

# **COLUMBIA RIVER TREATY REVIEW**

## **Summary Analysis of Revised Iteration #1**

### **Ecosystem-Based Function**

Sovereign Review Team  
Meeting  
June 14, 2012

# Locations Analyzed for Ecosystem-Based Functions

## KOOTENAI RIVER BASIN

- Lake Koocanusa above Libby Dam
- Kootenai River below Libby Dam

## FLATHEAD RIVER BASIN

- Hungry Horse Reservoir
- South Fork Flathead River below Hungry Horse Dam
- Flathead River at Columbia Falls
- Flathead Lake above Kerr Dam
- Flathead River below Kerr Dam

## PEND OREILLE RIVER BASIN

- Clark Fork River at Cabinet Gorge Dam (inflow to Lake Pend Oreille)
- Lake Pend Oreille above Albeni Falls Dam
- Pend Oreille River below Albeni Falls Dam

## SPOKANE RIVER BASIN

- Lake Coeur d'Alene above Post Falls Dam
- Spokane River below Post Falls Dam

## COLUMBIA RIVER BORDER to GRAND COULEE DAM

- Columbia River at Border (flowing into USA)
- Lake Roosevelt above Grand Coulee Dam
- Columbia River below Grand Coulee Dam

# Locations Analyzed for Ecosystem- Based Functions

## GRAND COULEE DAM to SNAKE RIVER CONFLUENCE

- Columbia River at Priest Rapids Dam
- Columbia River at Vernita Bar

## SNAKE RIVER BASIN

- Snake River at Brownlee Dam
- Hells Canyon Complex
- North Fork Clearwater River at Dworshak Dam
- Lower Snake River at Lower Granite Dam

## COLUMBIA RIVER at SNAKE RIVER CONFLUENCE to ESTUARY

- Columbia River at McNary Dam
- Columbia River at The Dalles Dam
- Columbia River at Bonneville Dam (Estuary)

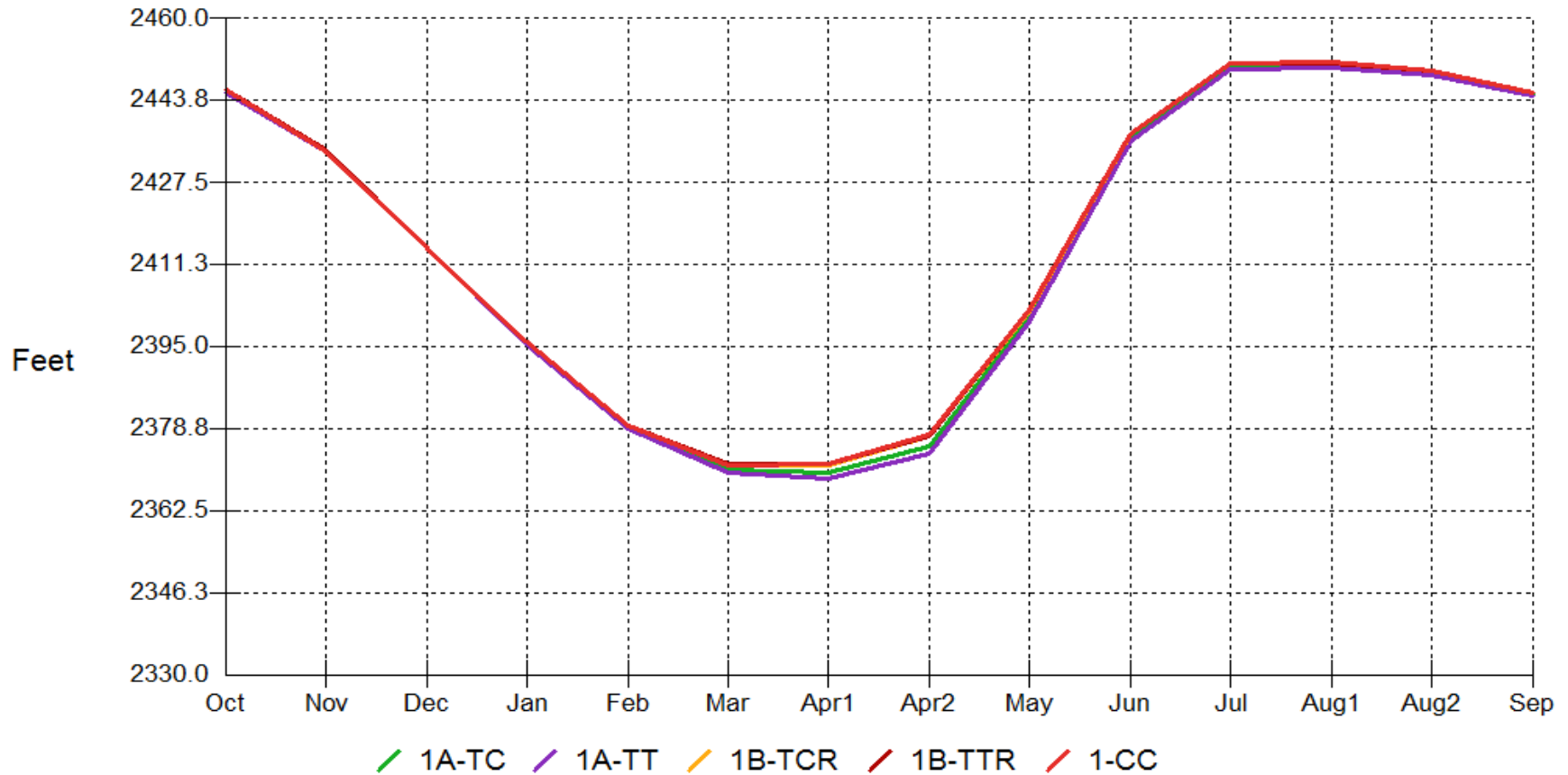
# KOOTENAI RIVER BASIN

- Lake Koocanusa above Libby Dam
- Kootenai River below Libby Dam

# LAKE KOOCANUSA – Elevations

## 5 Alternatives – 70 Water Years

Project Elevations: Libby (quintile ALL): Full=2459 Empty=2287

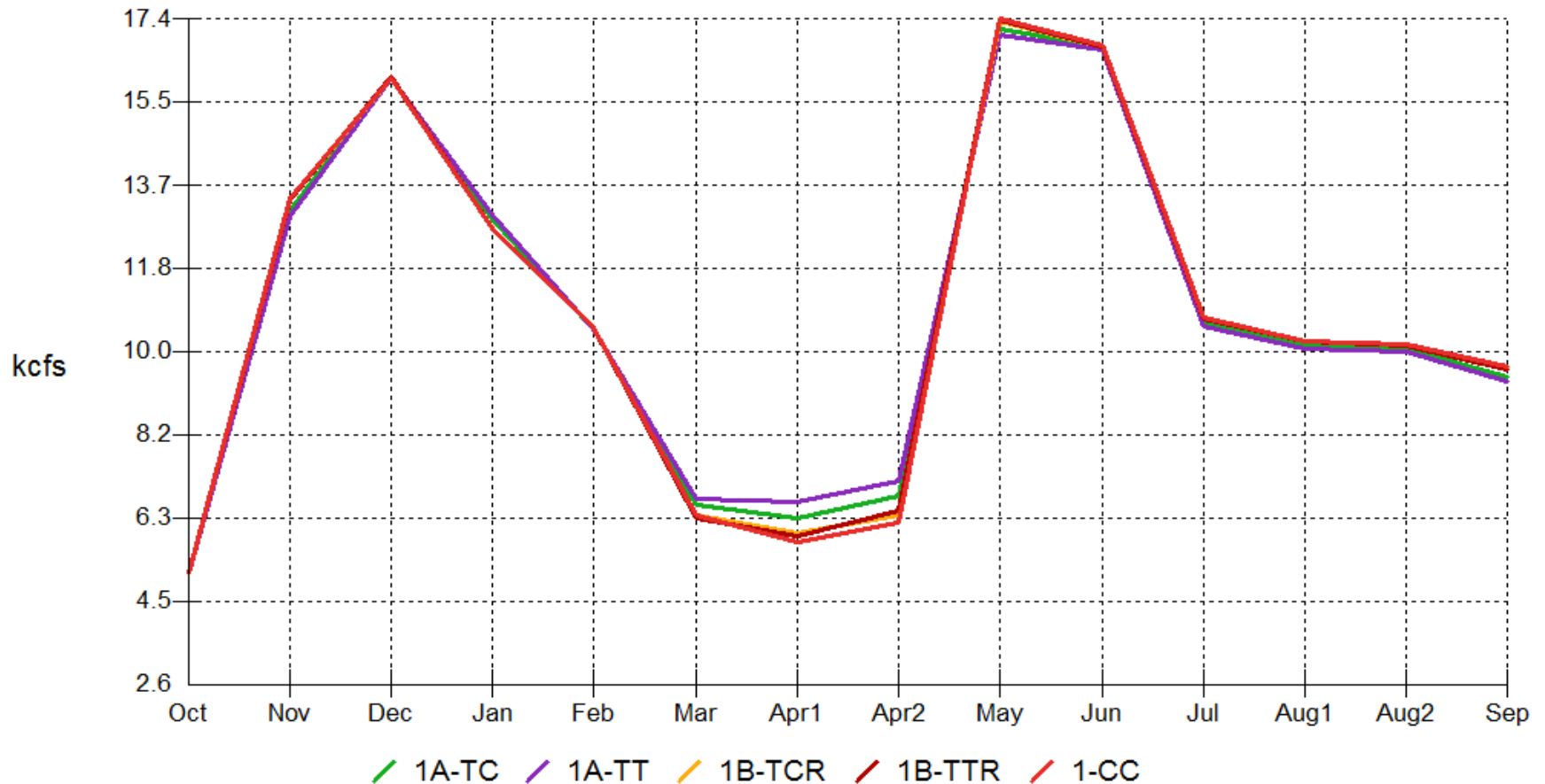


- With 600 alternatives, Lake is 2'-4' higher in April and 1' higher in summer than 450 alternatives, but 1' lower in April and the same in summer as Current Condition.
- In higher water years, Lake is 5'-12' higher in April and 3'-4' higher in summer with 600 alternatives compared to 450 alternatives ; 600 alternatives draft 2' more than Current Condition, but have same summer elevations.

# Kootenai River

## 5 Alternatives – 70 Water Years

Project Outflows:Libby (quintile ALL)



- 450 alternatives have < 1 kcfs greater flows in April compared to 600 alternatives and Current Condition.
- In lower water years, flows are very similar for all alternatives.
- In higher water years, 450 alternatives have flows ~2-3 kcfs more in April; ~ 1 kcfs less in Sept. compared to 600 alternatives and Current Condition.

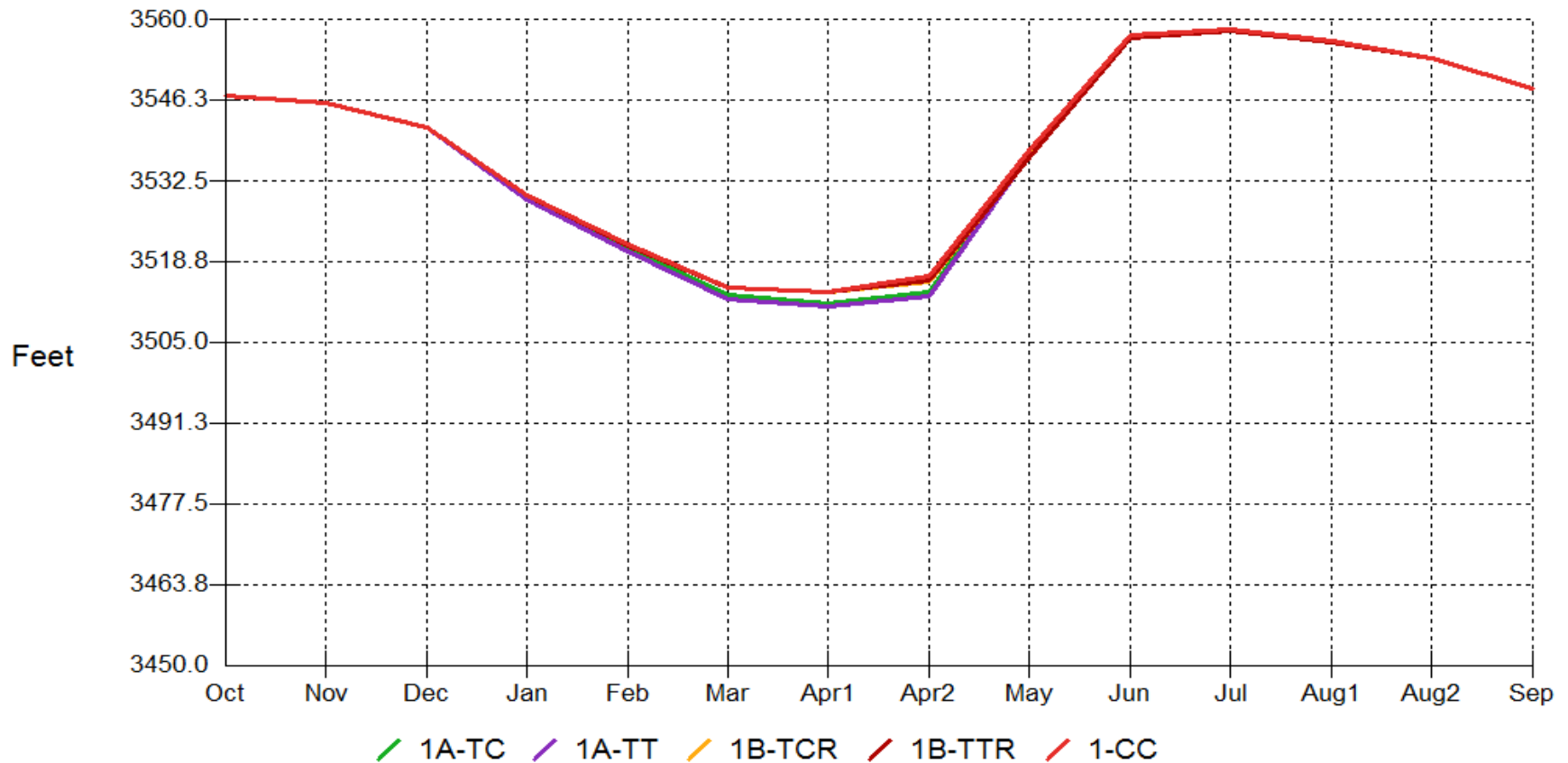
# FLATHEAD RIVER BASIN

- Hungry Horse Reservoir above Dam
- South Fork Flathead River below Hungry Horse Dam
- Flathead River at Columbia Falls
- Flathead Lake above Kerr Dam
- Flathead River below Kerr Dam

# Hungry Horse Reservoir Elevation

## 5 Alternatives – 70 Water Years

Project Elevations: Hungry Horse (quintile ALL): Full=3560 Empty=3336

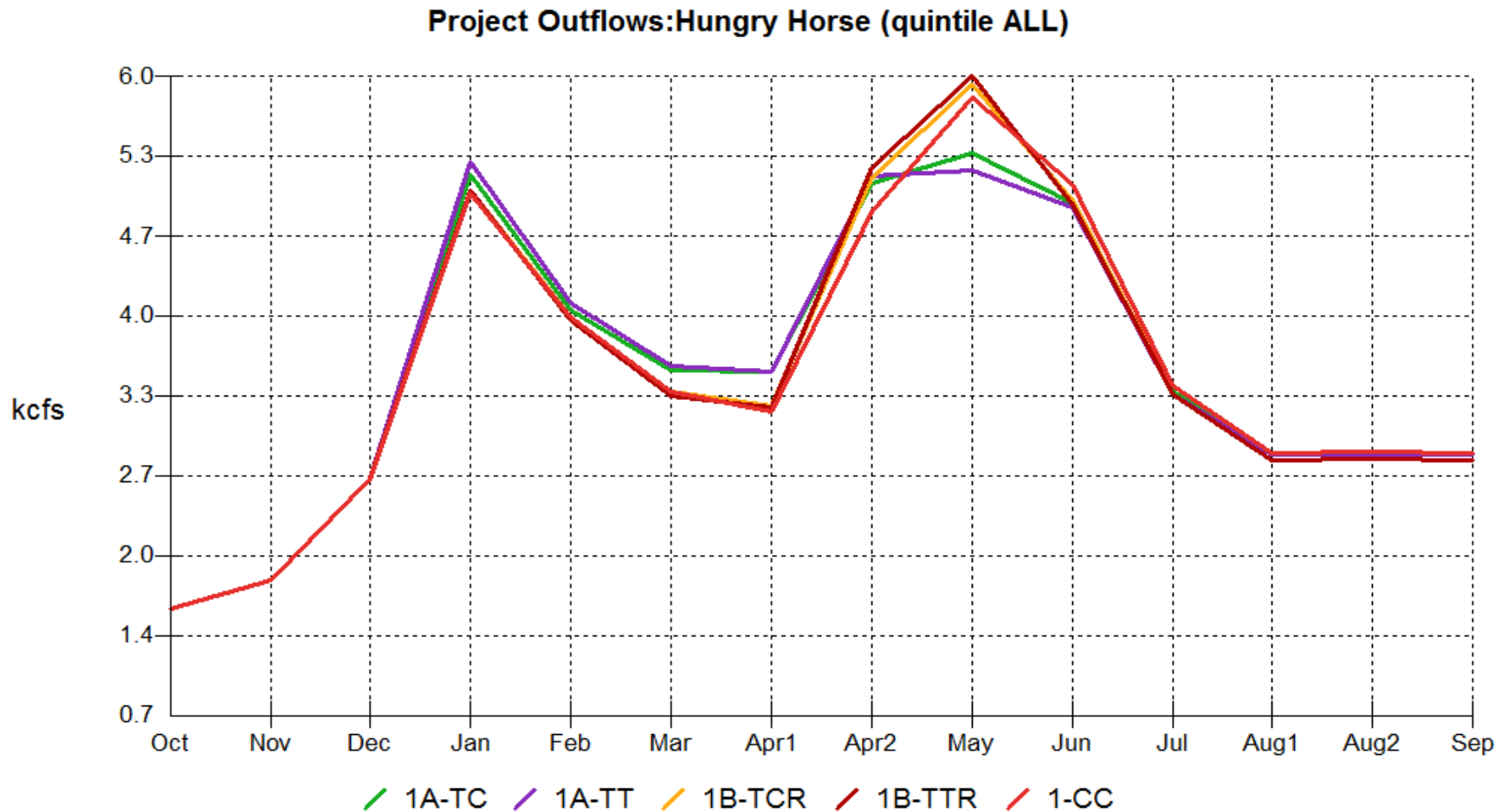


- 600 alternatives draft the reservoir 2'-3' less in the spring compared to 450 alternatives, but 1' more than Current Condition.
- 600 alternatives draft 8'-9' less than 450 alternatives and about 4' more than Current Condition in April.
- Refill is similar for all alternatives.



# S.F. Flathead below Hungry Horse Dam

## 5 Alternatives – 70 Water Years

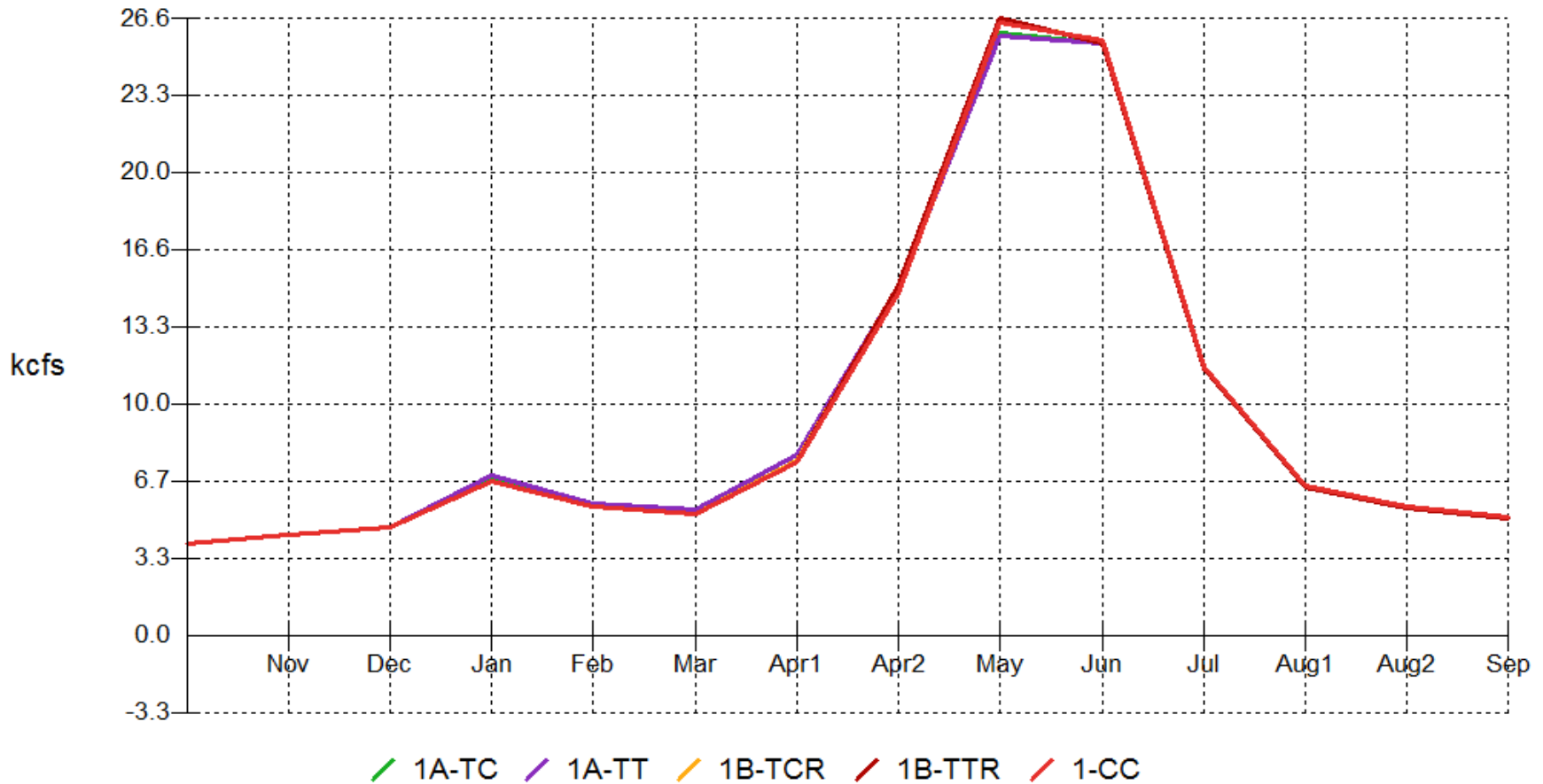


- 450 alternatives show ~ 0.3 kcfs higher flows in early spring and ~ 0.7 kcfs lower flows in May compared to the 600 alternatives and Current Condition.
- In higher water years, 450 alternatives show ~ 1 kcfs greater flow in the early spring and ~ 2 kcfs less flow in May compared to the 600 alternatives and Current Condition.

# Flathead River @ Columbia Falls

## 5 Alternatives – 70 Water Years

Project Outflows:Columbia Falls (quintile ALL)

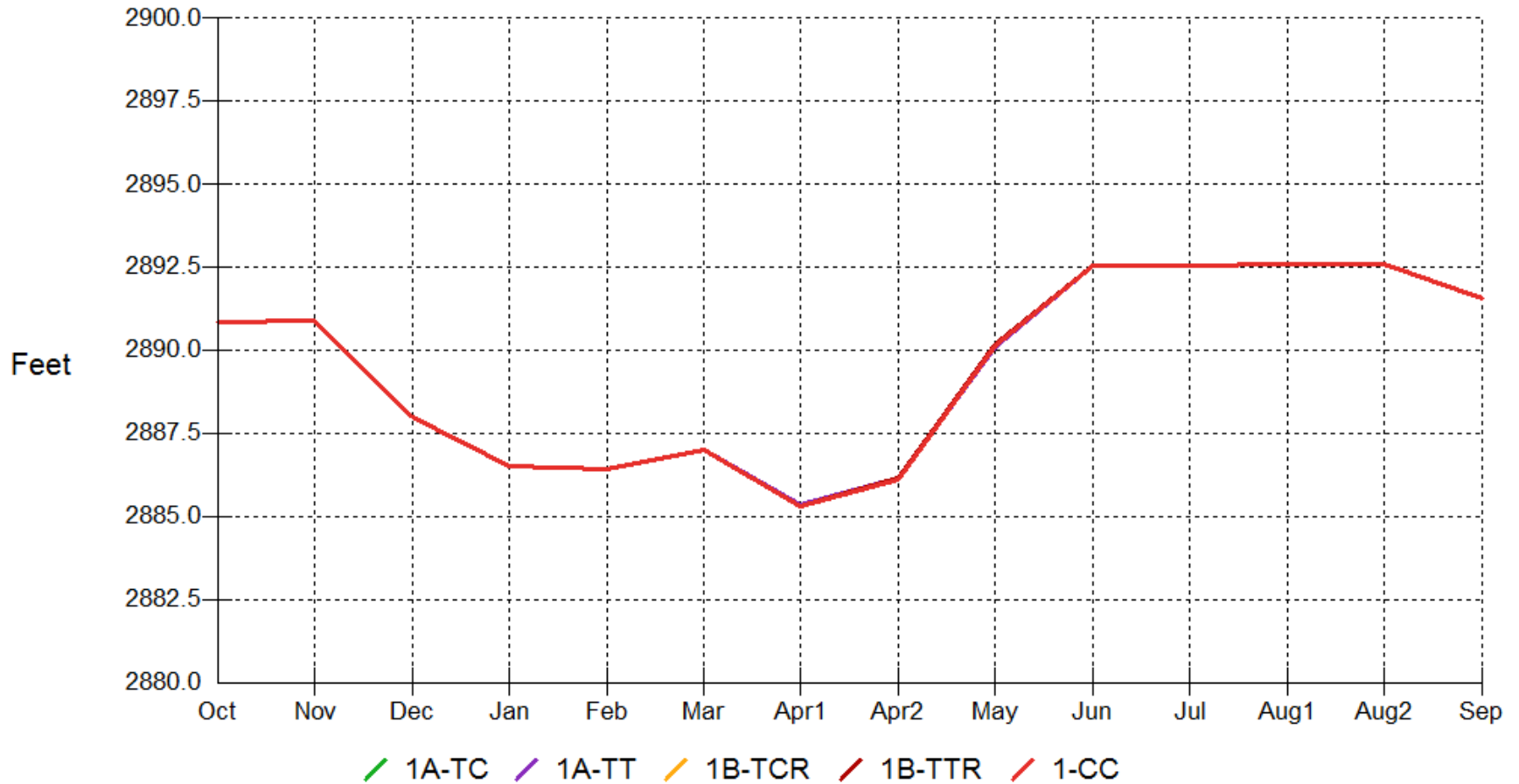


- Little differences in flows between alternatives.
- 450 alternatives' flows are ~1 kcfs higher in early spring and ~2 kcfs lower in May compared to the 600 alternatives and Current Condition.

# Flathead Lake – Elevations

## 5 Alternatives – 70 Water Years

Project Elevations:Kerr (quintile ALL):Full=2893 Empty=2883

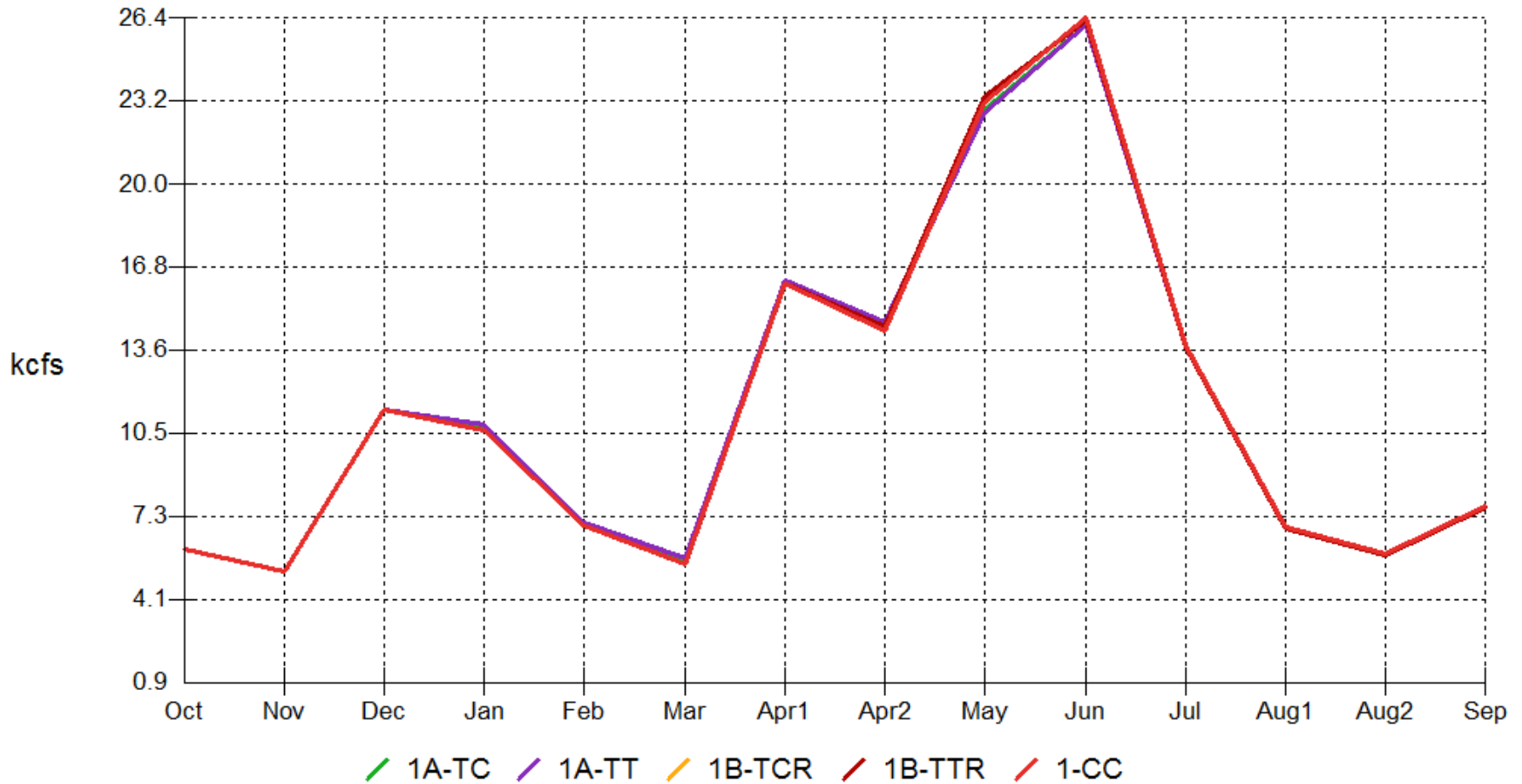


•No effects of alternatives on Flathead Lake elevations; same for lowest and highest water years.

# Kerr Dam Outflows

## 5 Alternatives – 70 Water Years

Project Outflows:Kerr (quintile ALL)



• Little, if any, differences in flows between alternatives; same for lowest and highest water years.

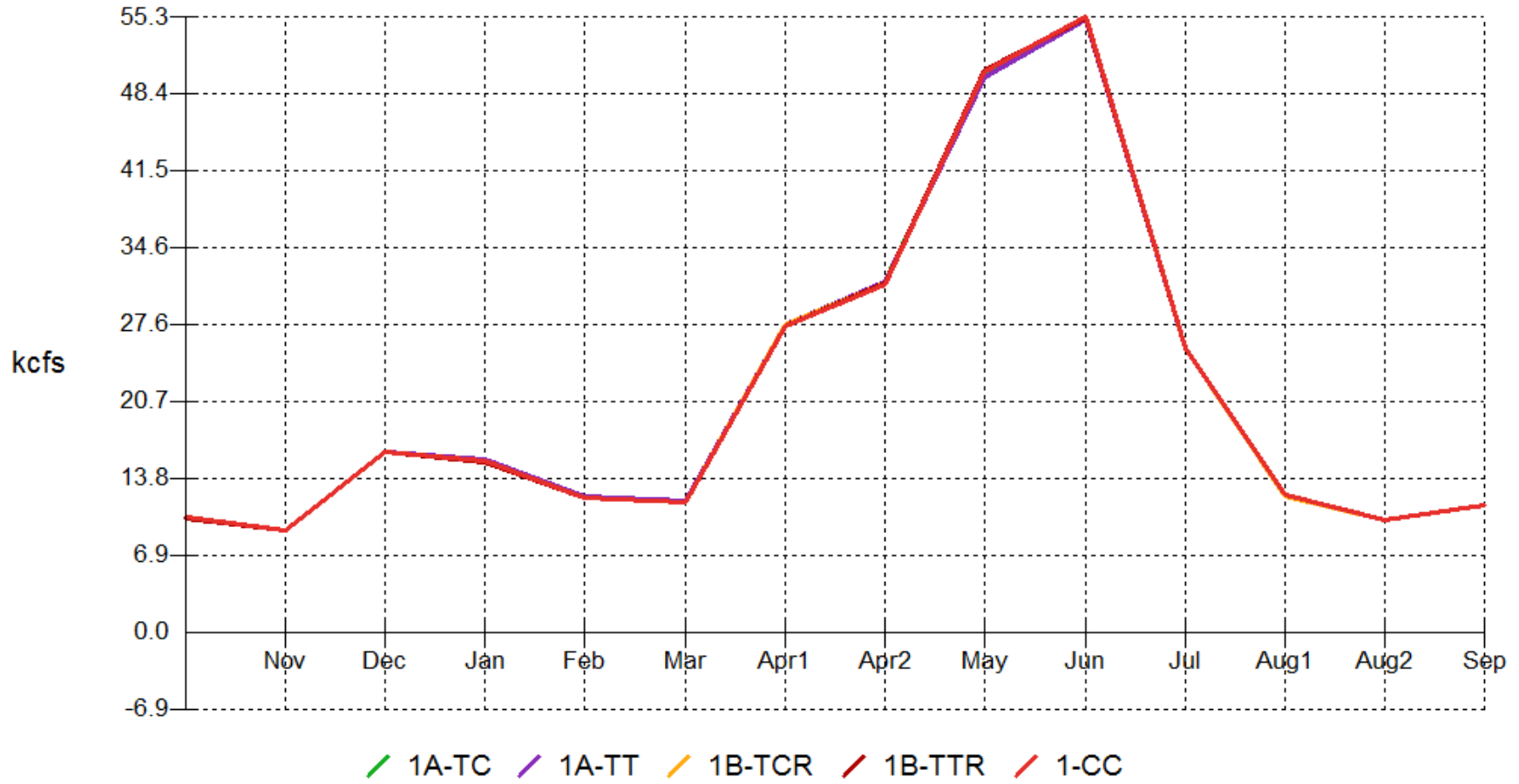
# PEND OREILLE RIVER BASIN

- Clark Fork River at Cabinet Gorge Dam
- Lake Pend Oreille above Albeni Falls Dam
- Pend Oreille River below Albeni Falls Dam

# Clark Fork River at Cabinet Gorge Dam

## 5 Alternatives – 70 Water Years

Project Outflows:Cabinet Gorge (quintile ALL)

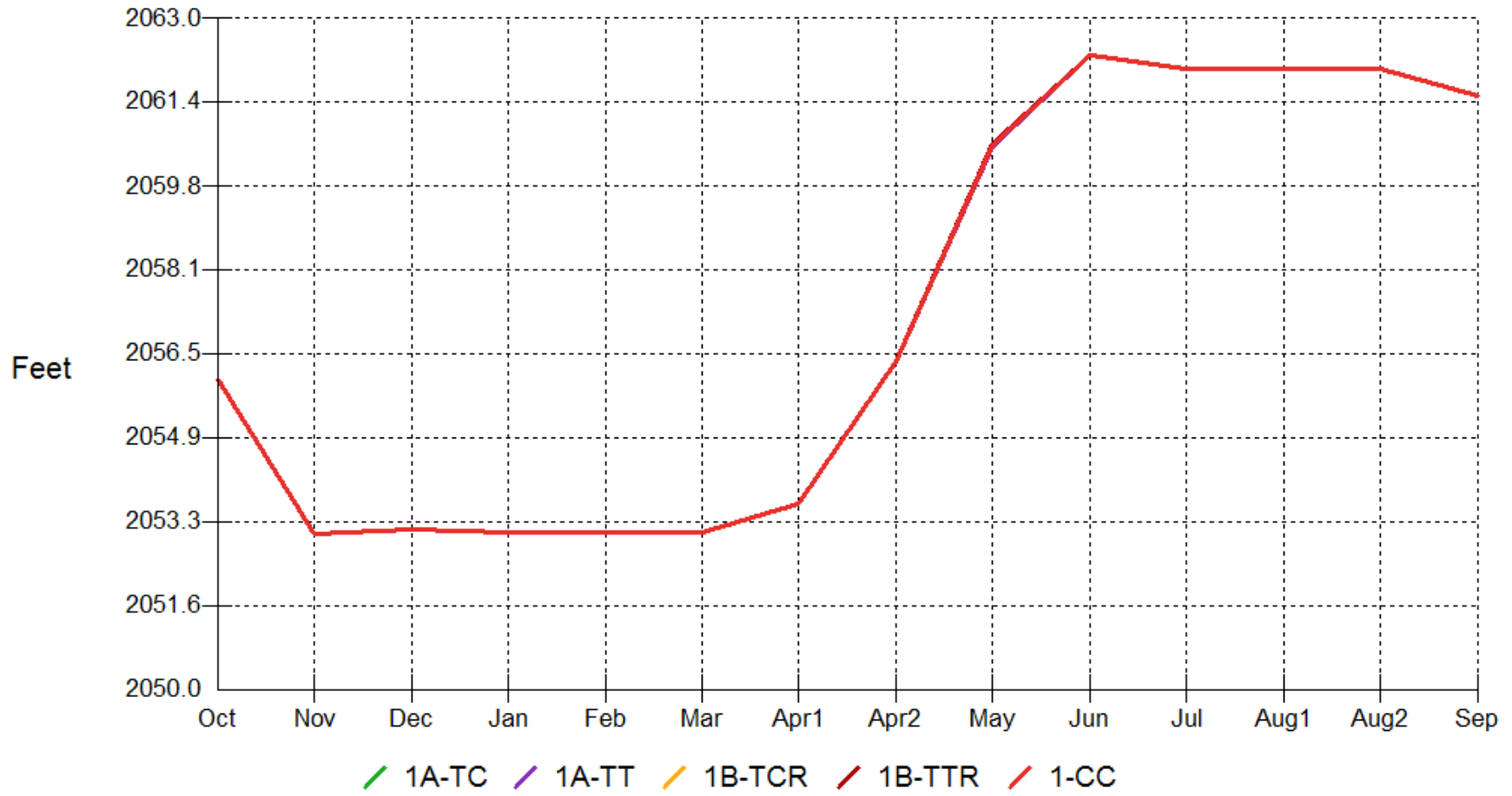


•Effects of Treaty alternatives is limited to 0 – 0.4 kcfs; similar effects in the lowest and highest water years.

# Lake Pend Oreille Elevations

## 5 Alternatives – 70 Water Years

Project Elevations: Albeni Falls (quintile ALL): Full=2062.5 Empty=2049.7

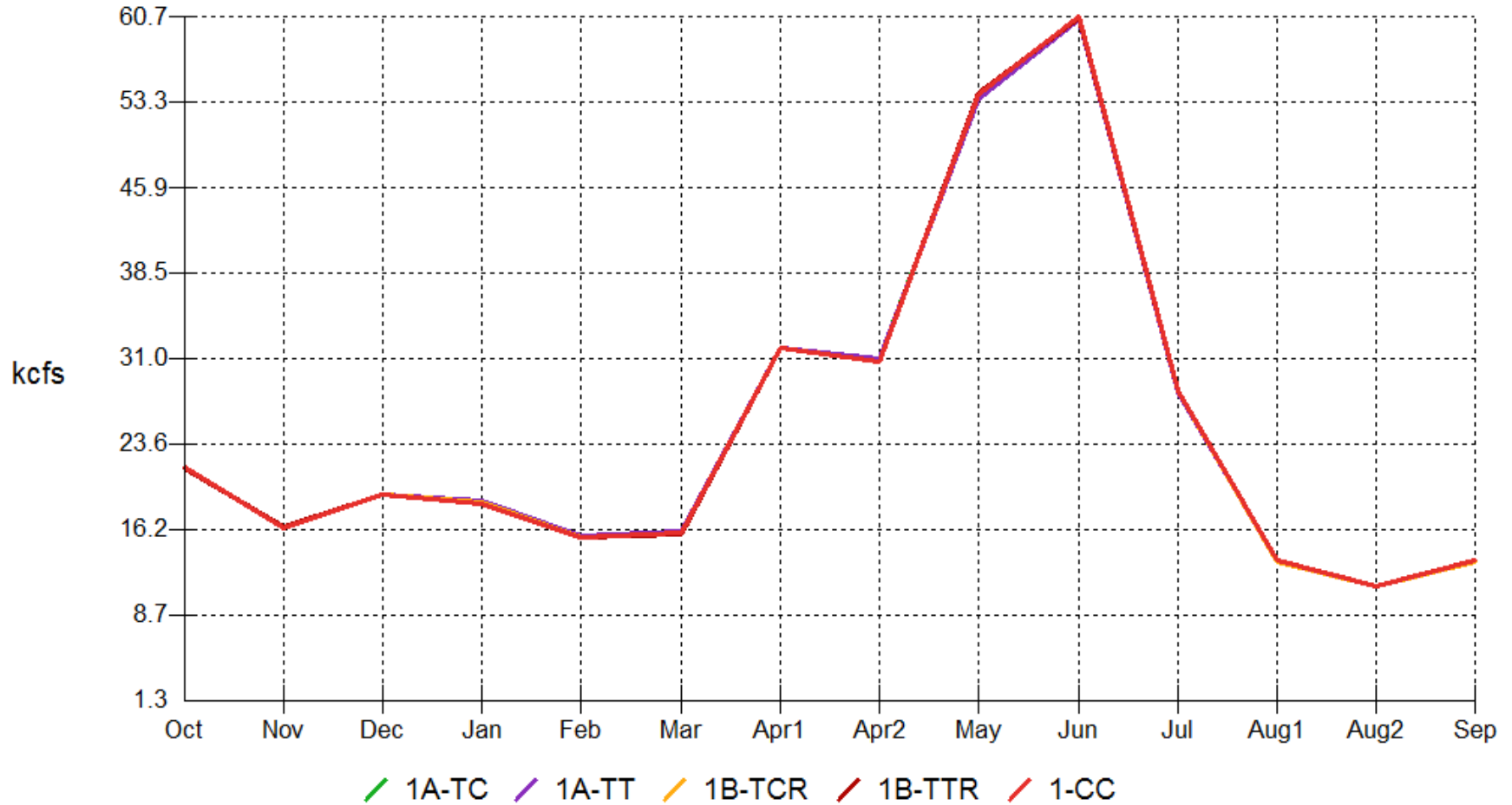


•No effects of Treaty alternatives on Lake elevations in all water conditions.

# Albeni Falls Dam – Outflows

## 5 Alternatives – 70 Water Years

Project Outflows:Albeni Falls (quintile ALL)



•Flow effects of Treaty alternatives are limited to no more than ~ 0.2 kcfs in all water conditions.



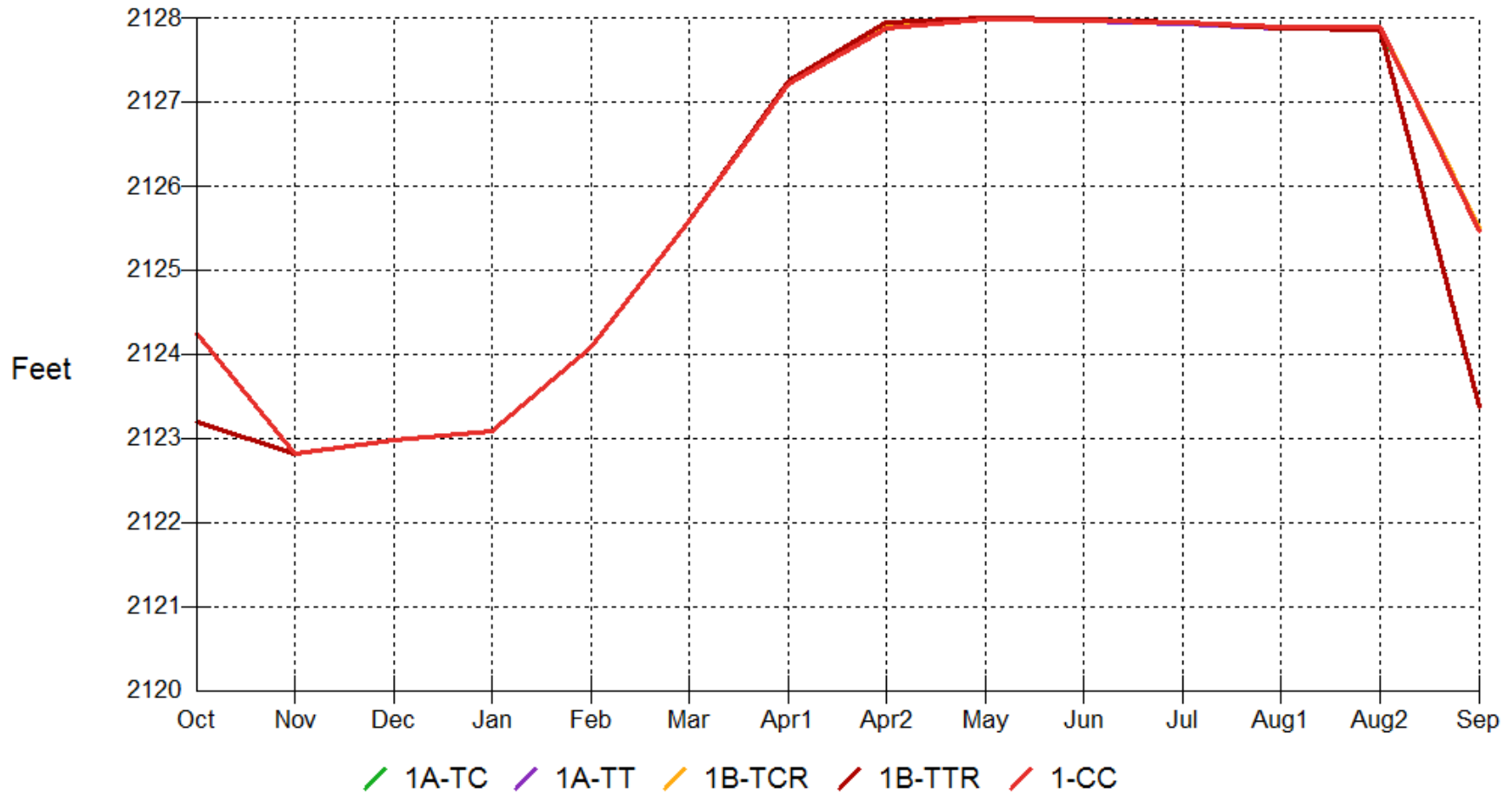
# SPOKANE RIVER BASIN

- Lake Coeur d'Alene
- Spokane River below Post Falls Dam

# Coeur d' Alene Lake Elevations

## 5 Alternatives - 70 Water Years

Project Elevations:Coeur d Alene Lake (quintile ALL):Full=2128 Empty=2120.5

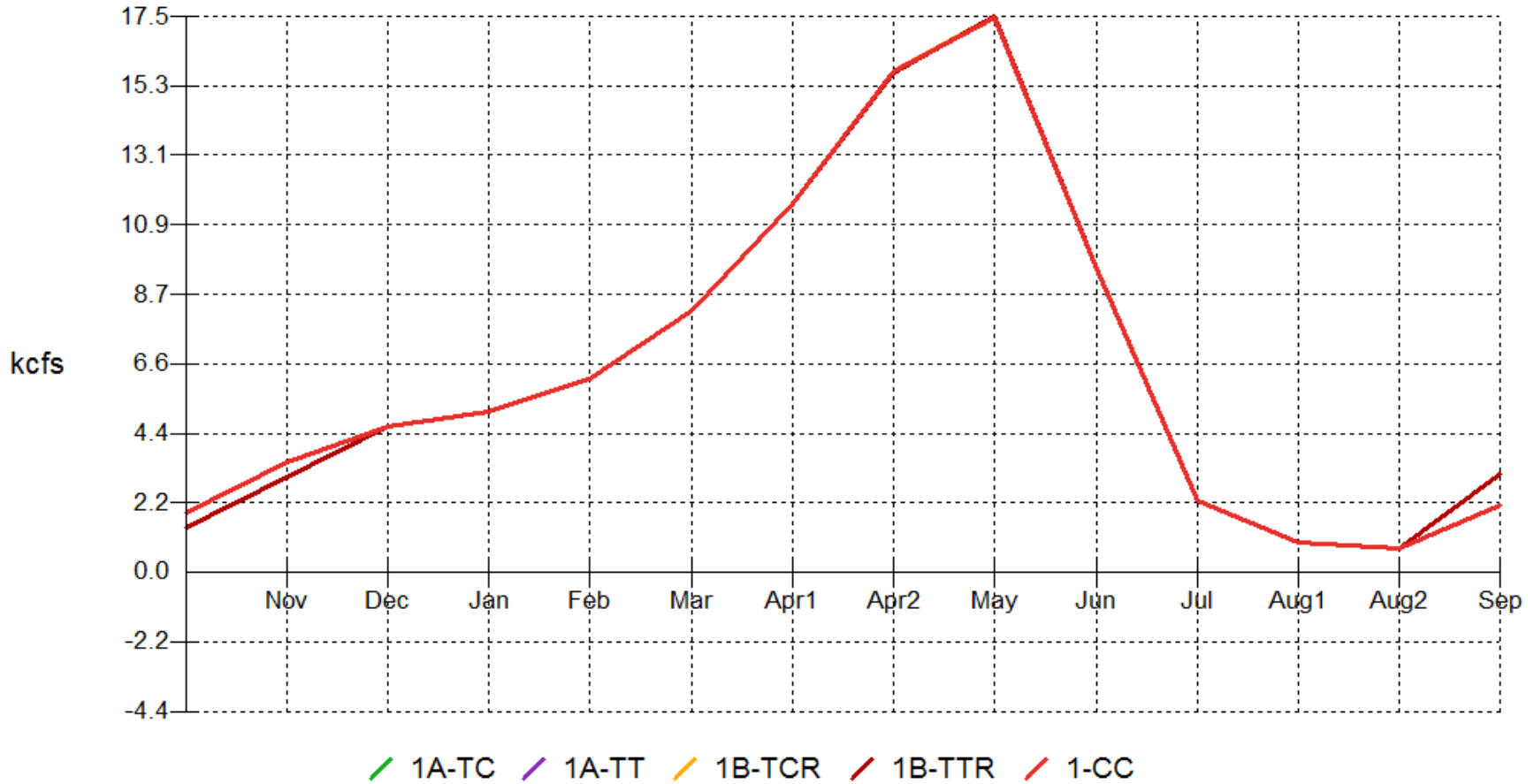


• Modeling of Treaty Terminates alternatives show potential to draft Lake ~ 1' more in the fall (3' in lowest water years), but in actual operations , this is not likely.

# Coeur d' Alene Lake Outflows

## 5 Alternatives - 70 Water Years

Project Outflows:Coeur d Alene Lake (quintile ALL)



• Modeling of Treaty Terminates alternatives show potential for higher fall flows of ~ 1 kcfs from Post Falls Dam, but in actual operations , this is not likely.

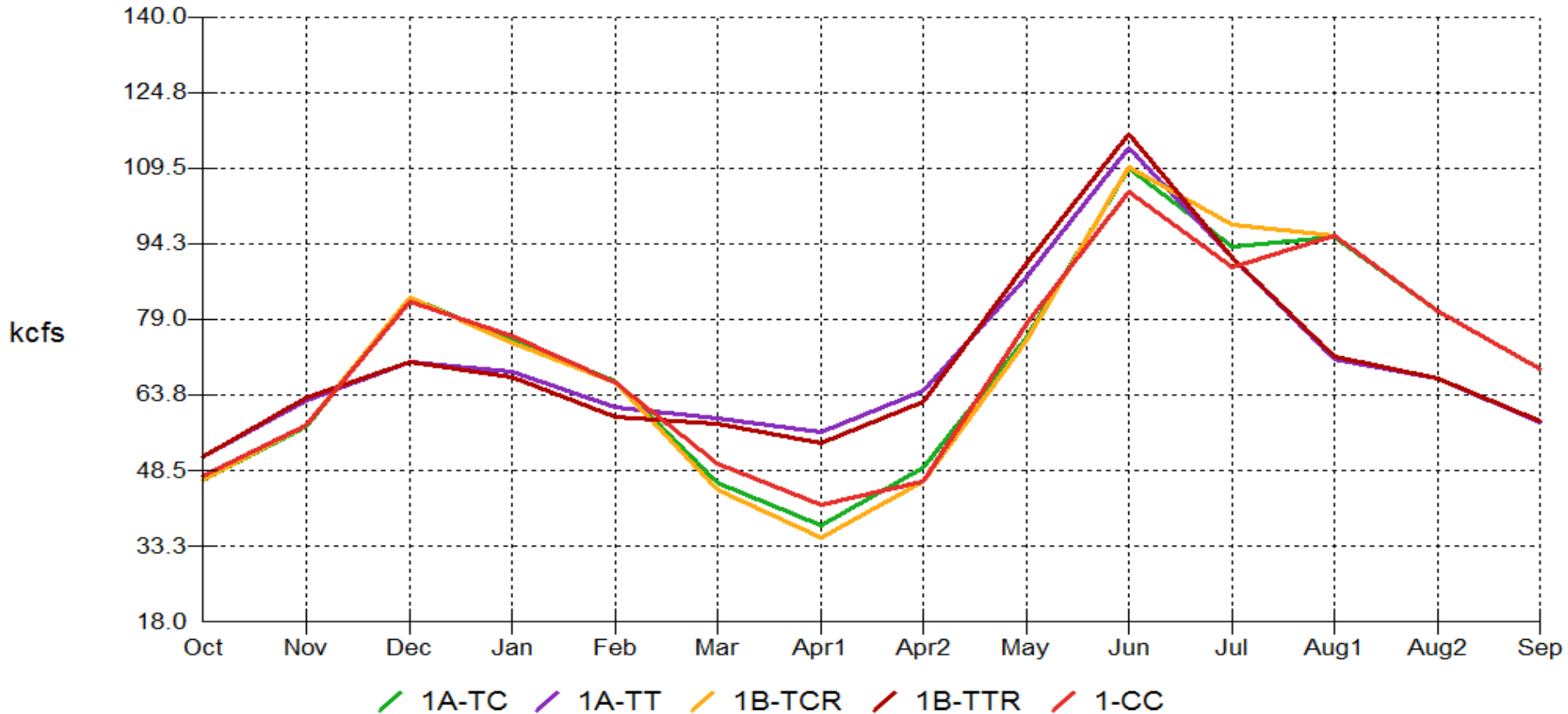
# COLUMBIA RIVER BORDER to GRAND COULEE DAM

- Columbia River at Border (flowing into USA)
- Lake Roosevelt above Grand Coulee Dam
- Columbia River below Grand Coulee Dam

# Columbia River Flows at Border

## 5 Alternatives - 70 Water Years

Combined Flows:US-Canada Border Outflow (quintile ALL)

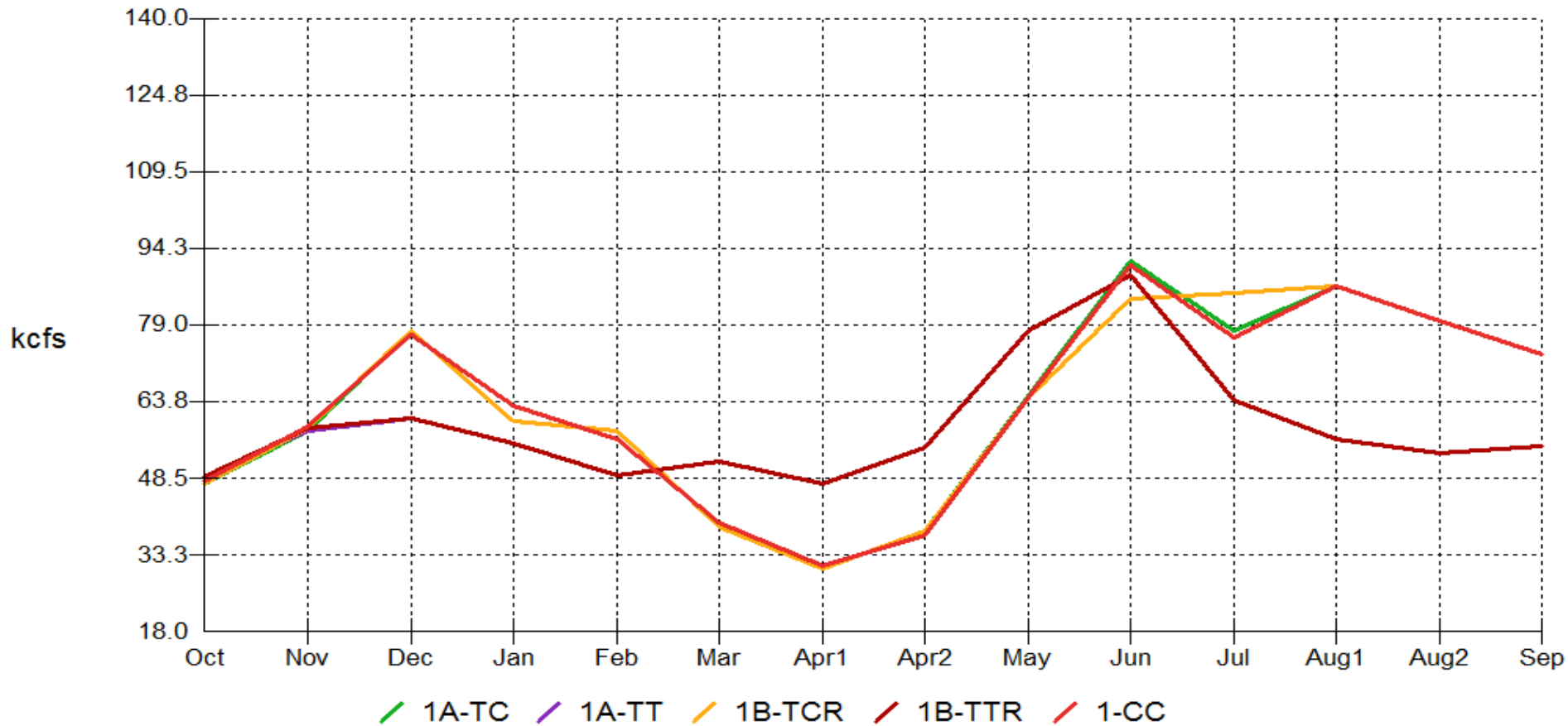


•Treaty Terminates alternatives show lower winter flows (10-13 kcfs), higher freshet flows (10-20 kcfs) and lower summer flows (10-20 kcfs).

# Flows at Border

## 5 Alternatives – 20% Lowest Water Years

Combined Flows:US-Canada Border Outflow (quintile L20)



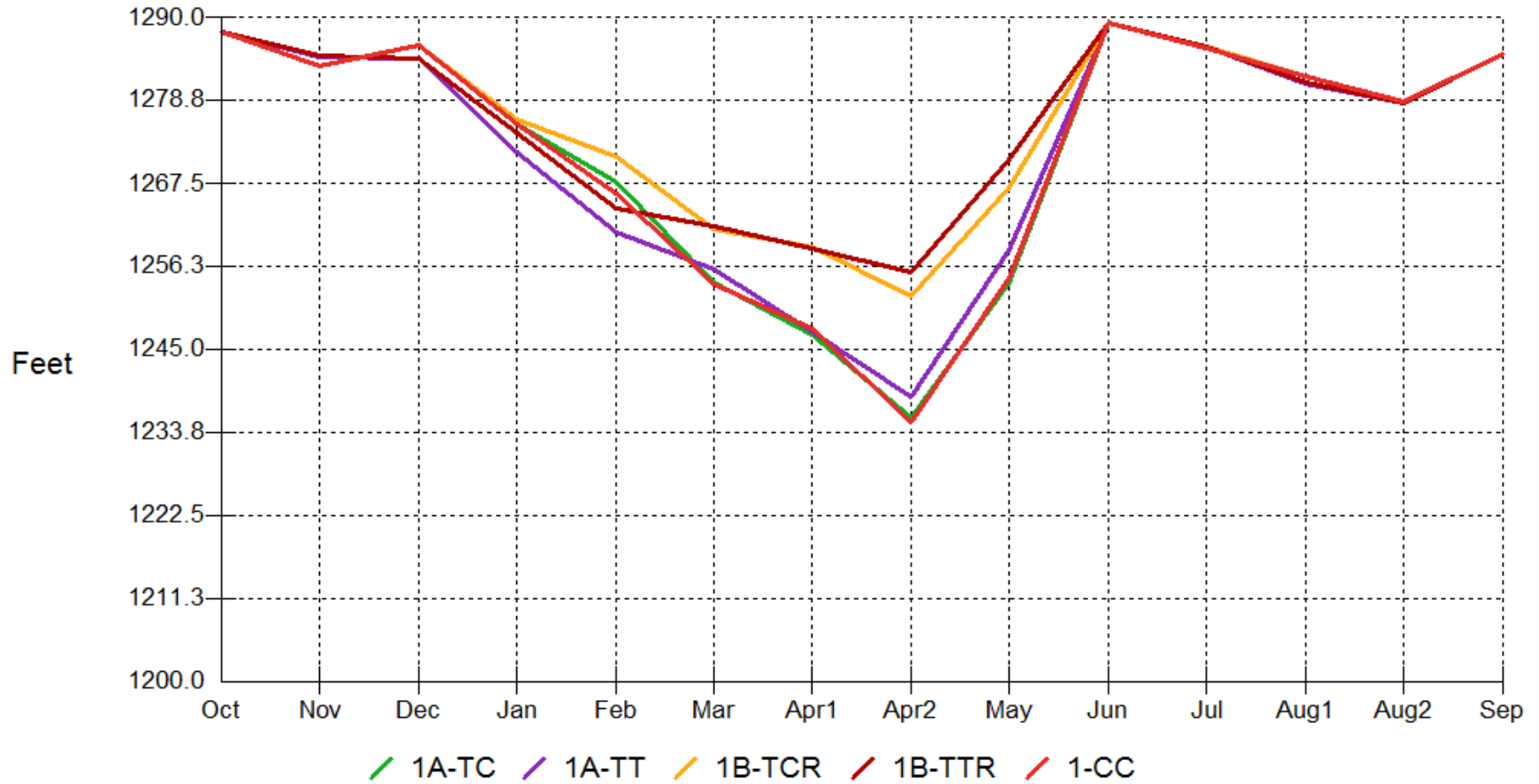
•In lower flow years, Treaty Terminates alternatives show similar flow pattern, except even lower summer flows (25-30 kcfs) .

•Flow differences are proportionately greater.

# Lake Roosevelt Elevation

## 5 Alternatives – 70 Water Years

Project Elevations: Grand Coulee (quintile ALL): Full=1290 Empty=1208

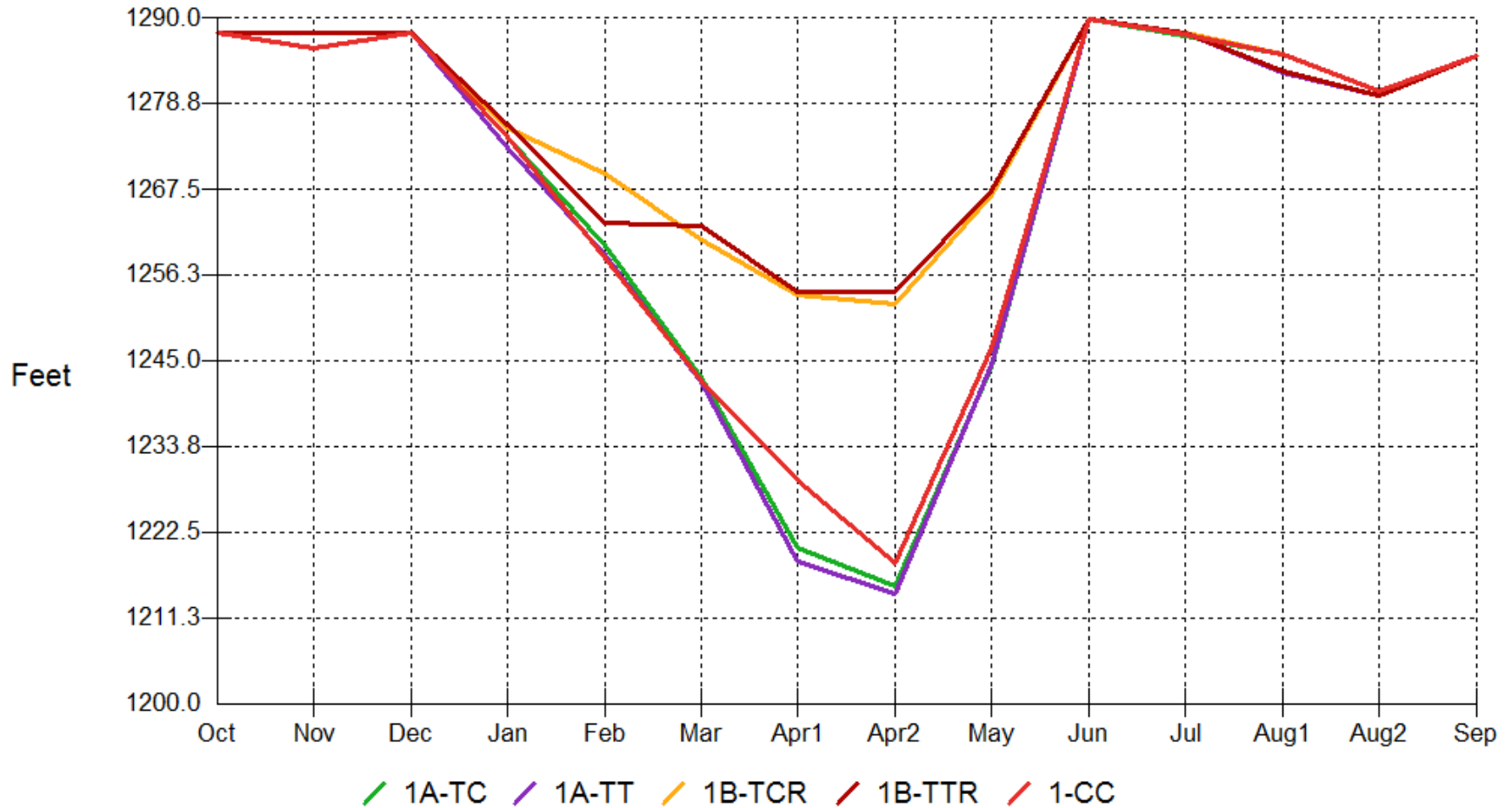


•600 alternatives draft the Lake 15' – 20' less in April than the 450 alternatives and Current Condition. Lake is also 10' – 15' higher in May.

# Lake Roosevelt Elevation

## 5 Alternatives – 20% Highest Water Years

Project Elevations: Grand Coulee (quintile H20): Full=1290 Empty=1208



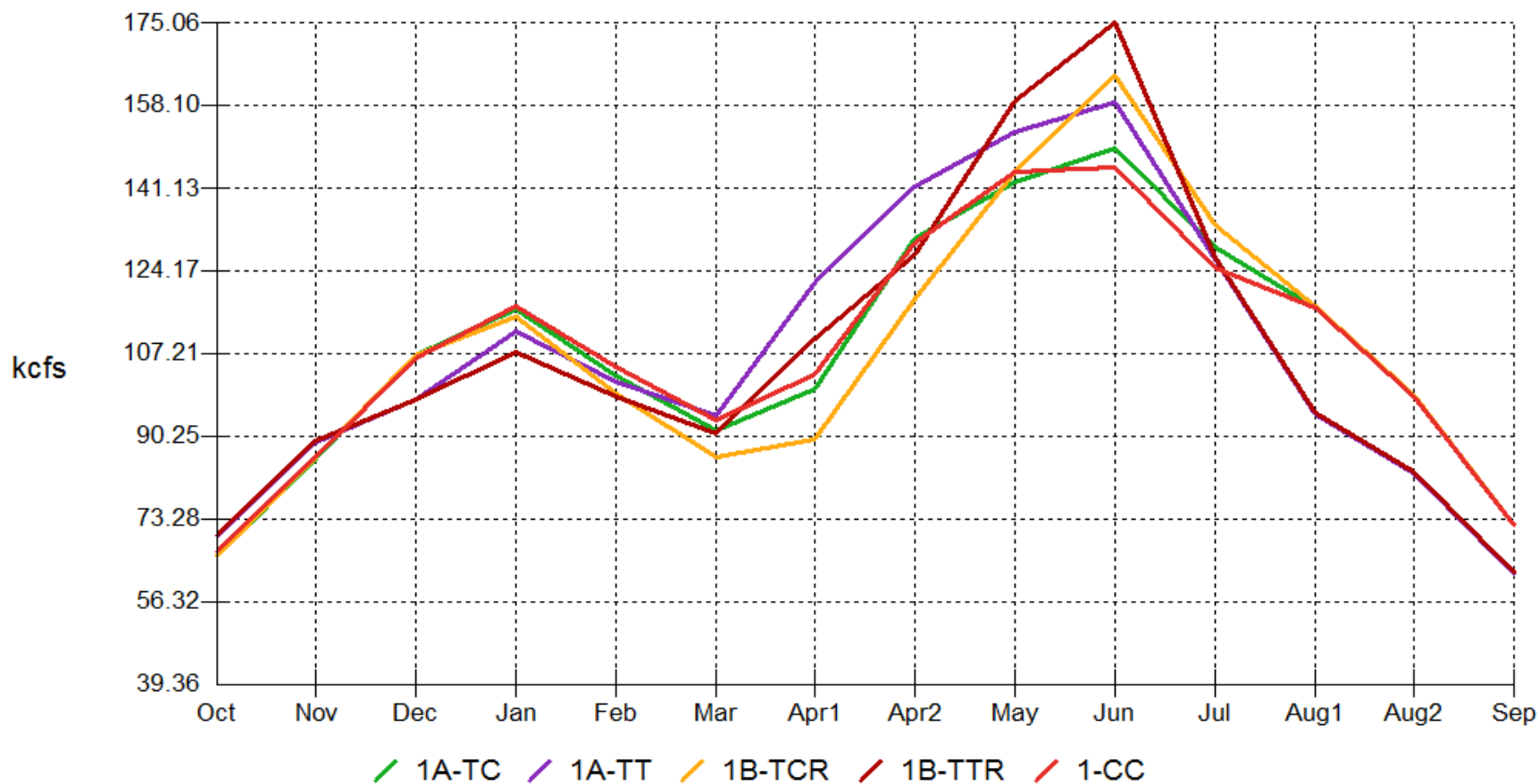
•600 alternatives draft Lake 35' to 40' less than 450 alternatives and Current Condition.



# Grand Coulee – Outflows

## 5 Alternatives – 70 Water Years

Project Outflows: Grand Coulee (quintile ALL)



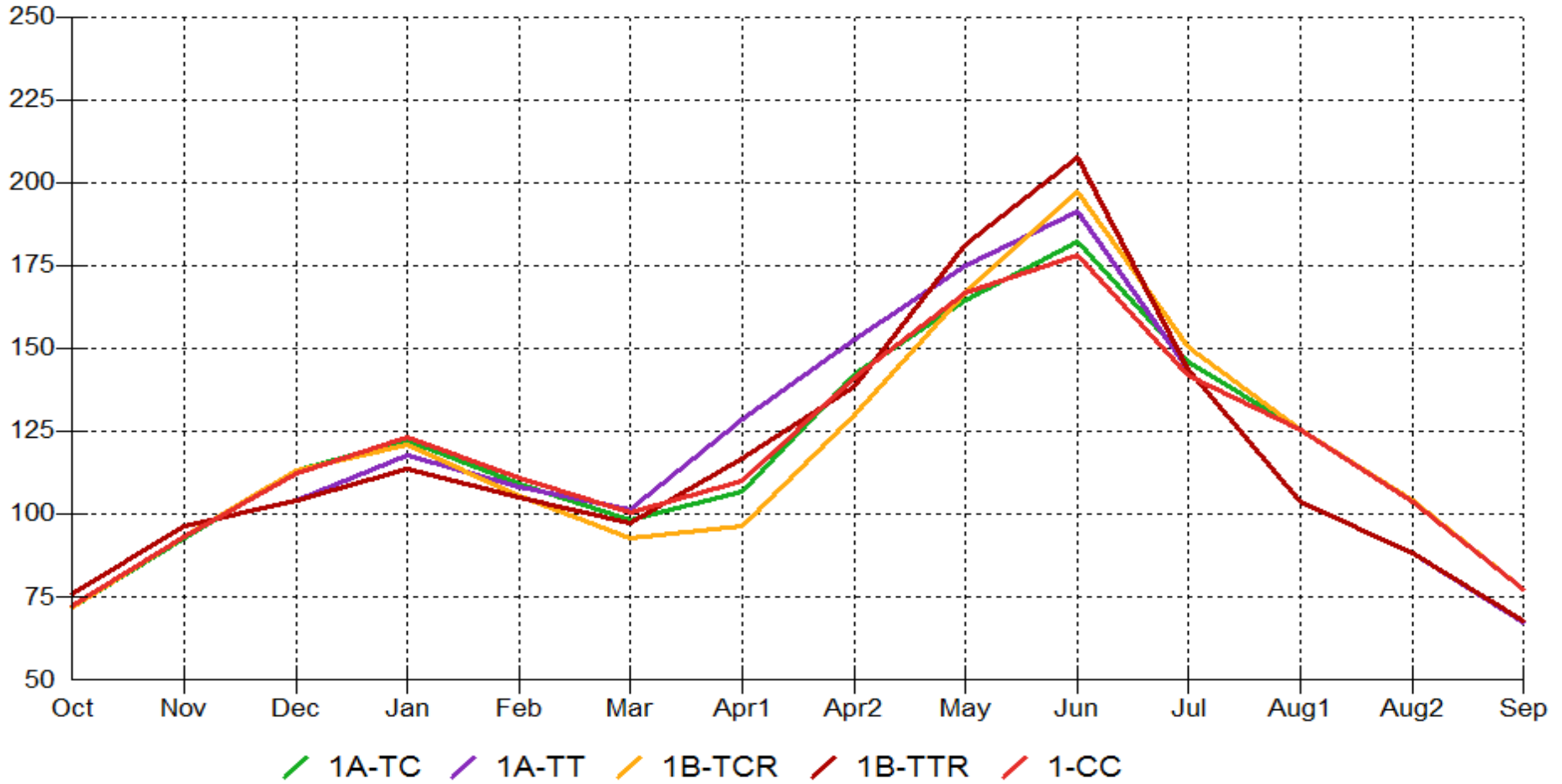
- Treaty Terminates alternatives provide higher spring freshet flows (13-30 kcfs), but lower late summer flows
- 600 alternatives have higher freshet flows (20-30 kcfs) compared to the Current Condition.
- In lower flow years, Treaty Terminates alternatives reduce summer flows by 20-30 kcfs.
- In higher flow years, 600 alternatives restore about 40 kcfs to the spring freshet.

# GRAND COULEE DAM to SNAKE RIVER CONFLUENCE

- Columbia River at Priest Rapids Dam
- Columbia River at Vernita Bar – no change

# COLUMBIA RIVER – PRIEST RAPIDS (PRD)

## 70 WATER YEARS AVERAGE FLOWS (KCFS)



# GRAND COULEE DAM to SNAKE RIVER CONFLUENCE -

## Key Points

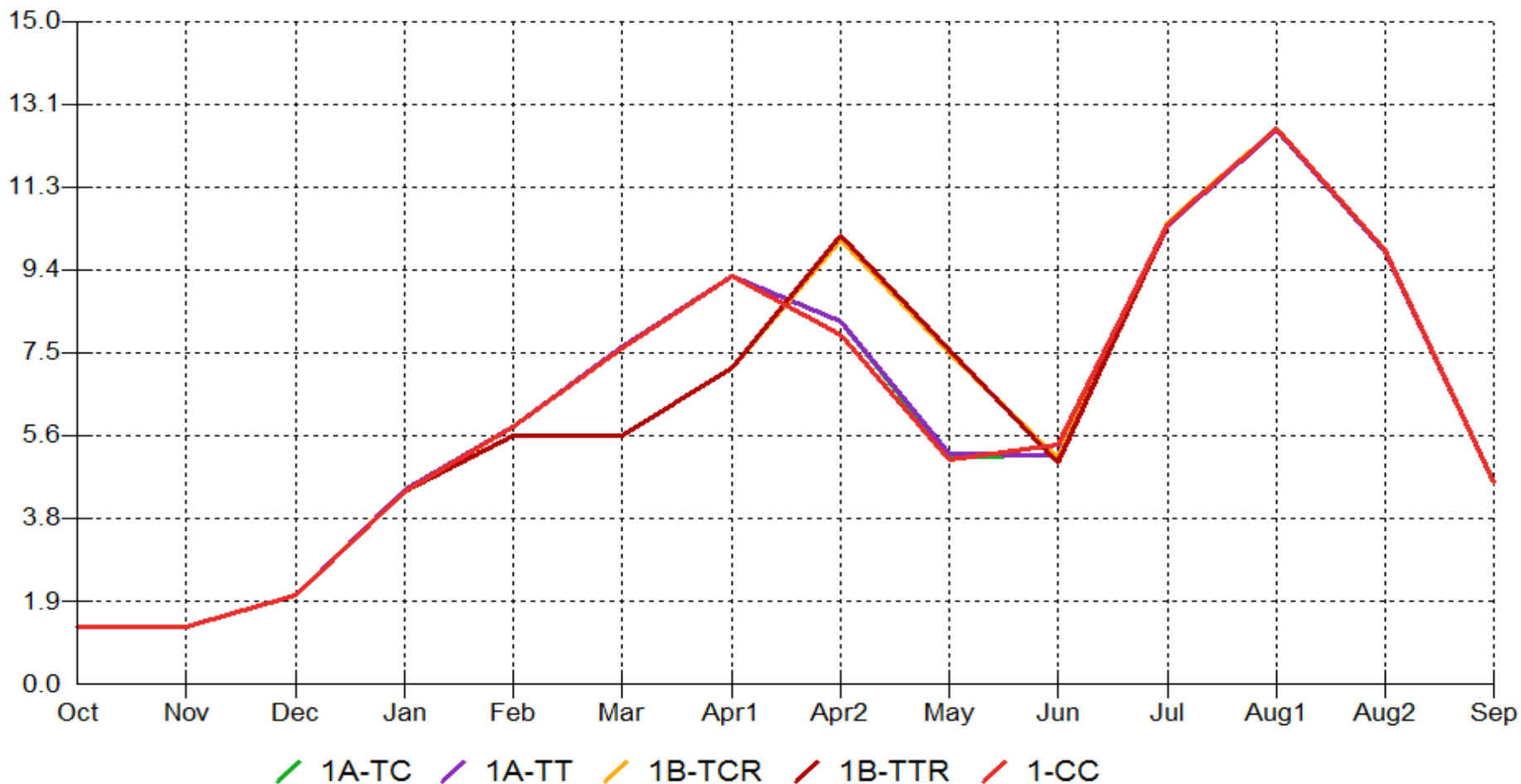
- Priest Rapids- all alternatives missed salmon BiOp spring flows of 135 Kcfs in the average of the 20% lowest water years
- All alternatives met BiOp spring flows in all 14 high water years
- For the average of the 70 year period, there was a mix of meeting and missing spring flows for all alternatives
- 600 kcfs alternatives increased June average peak flows over all other alternatives by 5-29 kcfs.
- Vernita Bar- Fall Chinook salmon flows are met for all water years (HYDSIM model methods and assumptions for Vernita Bar flows are under review).

# SNAKE RIVER BASIN

- Snake River at Brownlee Dam – no change
- Hells Canyon Complex – no change
- North Fork Clearwater River at Dworshak Dam
- Lower Snake River at Lower Granite Dam – no change

# NF CLEARWATER RIVER– DWORSHAK DAM (DWR)

## 70 WATER YEARS AVERAGE FLOWS (KCFS)



### Revised 600 kcfs alternatives results:

- 600 kcfs alternatives shift spring peak flows two weeks later compared to current condition and 450 kcfs alternatives.

## Snake River Flows - Key Points

- In general, there were no differences for Snake River flows and other metrics between the iteration #1 alternatives.
- Brownlee, Hells Canyon Complex and Lower Granite - no change in monthly average flows across the alternatives.
- Dworshak - 600 kcfs alternatives have spring peak flows shifted two weeks later than other alternatives.

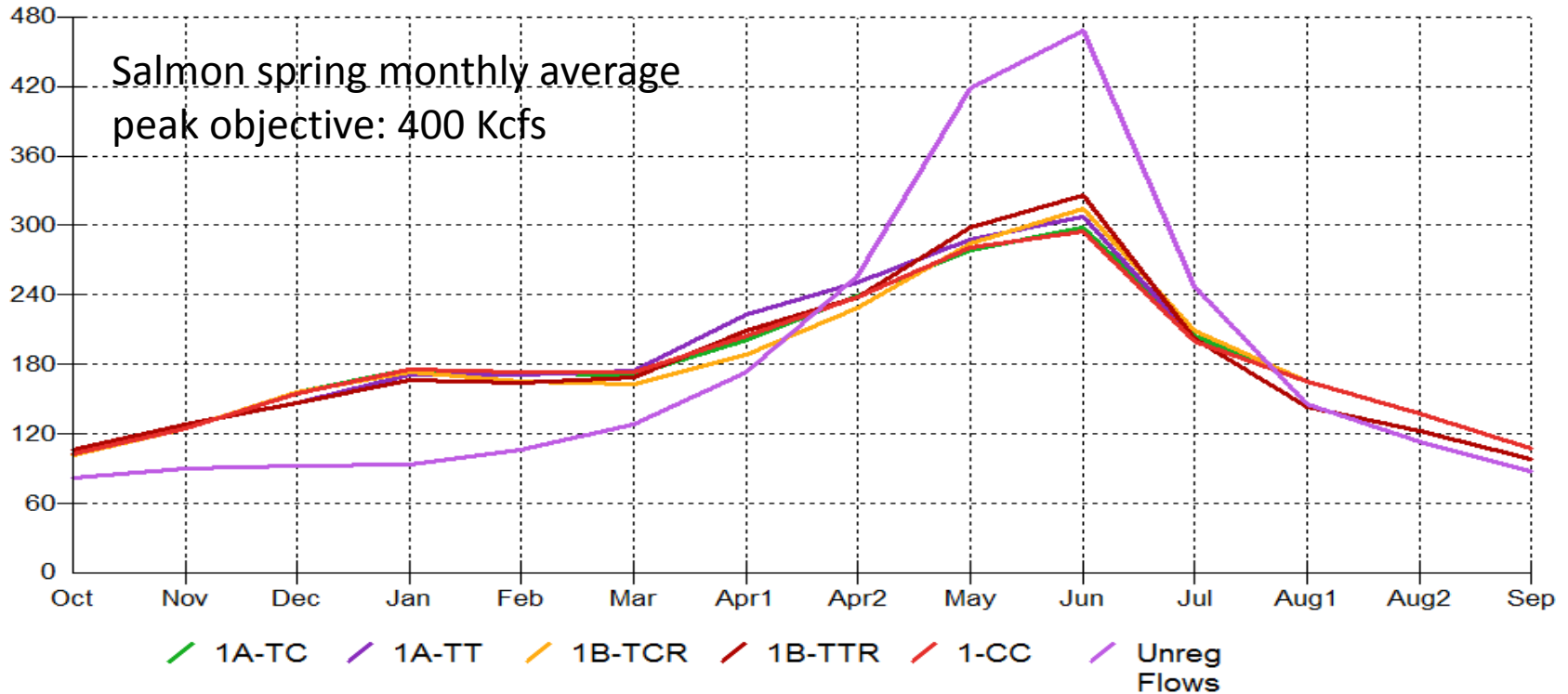
# COLUMBIA RIVER at SNAKE RIVER CONFLUENCE to ESTUARY

- Columbia River at McNary Dam – no change
- The Dalles Dam
- Columbia River at Bonneville Dam (Estuary) – no change



# COLUMBIA RIVER – THE DALLES DAM (TDA)

AVERAGE OF 70 WATER YEARS FLOWS and UNREGULATED FLOW (KCFS)



## 600 kcfs alternatives results:

- June average regulated flows greatest for 600 kcfs treaty terminates alternative, 13 to 31 kcfs higher than all other alternatives.

## Lower Columbia River- Key Points

- McNary- all alternatives fail to meet BiOp spring flows all 14 low water years. All alternatives meet BiOp spring flows for the average of the all 70 and 20% high water years
- McNary- 600 kcfs treaty terminates alternatives provide higher spring but lower summer salmon flows than 600 kcfs treaty continues alternatives
- McNary- 600 kcfs treaty terminates alternative results in highest spring flows of all alternatives.
- The Dalles- Treaty terminates alternatives increase spring flows but summer flows are greater for treaty continues alternatives. The 600 kcfs treaty terminates alternative increases the June 70 year average flows by about 31 kcfs over other alternatives.
- The Dalles- 600 kcfs treaty continues alternatives increase 70 year average late summer flows by about 20 kcfs over 600 kcfs treaty terminates alternatives

# Lower Columbia River- Key Points

## Continued

- The Dalles - June 70 year average fish flow objective of 400 kcfs was met for 600 kcfs treaty terminates alternative for 10 of the 14 highest flow years – a gain of 3 years over other alternatives.
- Bonneville – June 70 year average fish flows increased by 10 kcfs for the 600 kcfs treaty terminates alternative over 600 kcfs treaty continues alternatives.
- Bonneville- 70 year average late summer flows were lowest for the 600 kcfs treaty terminates alternatives and highest for the 600 kcfs treaty continues alternative. Average differences were about 16 kcfs.