements agreed upon with the Council on Environmental Quality (CEQ)

Record of Decision (ROD) signed November 5, 2010

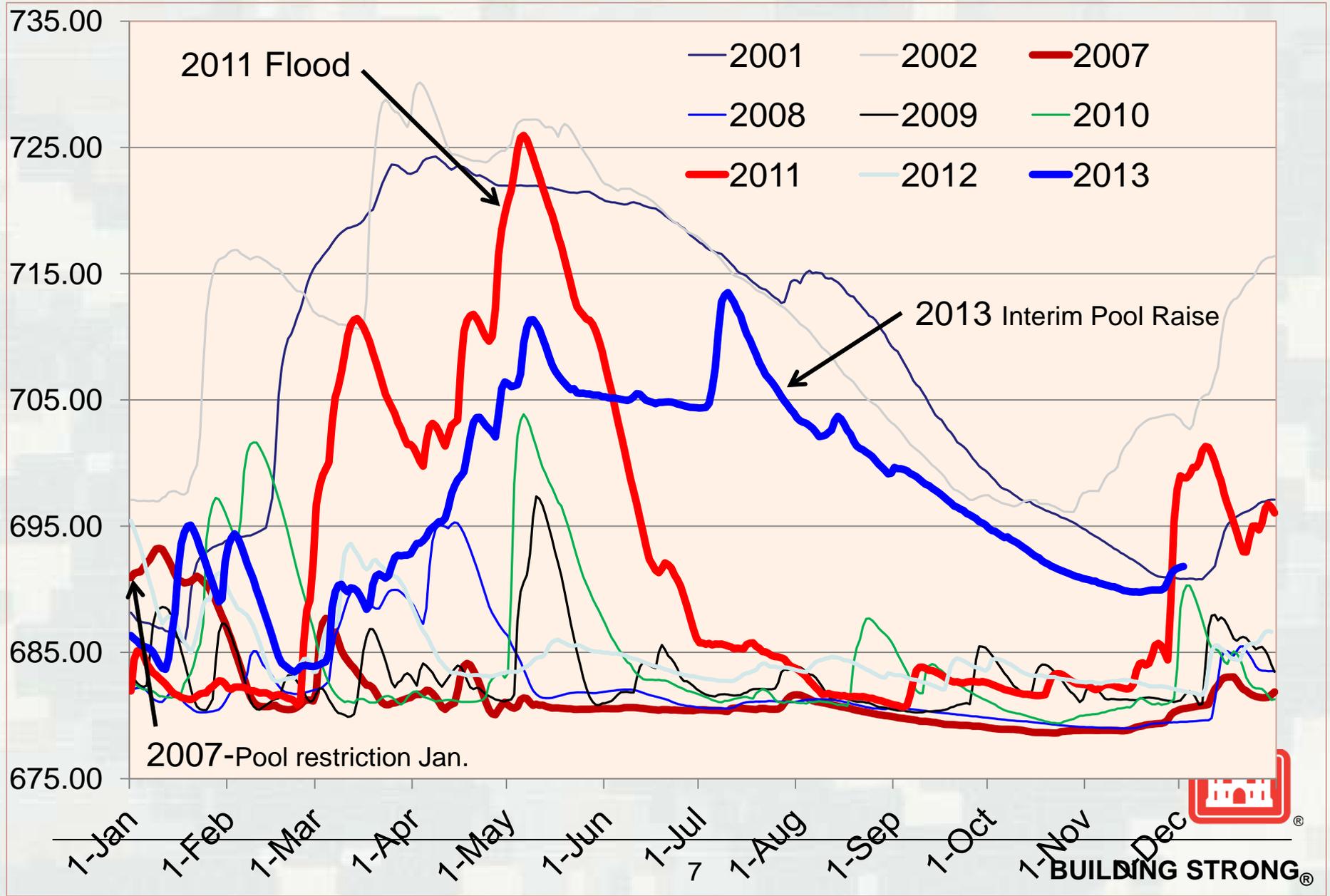


# Emergency Drawdown Environmental Impact Statement

- Record of Decision 2010 – Corps committed to complete surveys for Federally listed aquatic species prior to returning the lake to normal operations.



# Lake levels



# Coordination with USFWS during the EIS process:

The Service's main concerns were

- Wolf Creek National Fish Hatchery (cold water supply)
- Mussels in the Cumberland River many miles downstream
- ★ • Re-colonization of habitat in streams upstream of the dam where previously inundated by the reservoir



# 2013 Aquatic Species Survey on BSF

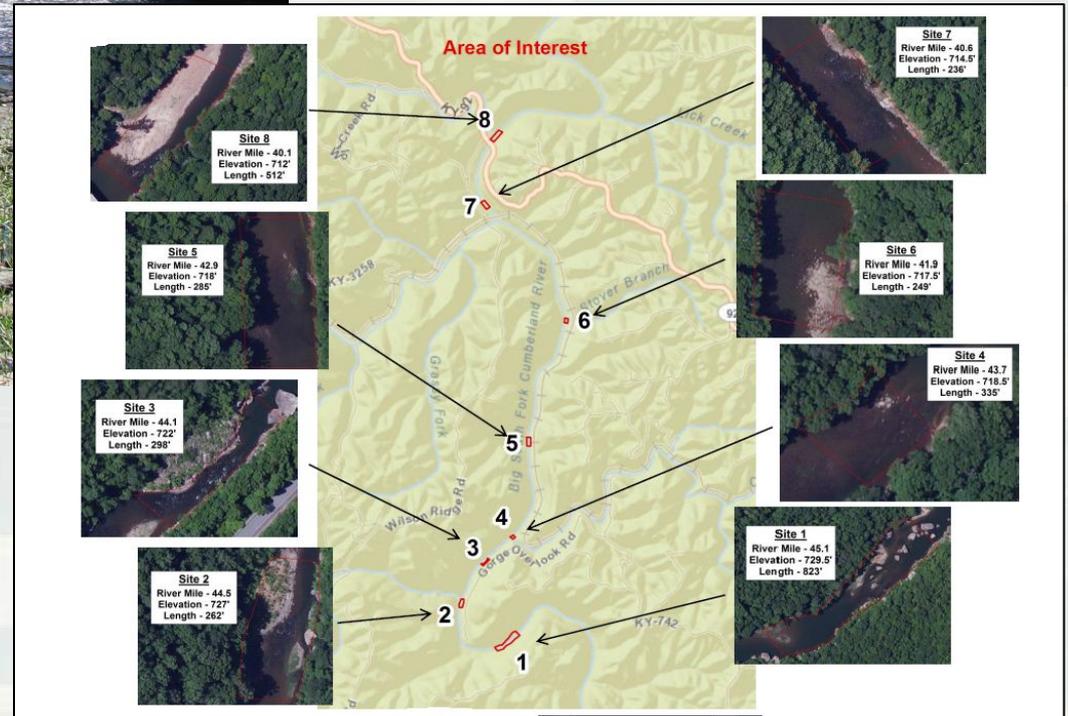
- Through consultation with USFWS it was decided to focus on mussels & potential fish hosts
- Corps completed the survey in October and November of 2013

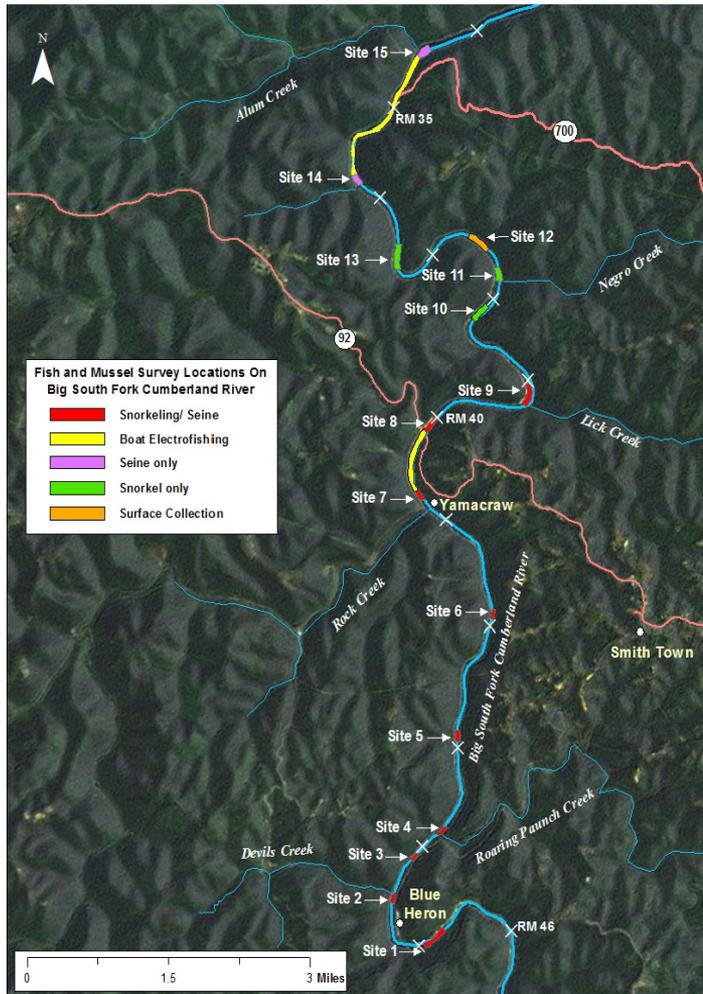




## Site 3

Sites chosen from known riffles in the stream reach that was affected by the drawdown.





- 15 Sample Sites covering approximately 11 river miles

Figure 3. Sampling locations in the Big South Fork Cumberland River, McCreary County, Kentucky, October and November, 2013.



# 2013 Survey Results (MUSSELS)

- 42 live (55.2 hrs of snorkeling) individuals
- 9 species
- 24 relics, 1 fresh dead (representing 3 additional species)
- All live mussels were found in sites 1-8
- No Federally-listed mussel species



## 2013 Survey Results cont'd - (FISH)

- Sampled fish species presence/absence for potential mussel host presence
- 52 species present (51 native and 1 non-native, redbreast sunfish)
- Percidae (darters) and Cyprinidae (minnows) were most diverse, each with 15 species.
-  duskytail darters (*Etheostoma percnurum*) found at sites 1-8



# Duskytail Darter



- Listed endangered in 1993
- found in six geographically distinct populations in Tennessee and Cumberland River Watersheds
- In 2008, the populations were described by Blanton and Jenkins as 4 distinct species
- The Big South Fork population is considered the tuxedo darter (*Etheostoma lemniscatum*) and is the only known population
- ❖ The tuxedo darter has not been listed as a new Federal species by the Service. Therefore for consultation purposes the fish was still considered the duskytail darter

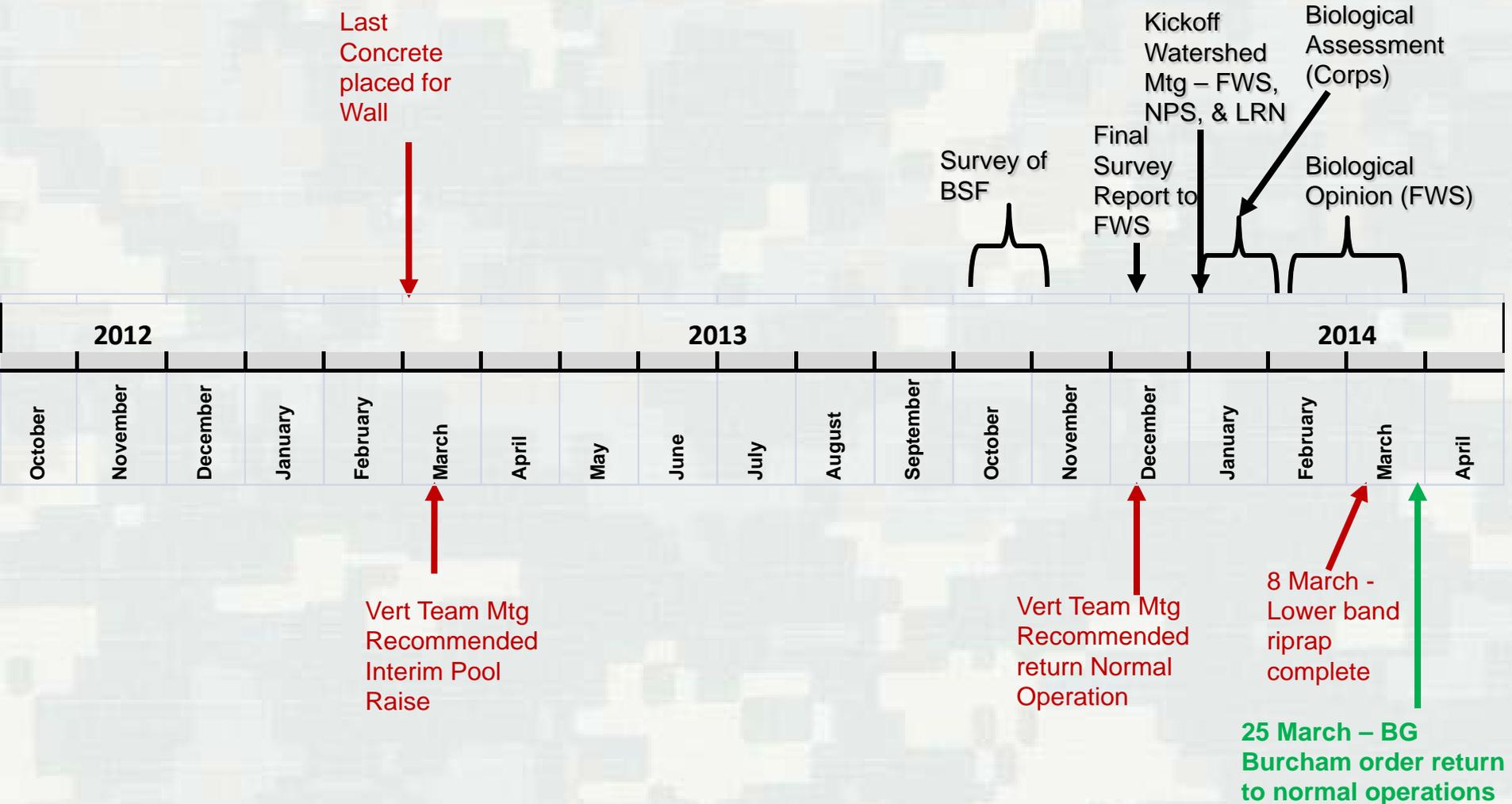


# Inter-Agency Coordination

- Corps began discussions with USFWS
- Informal discussion November 2013
- Inter-Agency Meeting (FWS, NPS, TVA, Corps)  
January 2014
- Initiated Formal Consultation January 2014



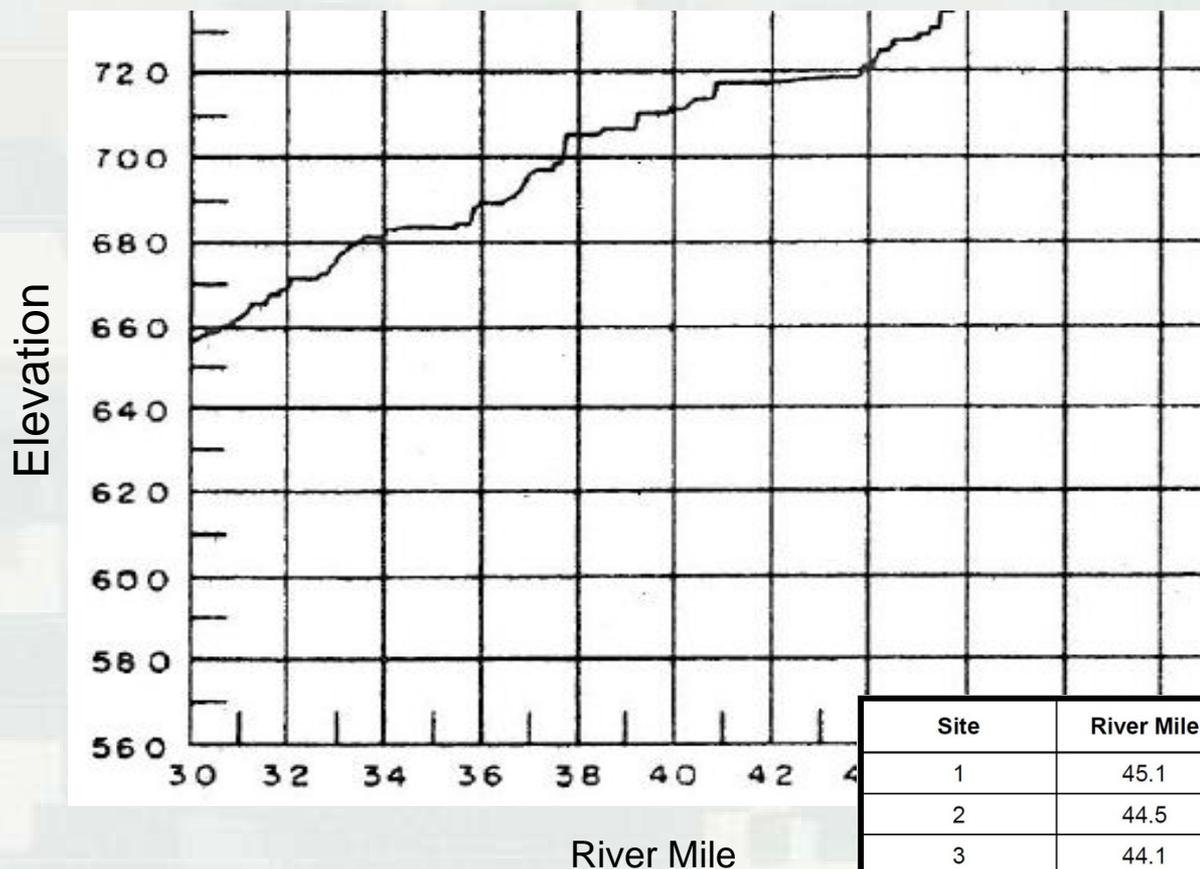
# Dam Safety and ESA Timeline of Events



- From initiation of the Biological Assessment to receipt of a signed Biological Opinion, took 42 days



# BSF Profile



- Used a stream profile obtained from a survey completed in the 1930s to determine the substrate elevation for each shoal complex.

| Site | River Mile | Elevation | Length (ft) |
|------|------------|-----------|-------------|
| 1    | 45.1       | 729.5     | 823         |
| 2    | 44.5       | 727.0     | 262         |
| 3    | 44.1       | 722.0     | 722         |
| 4    | 43.7       | 718.5     | 335         |
| 5    | 42.9       | 718.0     | 285         |
| 6    | 41.9       | 717.5     | 249         |
| 7    | 40.6       | 714.5     | 236         |
| 8    | 40.1       | 712.0     | 512         |
| 9*   | 39.1       | 707.0     | 765         |

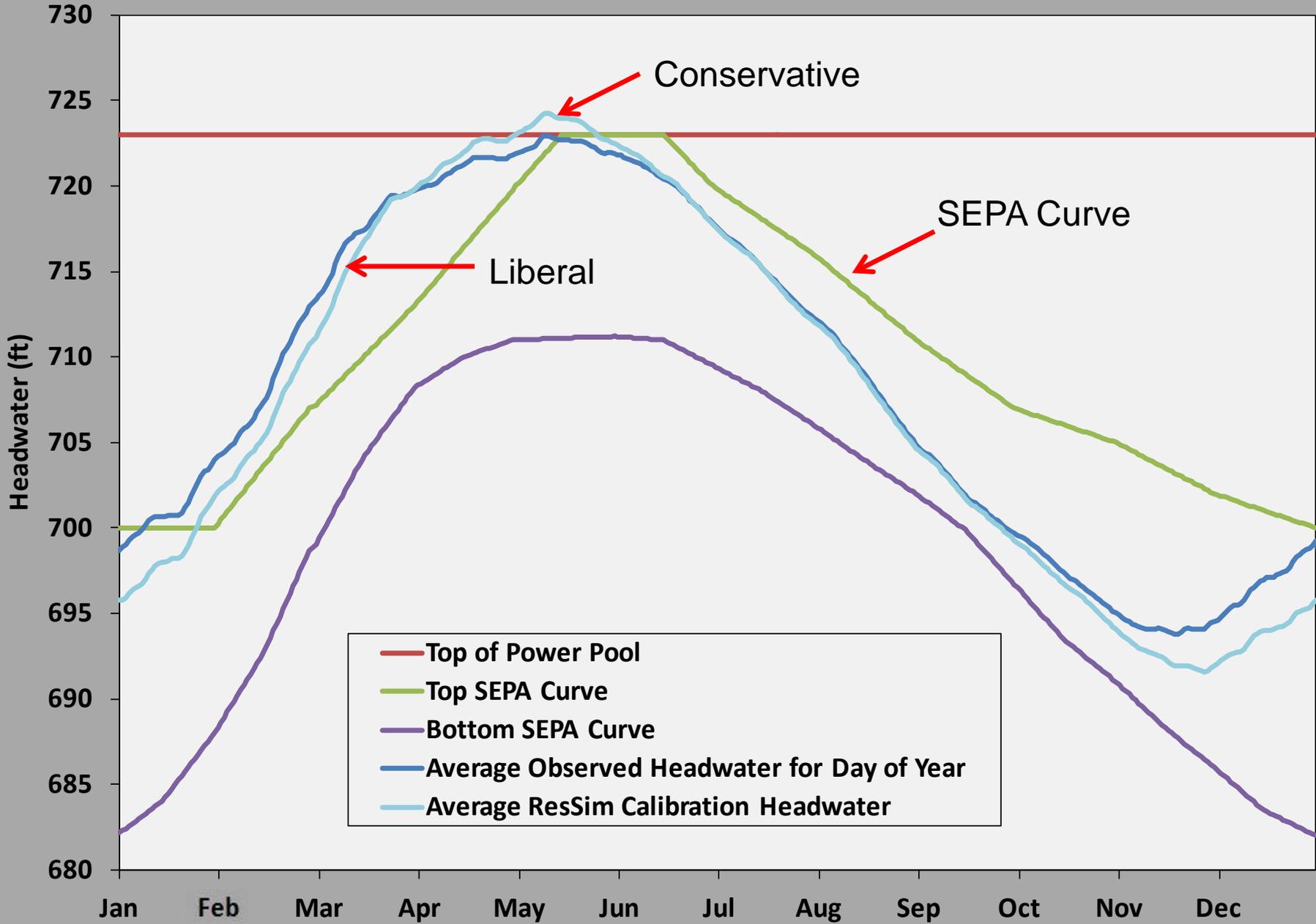


# Hydrology and Hydraulic Analyses

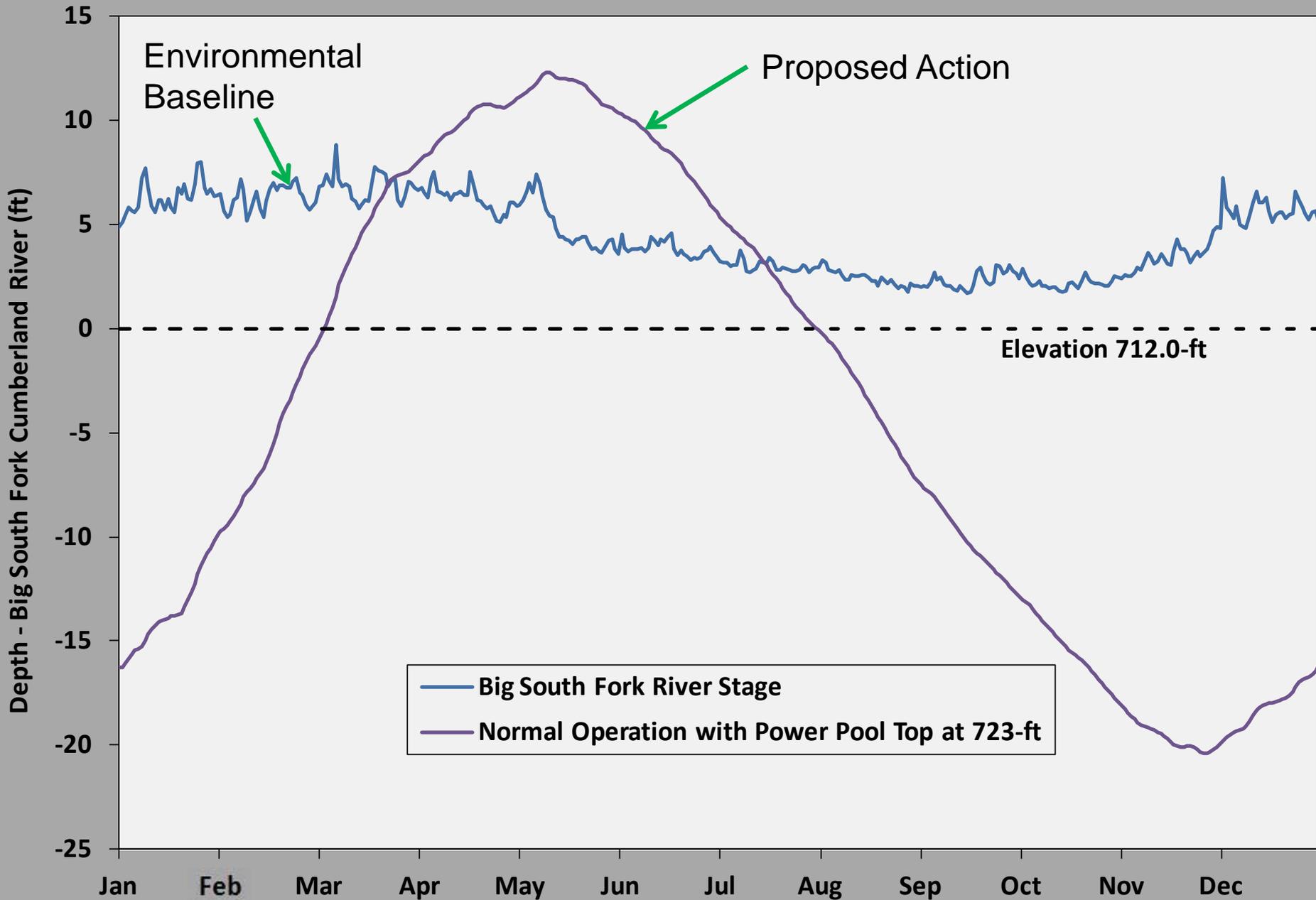
- Quantify Impacts - Depths and Velocities
  - Where?
  - How much?
  - When (time of year)?
- Models and Measured Data
  - ▶ Assumptions, Approximations, and Limitations
    - Conservative (overestimate negative impacts of dam operations on duskytail darter habitat)
    - Liberal (underestimate impacts)
  - ▶ Accuracies



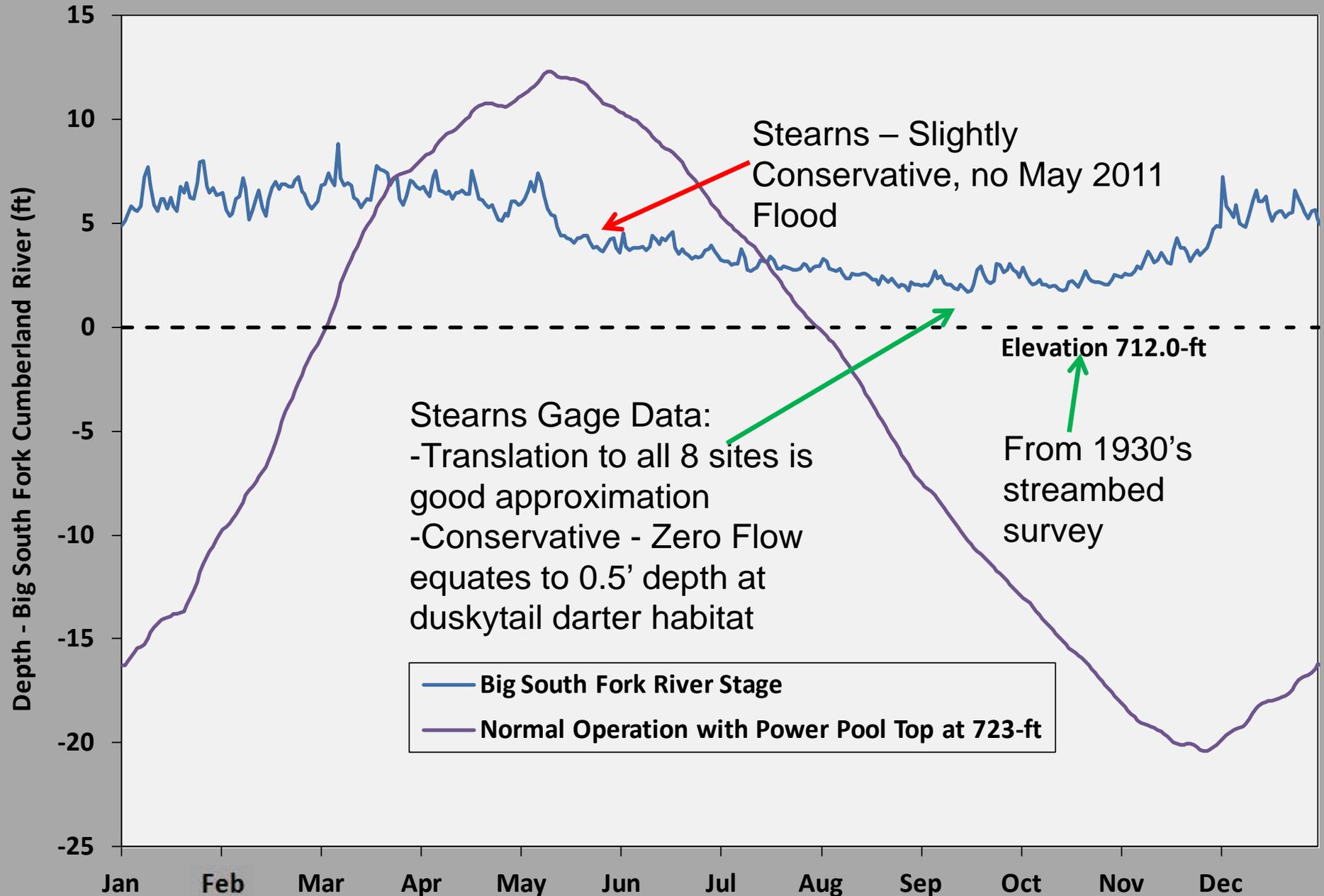
# Wolf Creek Guide Curves with Average Observed and ResSim Calibrated Headwater



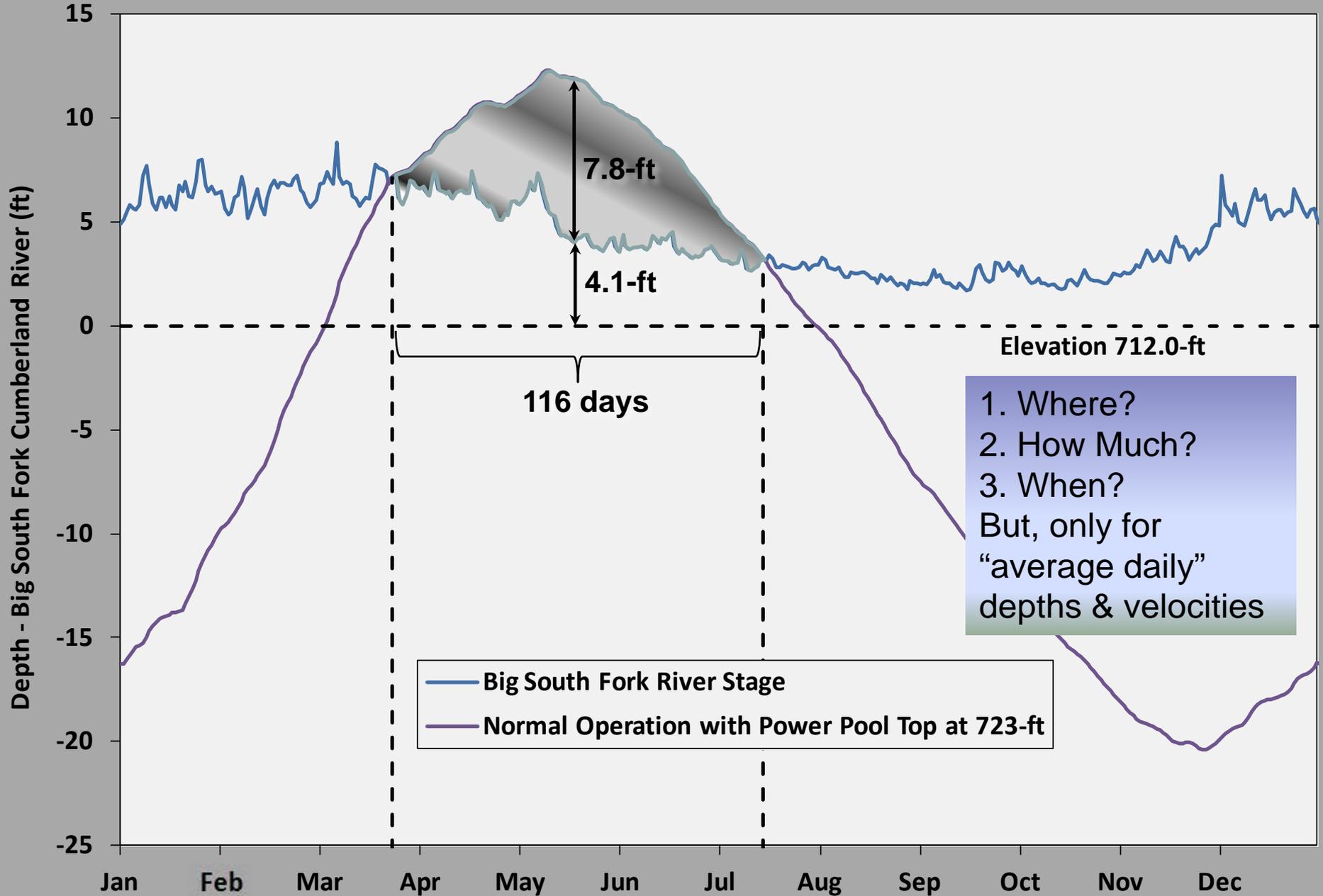
# Average River Stage and Backwater for Normal Operation with Power Pool Top at 723-ft at Site 8 (BSF River Mile 40.1 at Elevation 712.0-ft)



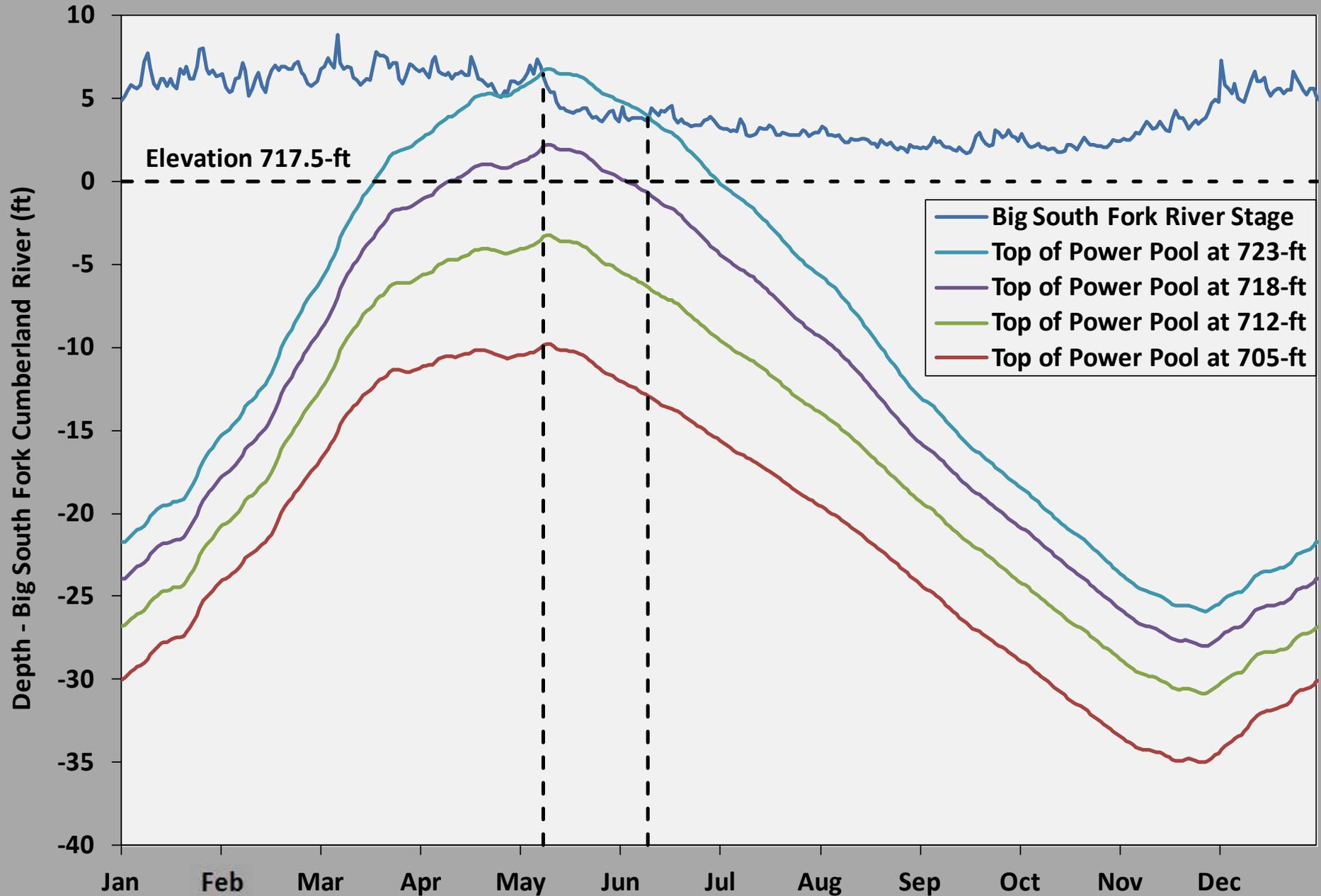
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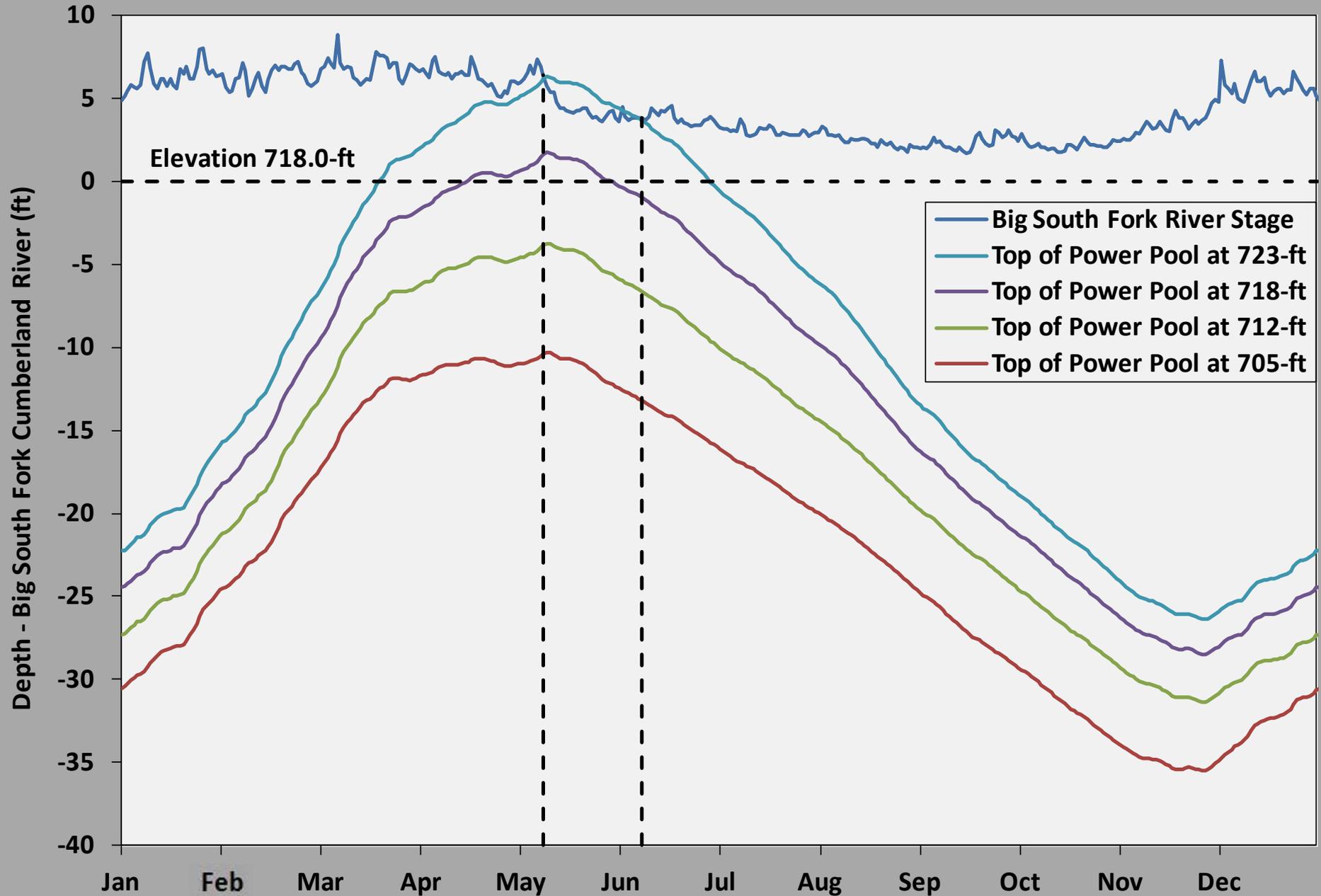
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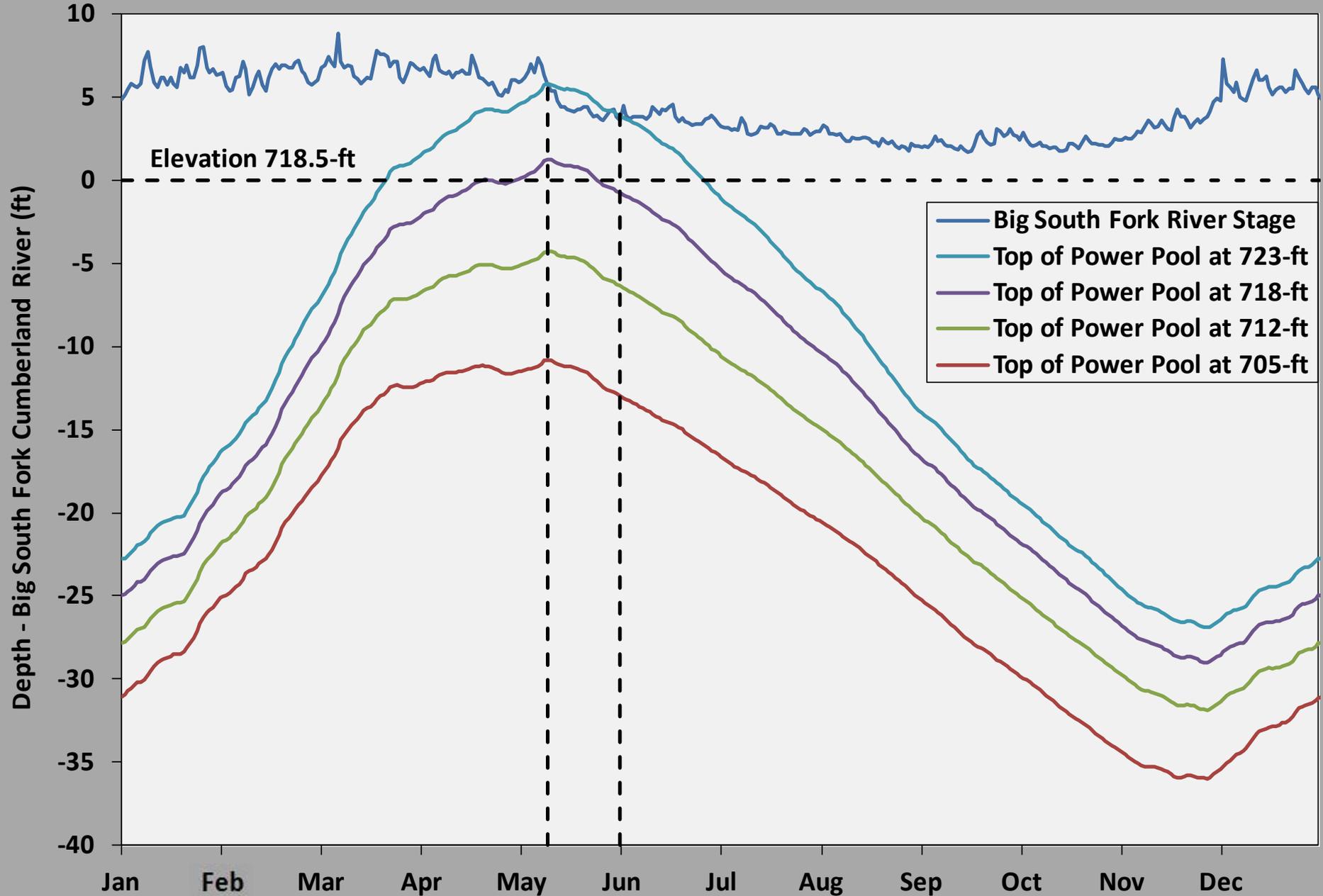
# Average River Stage and Backwater with Various Power Pool Operations at Site 6 (BSF River Mile 41.9 at Elevation 717.5-ft)



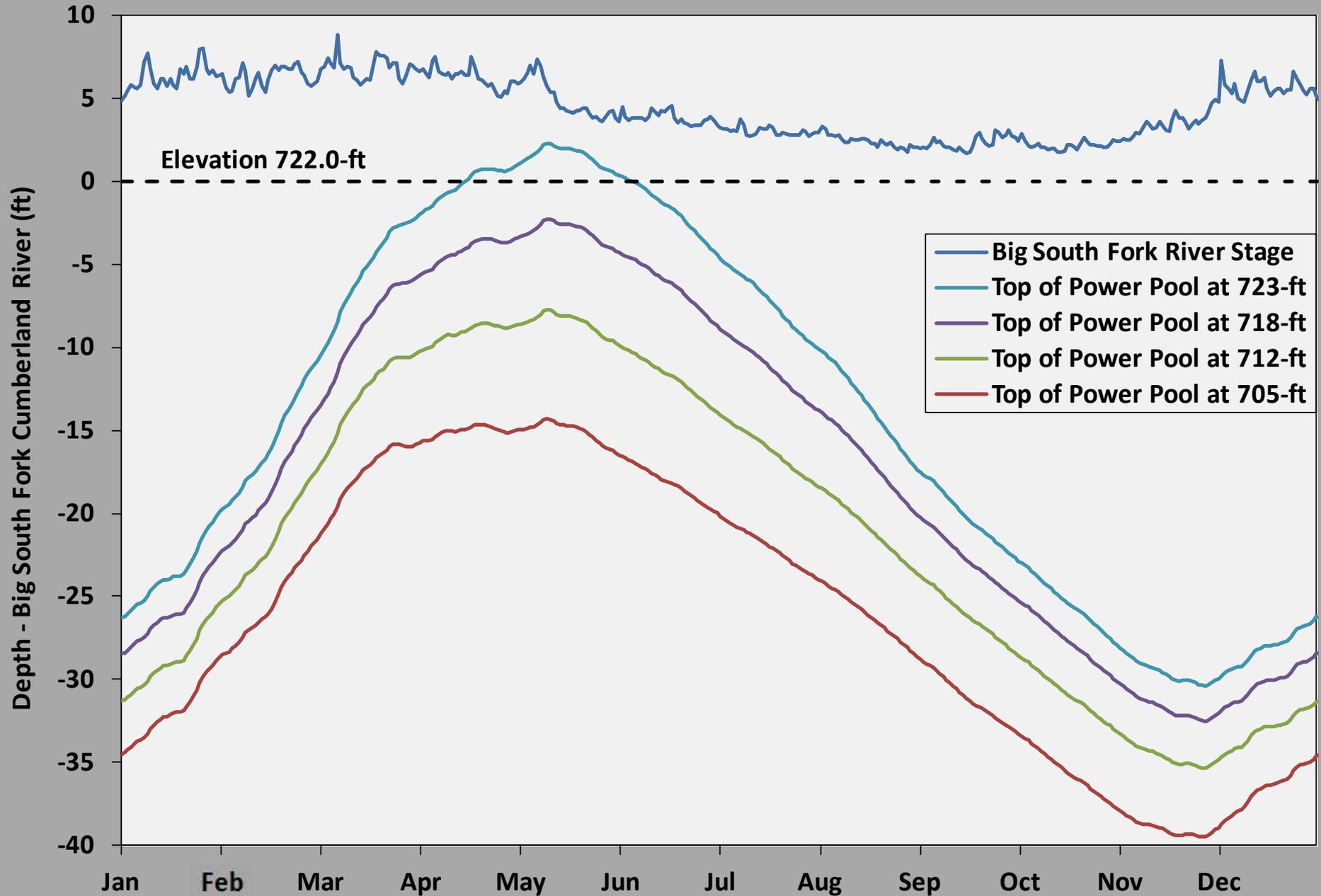
# Average River Stage and Backwater with Various Power Pool Operations at Site 5 (BSF River Mile 42.9 at Elevation 718.0-ft)



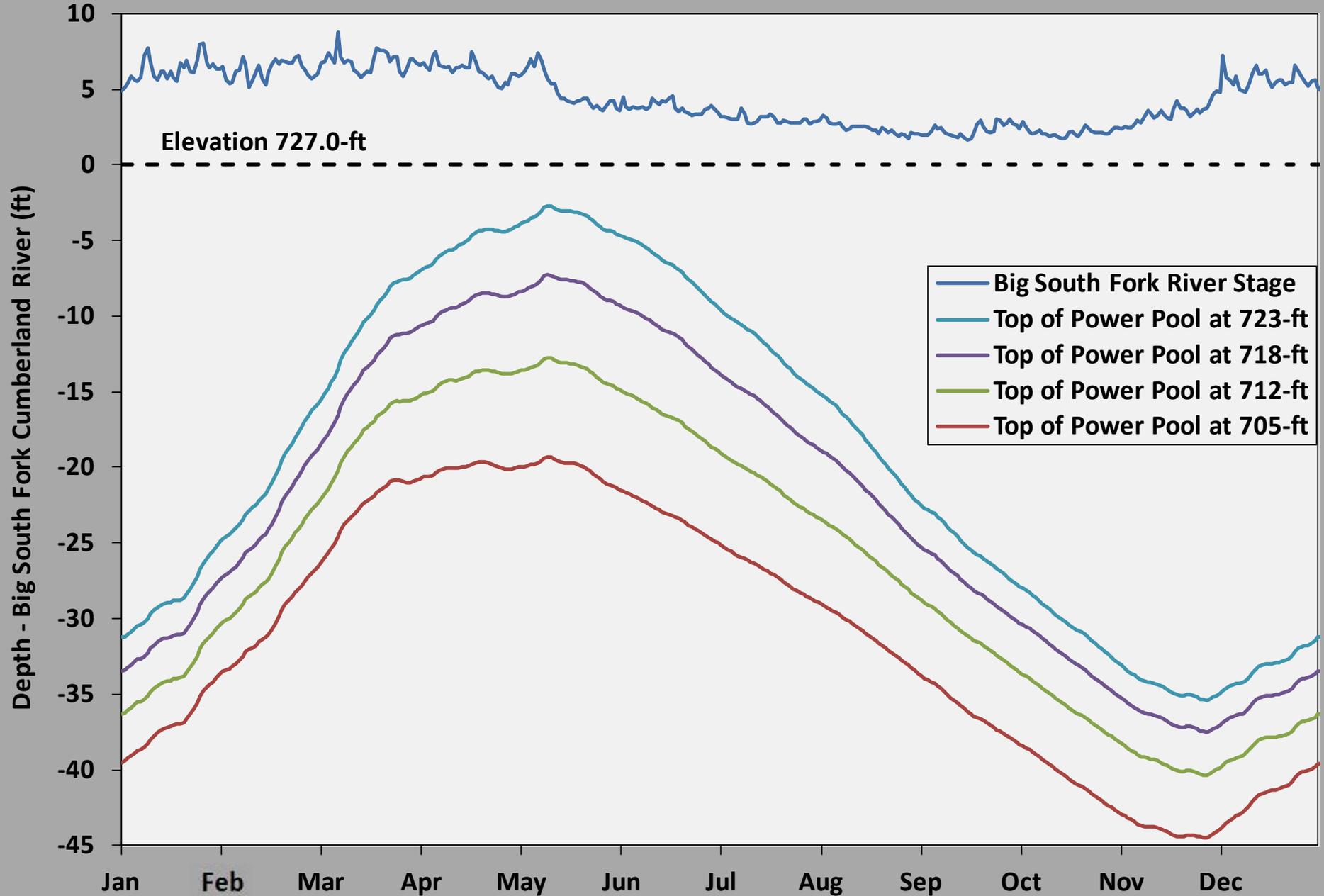
# Average River Stage and Backwater with Various Power Pool Operations at Site 4 (BSF River Mile 43.7 at Elevation 718.5-ft)



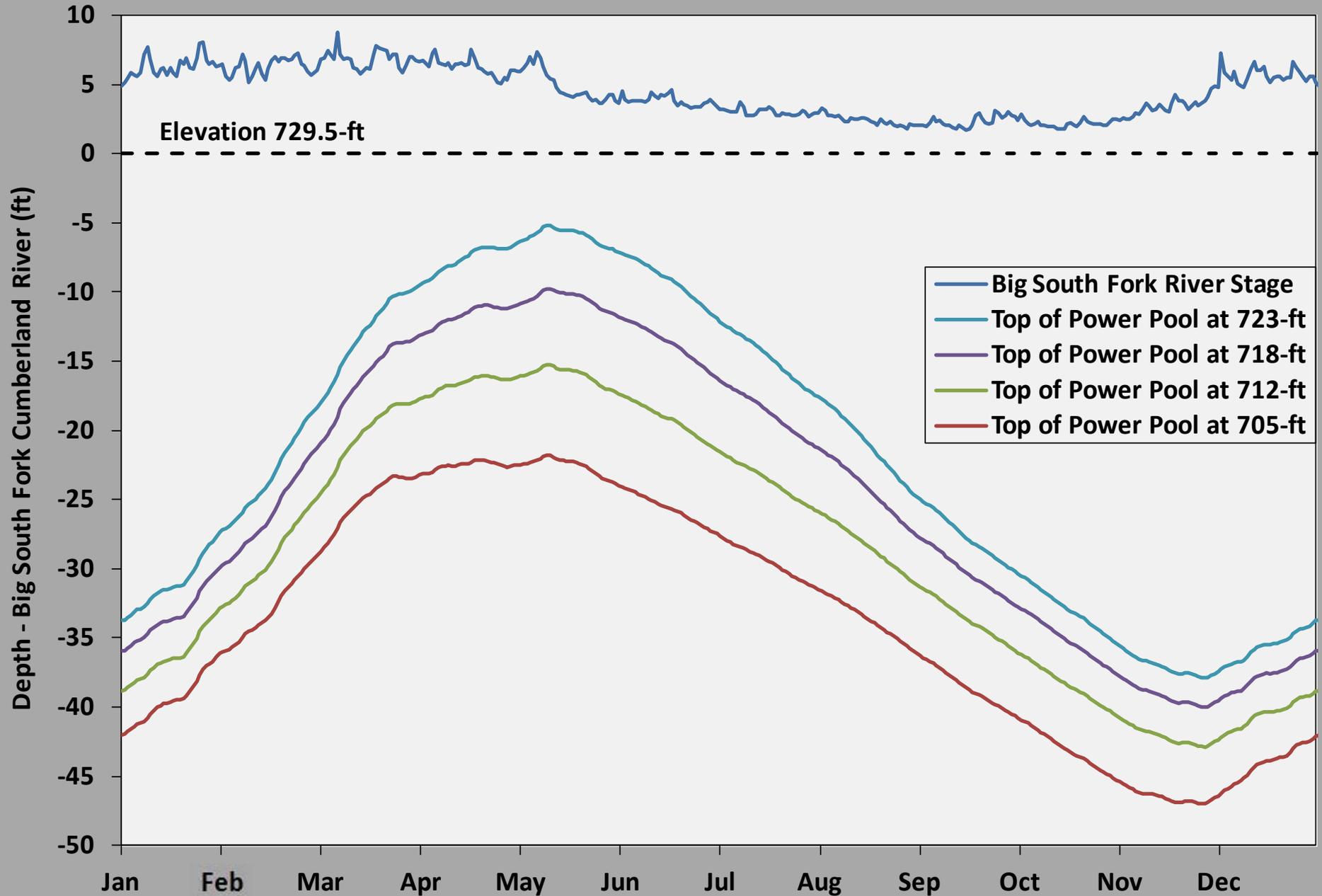
# Average River Stage and Backwater with Various Power Pool Operations at Site 3 (BSF River Mile 44.1 at Elevation 722.0-ft)



# Average River Stage and Backwater with Various Power Pool Operations at Site 2 (BSF River Mile 44.5 at Elevation 727.0-ft)



# Average River Stage and Backwater with Various Power Pool Operations at Site 1 (BSF River Mile 45.1 at Elevation 729.5-ft)



# Biological Assessment Results

- Lake level impacts all sites upstream to site 4
- Potential impacts to site 2 and 3 based on extreme weather events
- Potential elimination of duskytail darter population from sites 2 – 8.
- “Likely to adversely effect”



# Required Terms and Conditions in Biological Opinion - \$3M

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- The Corps will construct Water Quality Improvements in Big South Fork watershed
- Interim dam operation – Follow Top SEPA curve during fill cycle for 3 years or until WQ measures are implemented
- Long term monitoring of the duskytail darter in Big South Fork – 5 to 7 years
- Capture and hold duskytail darters



# Laurel Branch Stream Site



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# Big South Fork Streambank Protection Site – March 2014



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# 2014 Duskytail Monitoring

- Tennessee Valley Authority and Corps conducted monitoring at sites 2 – 10
- Duskytail darter presence/absence
- Habitat conditions
- Fish species richness



# Duskytail Darter Presence/Absence



- Snorkeling with hand nets
- Marked each fish sighting with weighted marker



- Seine Hauls



# Habitat Conditions



- 3 transects of 10 points per shoal
- Water velocity at substrate and water column (60% from bottom)
- Substrate percentage (boulder, cobble, gravel, sand, fines)



# Fish Species Richness



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# 2014 Monitoring – Preliminary Results

- Duskytail darters were present at sites 2-9
- 55 species of fish
- Habitat conditions are very similar to conditions observed during drawdown (very little distinction in substrate, some distinction in velocities)



# Capture and Hold

- 27 individuals captured
- Being held at a facility in Knoxville, TN to establish a captive population
- Genetic analysis being compared with wild population
- To be held at two locales in future – Knoxville and Wolf Creek NFH?



# Questions?



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