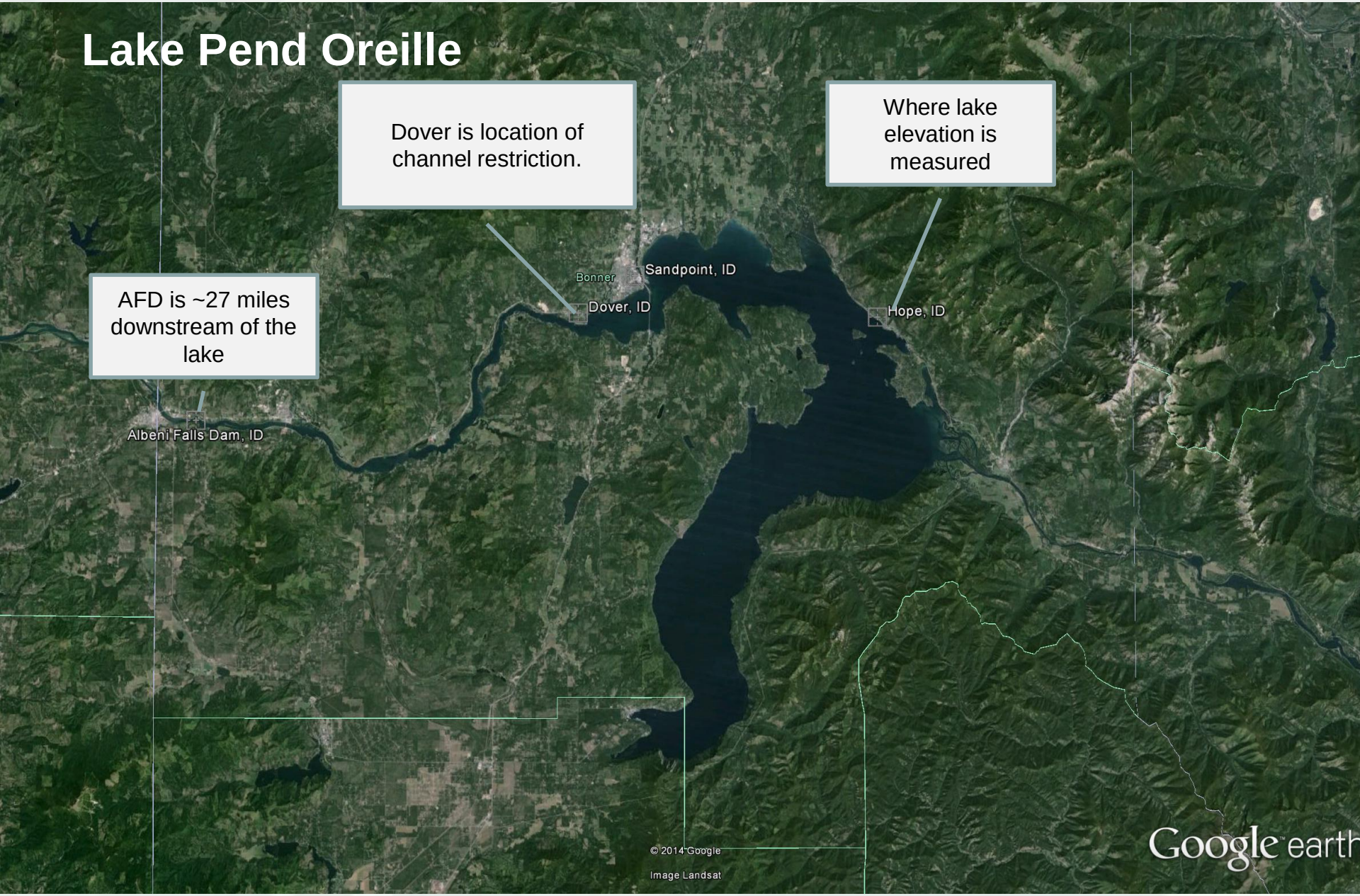
Albeni Falls Operations
April 21, 2016

Joel Fenolio – Corps of Engineers

Albeni Falls Dam/Lake Pend Oreille Overview

- Operate top 11.5 feet of the Lake (2051 to 2062.5 feet)
- 3 Turbines Rated at about 14 MW apiece
  - ~42 MW Max Capacity
- Spillway has 10 gates and 420 kcfs capacity
- During large snowpack years not uncommon to go on freeflow
- ~1 MAF of storage in Lake Pend Oreille
- Downstream flood flow is 95 kcfs but control point is at Sandpoint as measured at the Hope Gage of 2063.5 feet.

Lake Pend Oreille

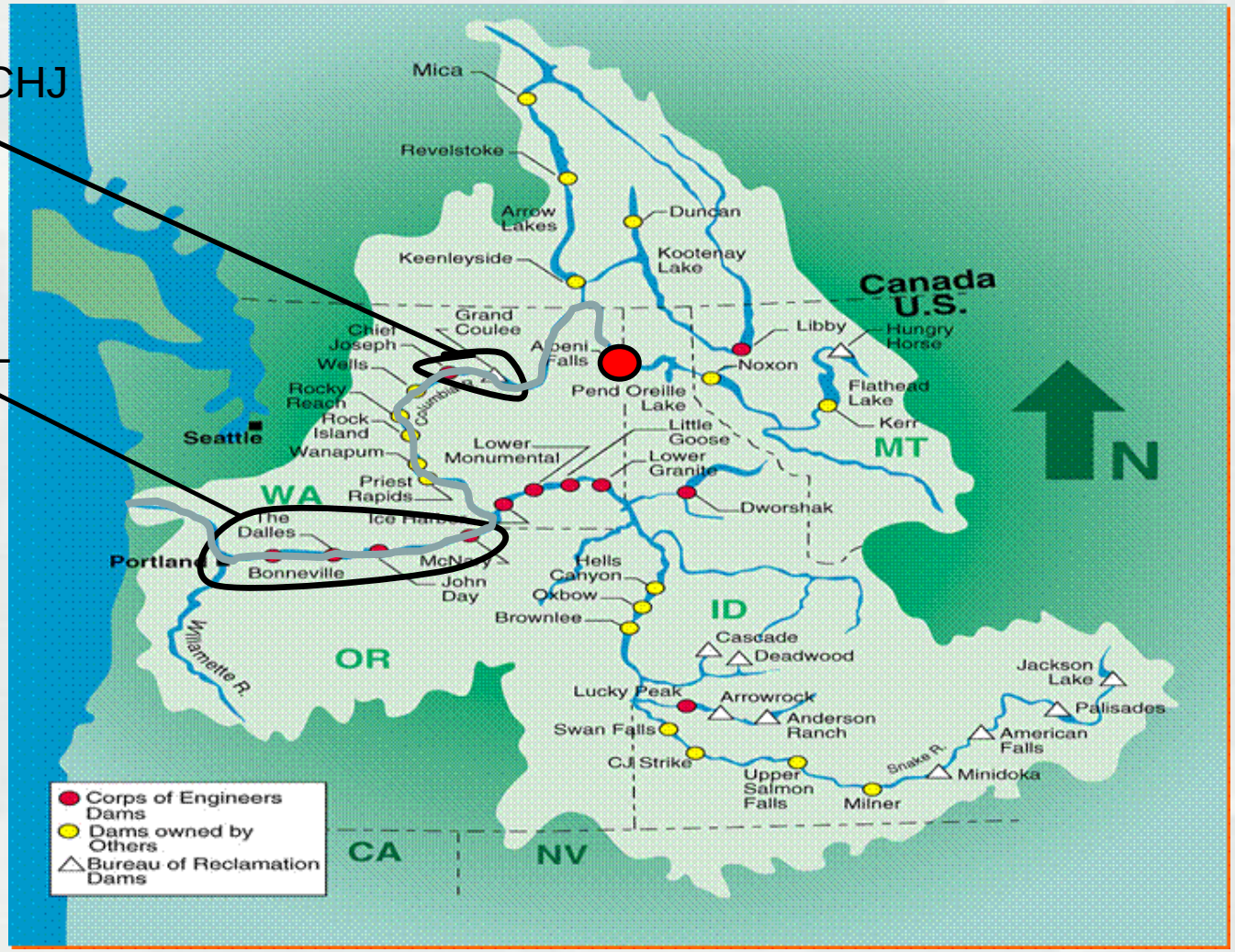


BUILDING STRONG®

FCRPS Projects

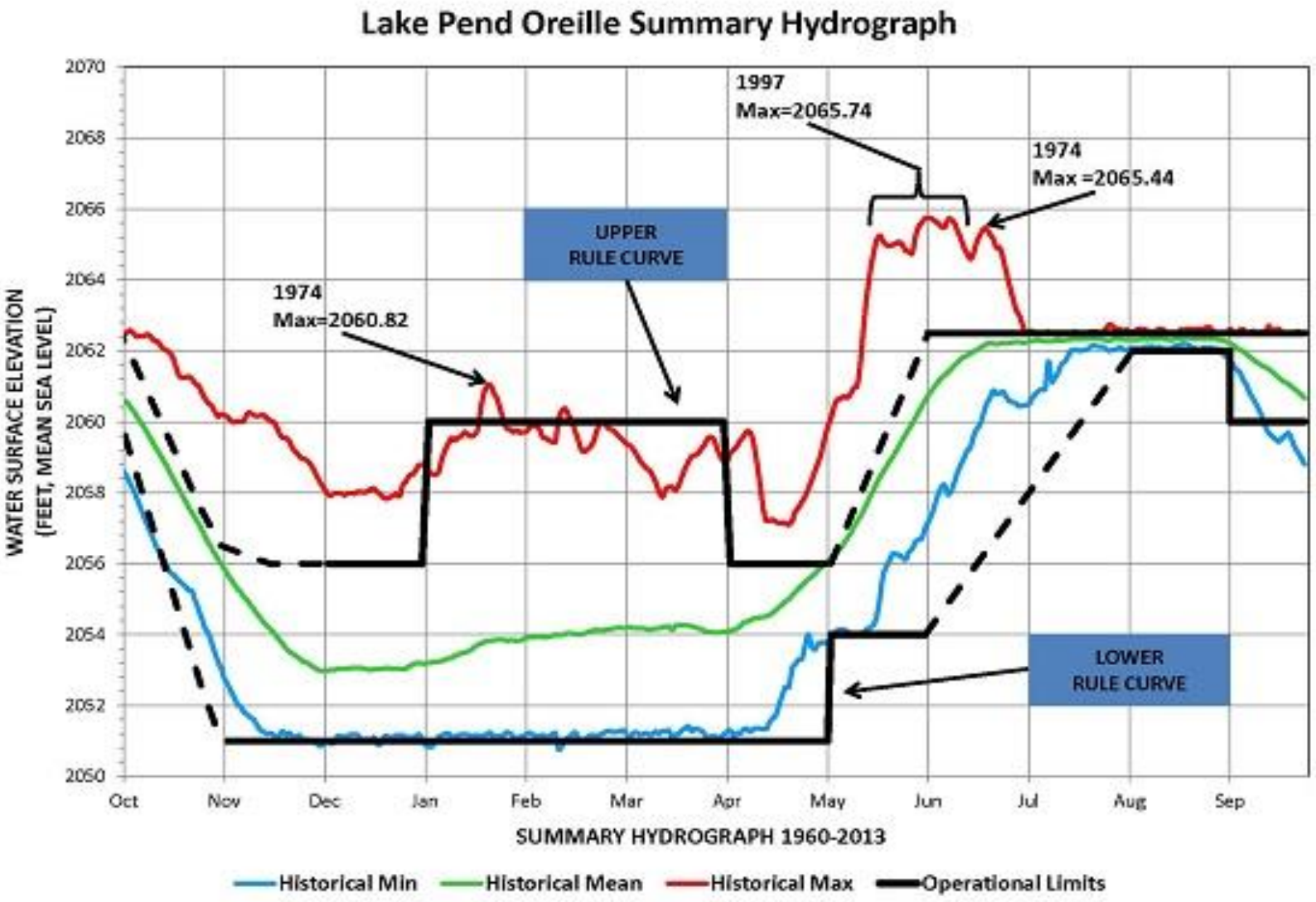
GCL/CHJ

LCOL

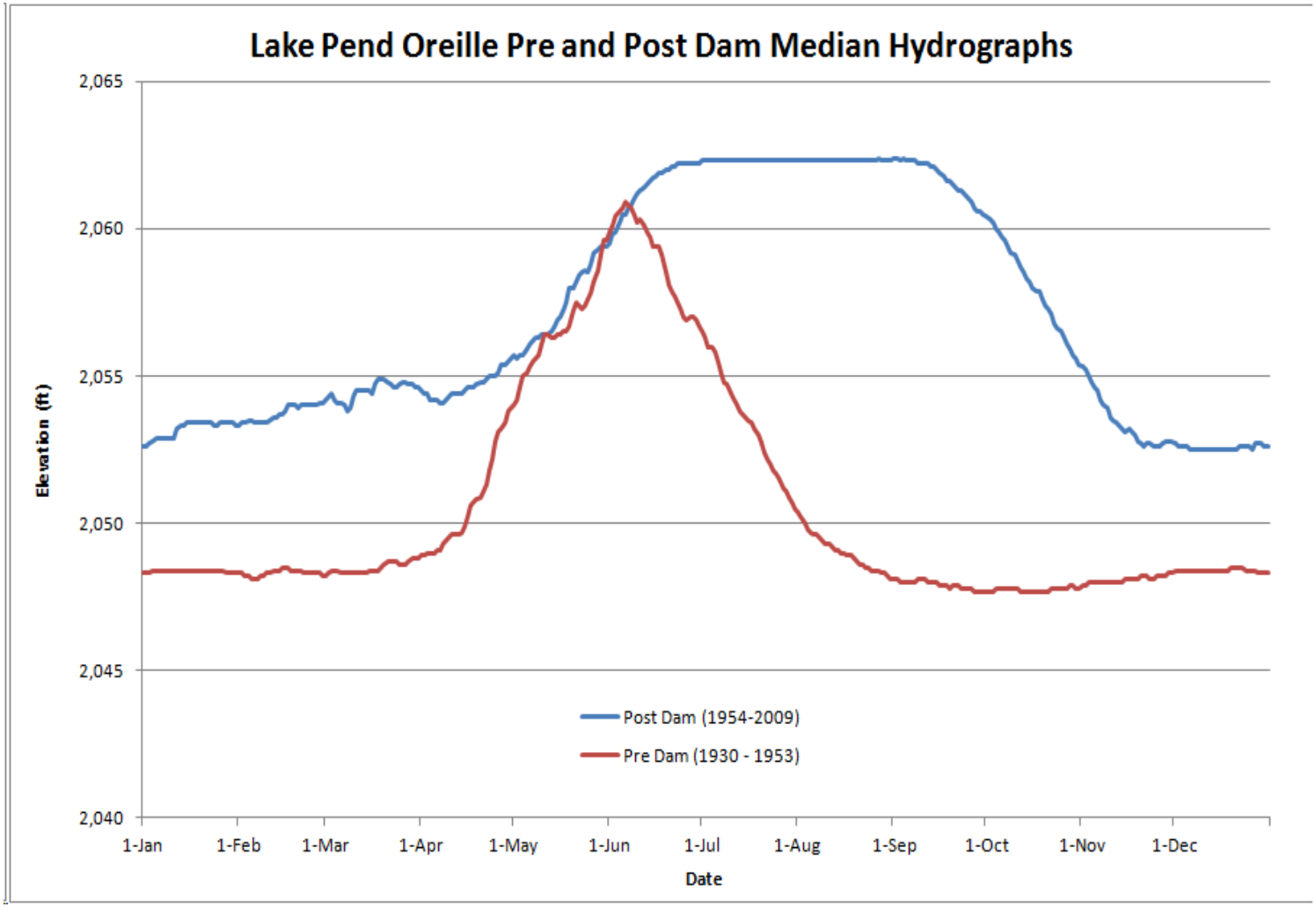


Albeni Falls Dam

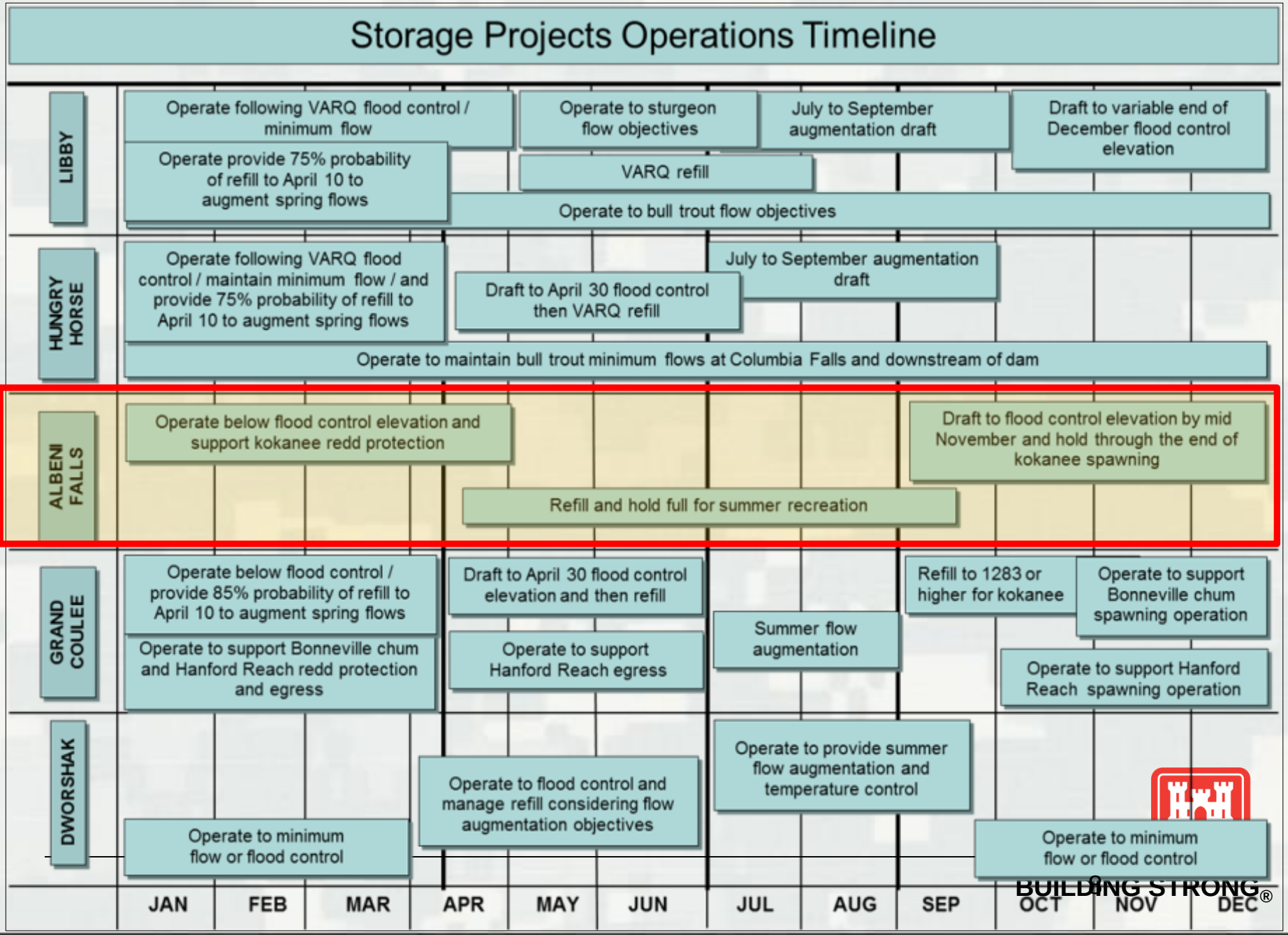
- 20-25% of GCL average inflow
- 1’ of forebay = 1’ of forebay at GCL
- 1 unit of water produces 2 MW at site
- 1 unit of water produces up to 60 MW for D/S Fed projects


Lake Pend Oreille Summary Hydrograph
1997
Max=2065.74
1974
Max =2065.44
UPPER
RULE CURVE
1974
Max=2060.82
LOWER
RULE CURVE
WATER SURFACE ELEVATION
(FEET, MEAN SEA LEVEL)
2070
2068
2066
2064
2062
2060
2058
2056
2054
2052
2050
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
SUMMARY HYDROGRAPH 1960-2013
Historical Min
Historical Mean
Historical Max
Operational Limits

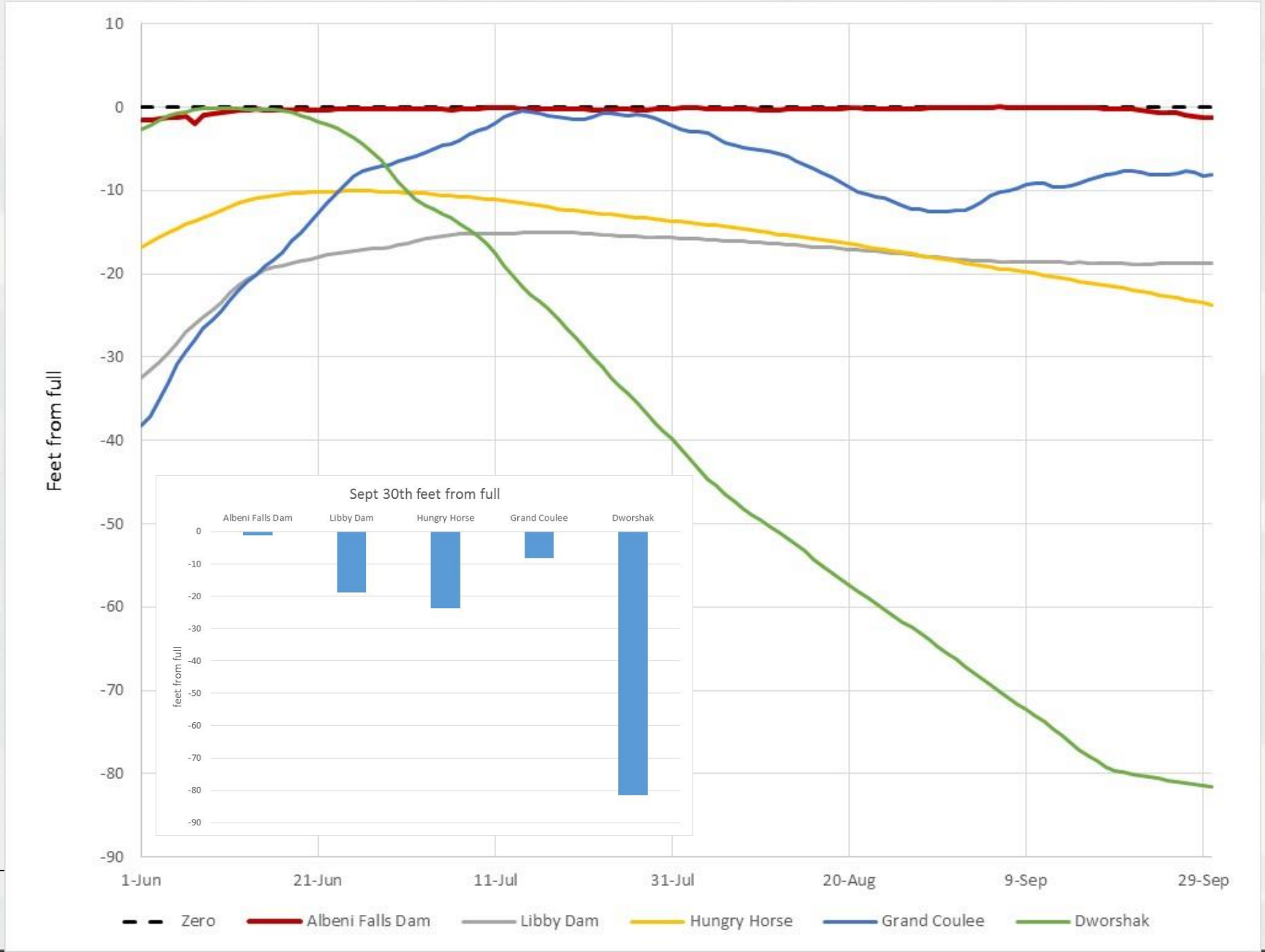
Lake Pend Oreille Pre and Post Dam



Storage Projects Operations Timeline



Federal Headwater Projects Feet from full 2015



Coordination and Clarified Operations September Drawdown

- Hold the summer pool (2062 to 2062.5 feet) through the third Sunday of Sept or Sept 18th, whichever is later.
- Make effort to be above 2061 feet the forth weekend of Sept or Sept 25th, whichever is later.
- No lower than 2060 feet on Sept 30th.
- There maybe times when elevations are lower than those specified above.

Coordination and Clarified Operations Oct/Nov Drawdown

- Winter minimum elevation will be 2051 feet.
- October through 1st week of November, target being at 2051 feet no later than Nov 15.
- In November the lake will be drafted no lower than 2051 feet or elevation at the time of kokanee spawning.
- Targeting 2051 feet gives greater flexibility to:
  - ► Flood risk management in the winter and spring.
  - ► Power operations in the winter both at Albeni Falls Dam and in the Columbia River.

2016 Flexible Winter Power Operations

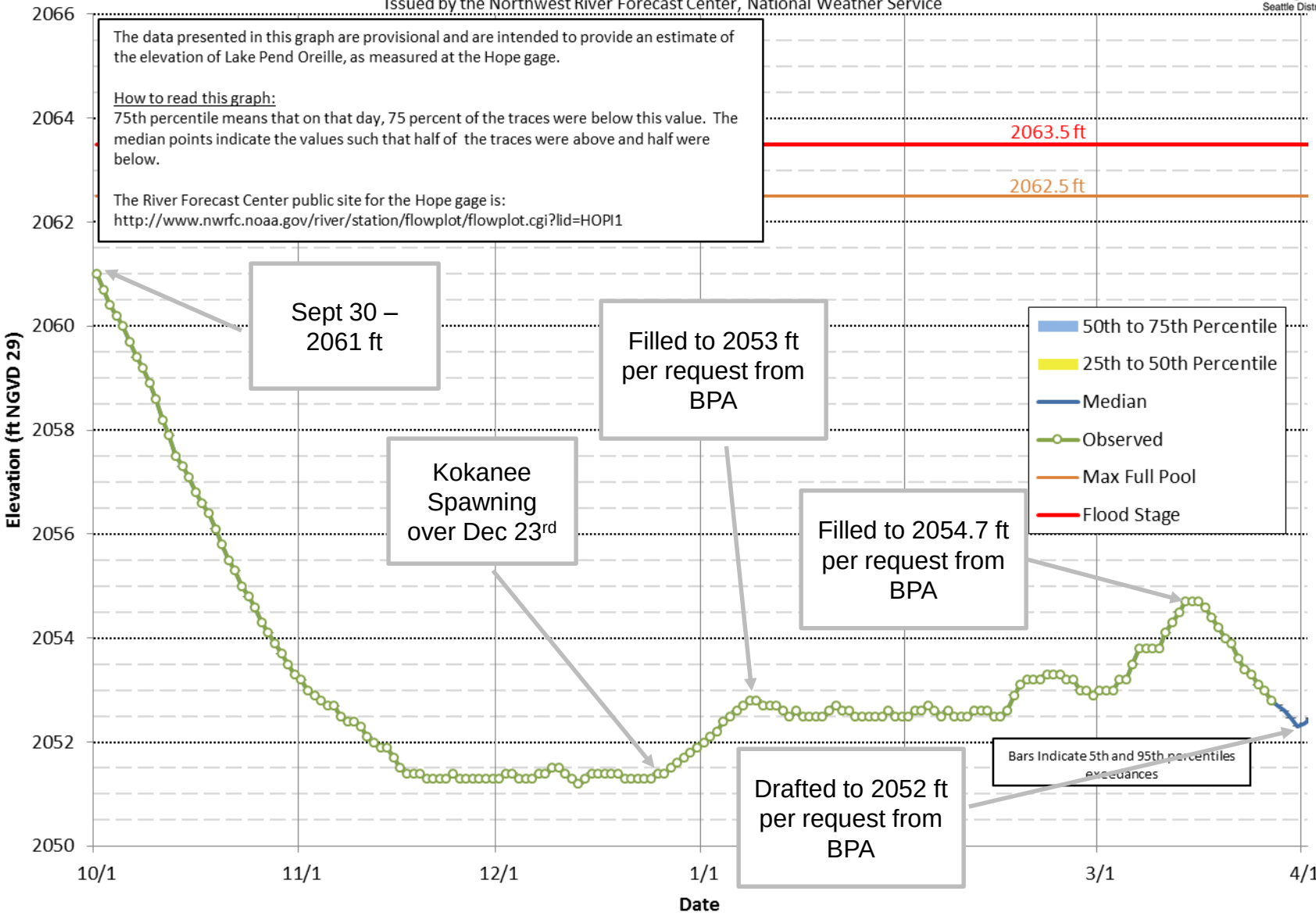
- FWPO was utilized in the winter of 2016 to benefit power and downstream operations
  - Between end of December and mid-March, Lake Pend Oreille filled ~3.5’
    - Took advantage of low energy prices
    - Reduced future streamflow risks for Lower Columbia Operations
    - Assisted Grand Coulee to meet drum gate maintenance requirements
      - Reservoir drafted 20’ between February and March
    - Reduced spill on Lower Columbia projects
  - Between mid-March and early April Lake Pend Oreille drafted ~2.5’
    - Helped maintain Grand Coulee’s elevation to meet system biological objectives
    - Took advantage of higher energy prices for this period
    - Coincided with Sandpoint marina work requiring a lower elevation

Modeled using current ESP traces as of 03/28/16

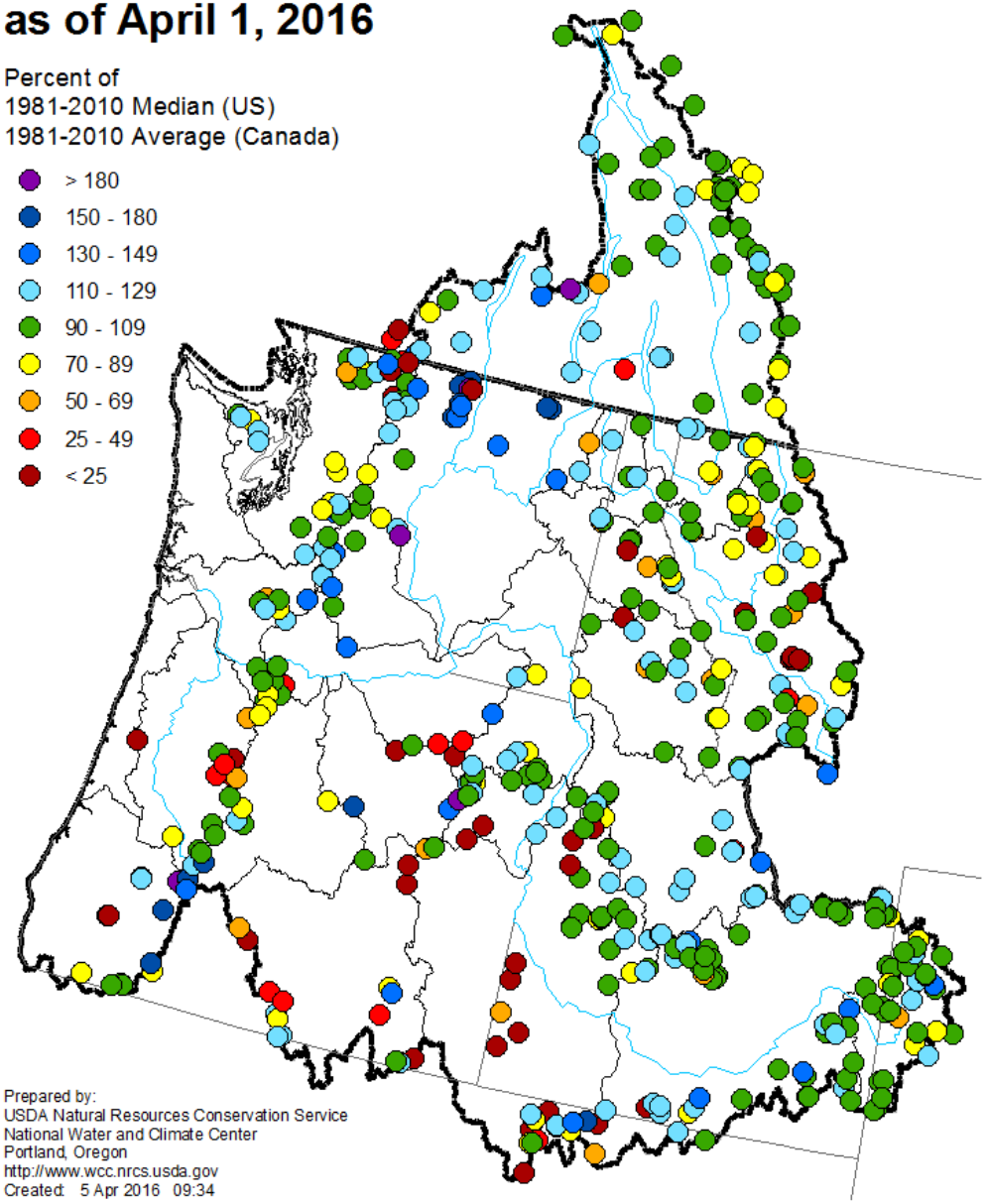
Lake Pend Oreille Elevation (Hope Gage) - Probability Chart

Corps of Engineers Projections Based on the 53 Ensemble Streamflow Prediction Traces
Issued by the Northwest River Forecast Center, National Weather Service

US Army Corps of Engineers
Seattle District



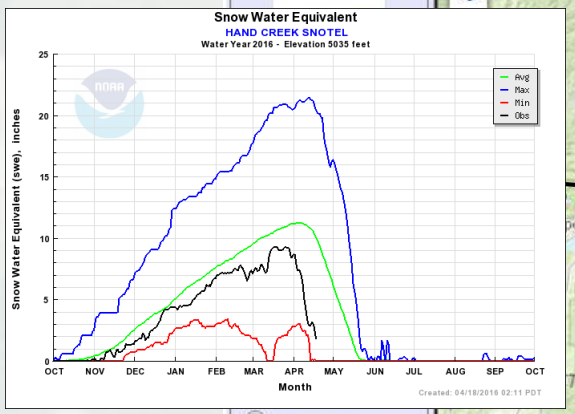
Columbia River and Pacific Coastal Basins Mountain Snowpack as of April 1, 2016

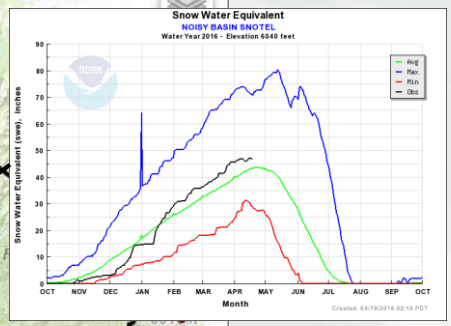


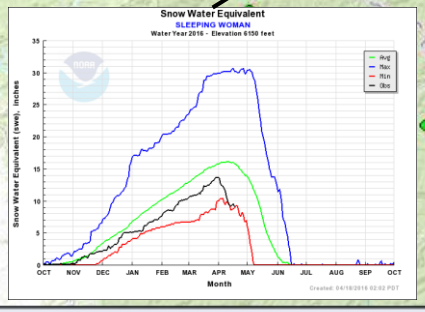
Northwest River Forecast Center
Current Station Snow Conditions

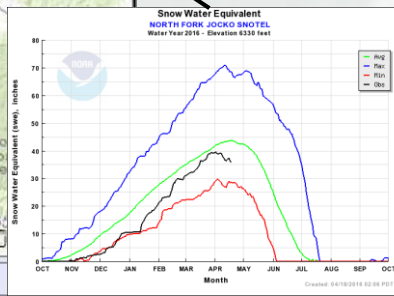
River and Hydrology | Water Supply | Observations | Weather Forecasts | Climate | NWRFC

Search by NWS ID:









Seasonal Peak Status
Basin Obs Status
Basin Sim Status
Diff

Legend

SWE (% Avg)
- Zero or No Avg
- < 25
- 25-50
- 50-75
- 75-90
- 90-110
- 110-125
- 125-150
- 150-175
- > 175

Stations Displayed: 47

Related Links

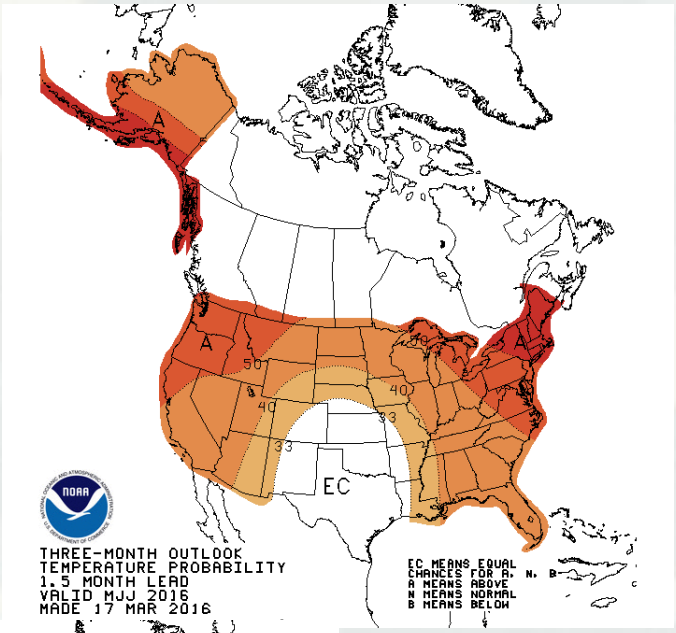
Station Summary List
Basin Summary List

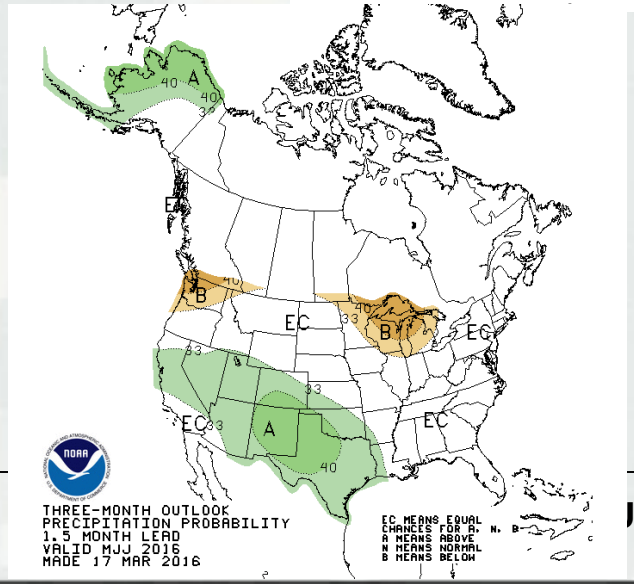
Kootenai National Forest
CABINET MOUNTAINS
PURCELL MOUNTAINS
Lake Pend Oreille
Kaniksu National Forest
TERROOT RANGE
Coeur D Alene National Forest
Post Falls
Coeur D'Alene
Kalispell
Flathead National Forest
Flathead Lake
Lewis & Clark National Forest
Bob Marshall Wilderness
MONTANA
St. Joe National Forest
Lolo National Forest
Missoula
SAPPHIRE RANGE
Helena National Forest
Moscow
Lewiston Orchards
6574 ft
7074 ft
9981 ft

Leaflet | Esri, HERE, DeLorme, FAO, U

Water Supply Outlook

- Current Forecast is 12 million acre-feet (97% of average) of water between Apr-July
- Below average to average precipitation and above average temperatures



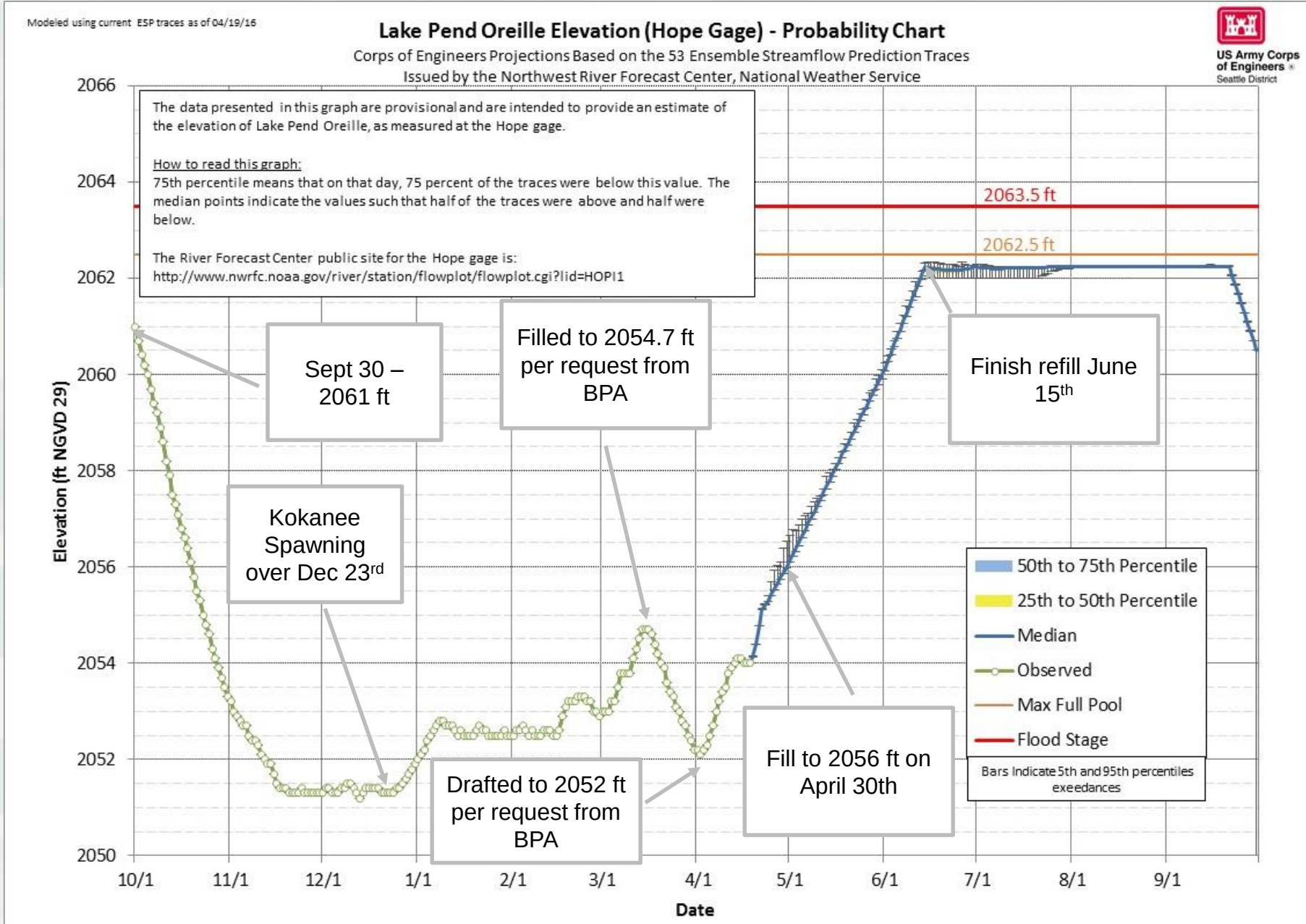


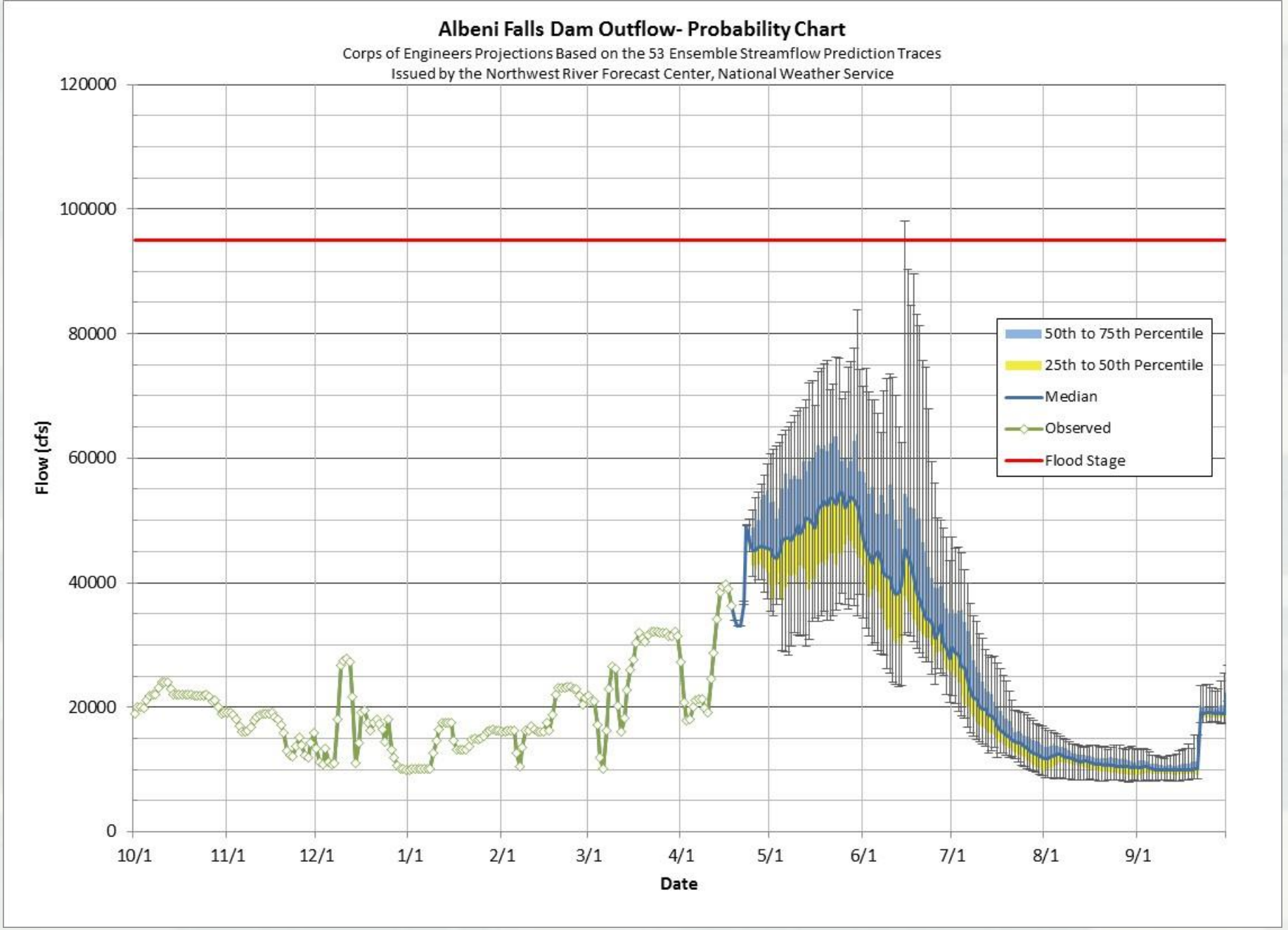
Spring Operations

- Target elevations through June
  - 2056 ft on April 30th
  - 2060 ft on May 31st
  - 2062 ft by June 15th
  - Targets may change due to precipitation conditions and downstream power needs
- Public meeting on April 21st at 6 pm
  - Priest River Event Center

Fall Targets 2015

- Between 2062 to 2062.5 feet through Sept 18th.
- Above 2061 feet through Sept 25th.
- Target being between 2060.5 and 2061 feet on Sept 30.
- Winter Minimum Control Elevation is 2051 feet.
  - ► Target being within a half foot by November 15.


Modeled using current ESP traces as of 04/19/16
Lake Pend Oreille Elevation (Hope Gage) - Probability Chart
Corps of Engineers Projections Based on the 53 Ensemble Streamflow Prediction Traces
Issued by the Northwest River Forecast Center, National Weather Service
US Army Corps of Engineers
Seattle District
The data presented in this graph are provisional and are intended to provide an estimate of the elevation of Lake Pend Oreille, as measured at the Hope gage.
How to read this graph:
75th percentile means that on that day, 75 percent of the traces were below this value. The median points indicate the values such that half of the traces were above and half were below.
The River Forecast Center public site for the Hope gage is:
http://www.nwrfc.noaa.gov/river/station/flowplot/flowplot.cgi?lid=HOPI1
2063.5 ft
2062.5 ft
Sept 30 – 2061 ft
Filled to 2054.7 ft per request from BPA
Finish refill June 15th
Kokanee Spawning over Dec 23rd
Drafted to 2052 ft per request from BPA
Fill to 2056 ft on April 30th
50th to 75th Percentile
25th to 50th Percentile
Median
Observed
Max Full Pool
Flood Stage
Bars Indicate 5th and 95th percentiles exeedances
Elevation (ft NGVD 29)
2066
2064
2062
2060
2058
2056
2054
2052
2050
10/1
11/1
12/1
1/1
2/1
3/1
4/1
5/1
6/1
7/1
8/1
9/1
Date


Albeni Falls Dam Outflow- Probability Chart
Corps of Engineers Projections Based on the 53 Ensemble Streamflow Prediction Traces
Issued by the Northwest River Forecast Center, National Weather Service
120000
100000
80000
60000
40000
20000
0
Flow (cfs)
10/1
11/1
12/1
1/1
2/1
3/1
4/1
5/1
6/1
7/1
8/1
9/1
Date
50th to 75th Percentile
25th to 50th Percentile
Median
Observed
Flood Stage

Summary for Spring and Summer

- Low flood risk on Lake and downstream
- Refill to occur earlier than normal
- Lack of spring and summer rain could make maintaining summer pool difficult
  - Cabinet Gorge can release less than Albeni Falls minimum flow

Questions

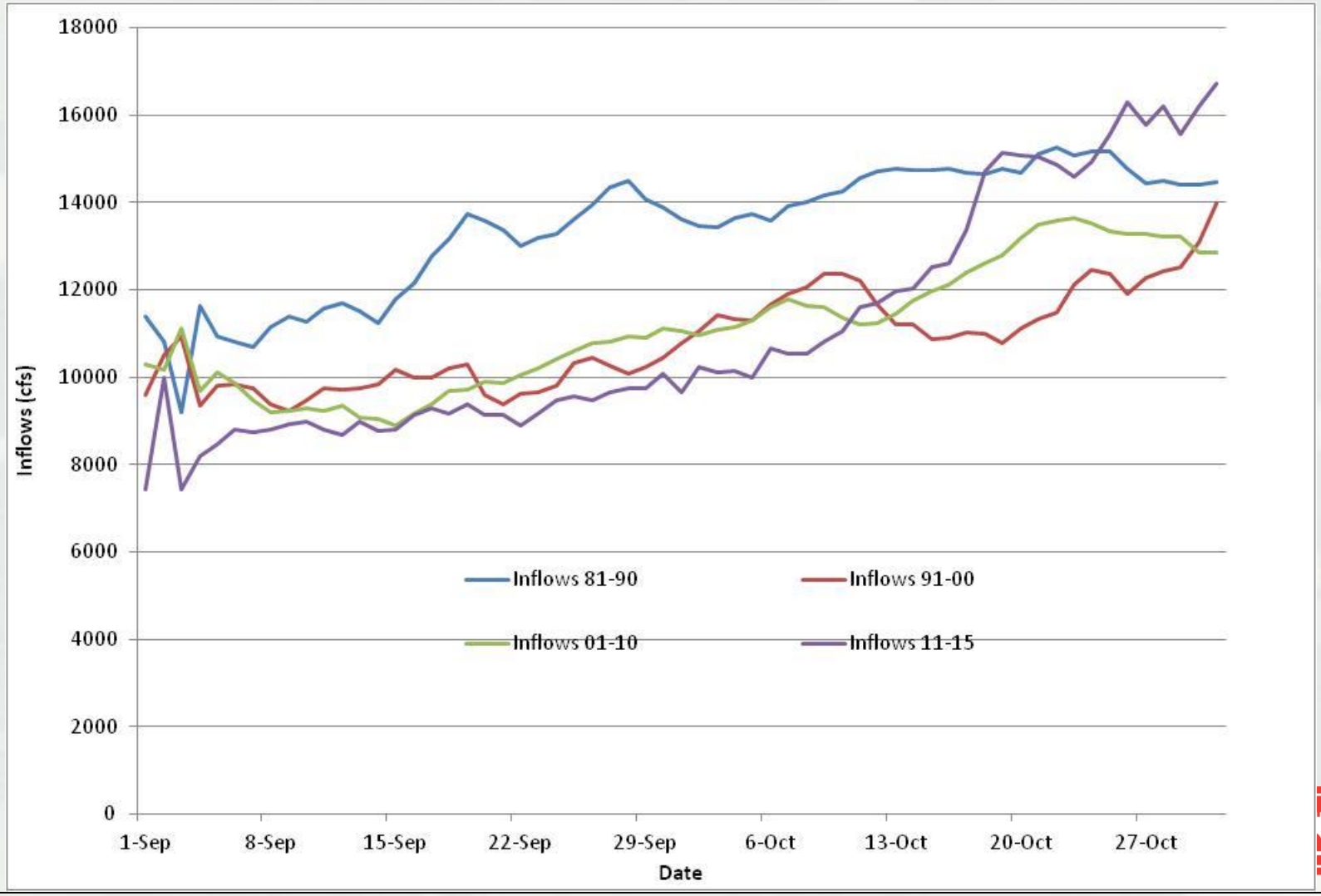
Lessons Learned from the Fall

- Cabinet Gorge can drop releases below 5 kcfs down to 3 kcfs
  - This could make managing elevations in dry years difficult

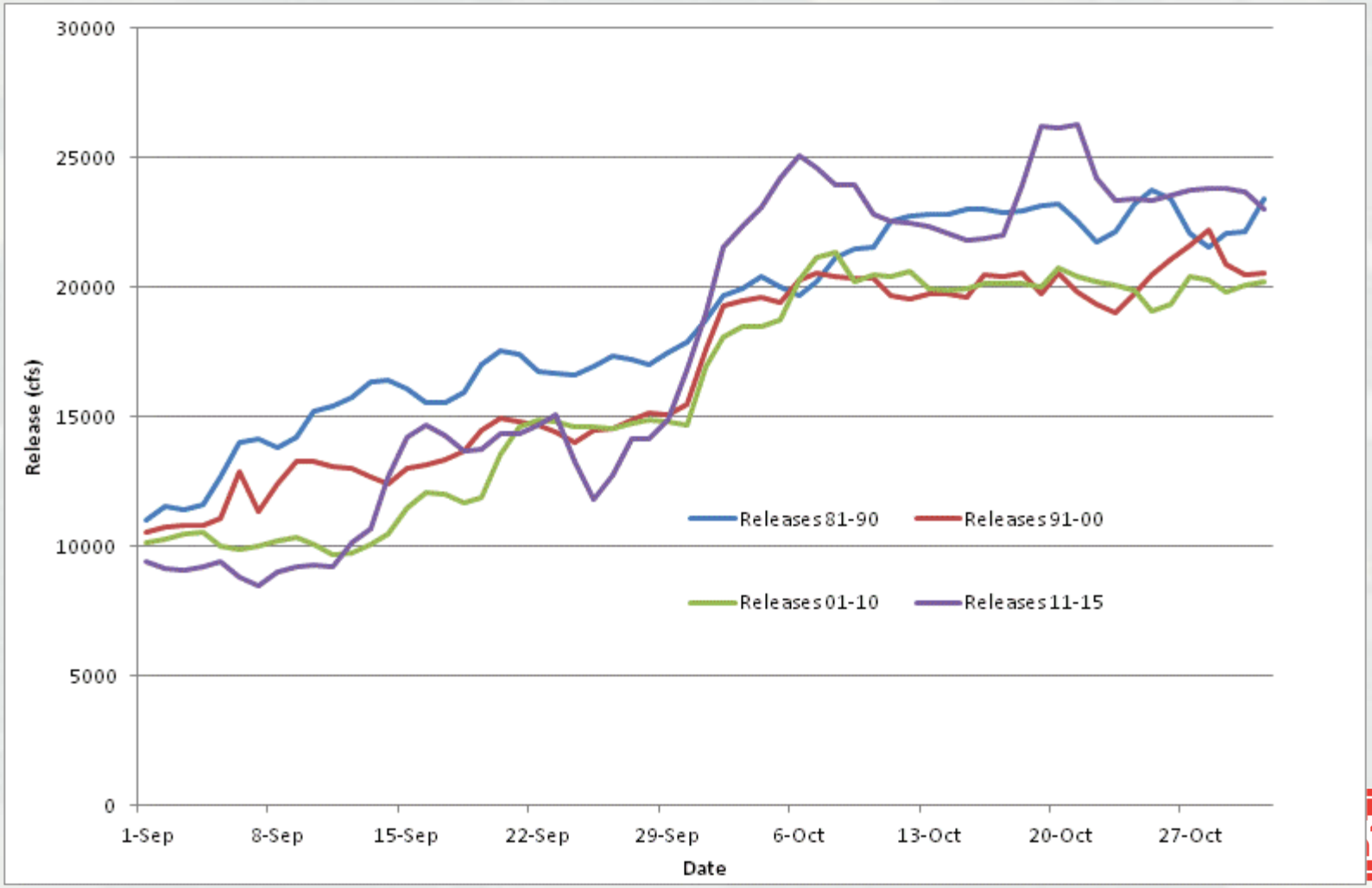
Spring Refill Operations

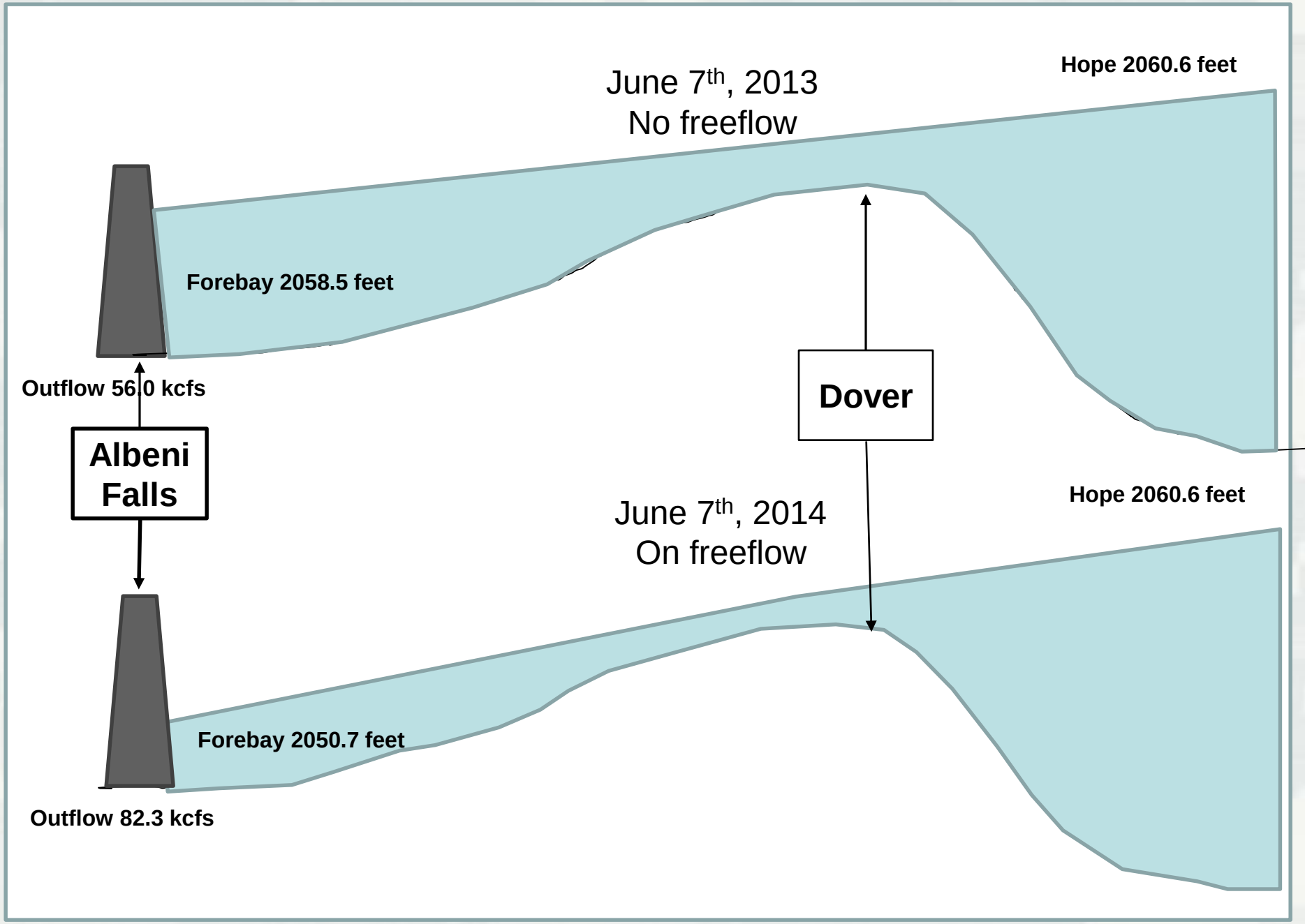
- **Regarding Spring Refill Operations:** As discussed in detail in our coordination, spring refill is set with flood control as a priority. As described in the Spring Operations attachment, Lake Pend Oreille will continue to be refilled to 2,062 feet in mid to late June depending on flood risk, forecasts, and snowpack conditions in the Pend Oreille River basin. Any earlier attempts to refill the Lake would increase flood risk both downstream and upstream of the Dam. This risk is unacceptable to the Corps.

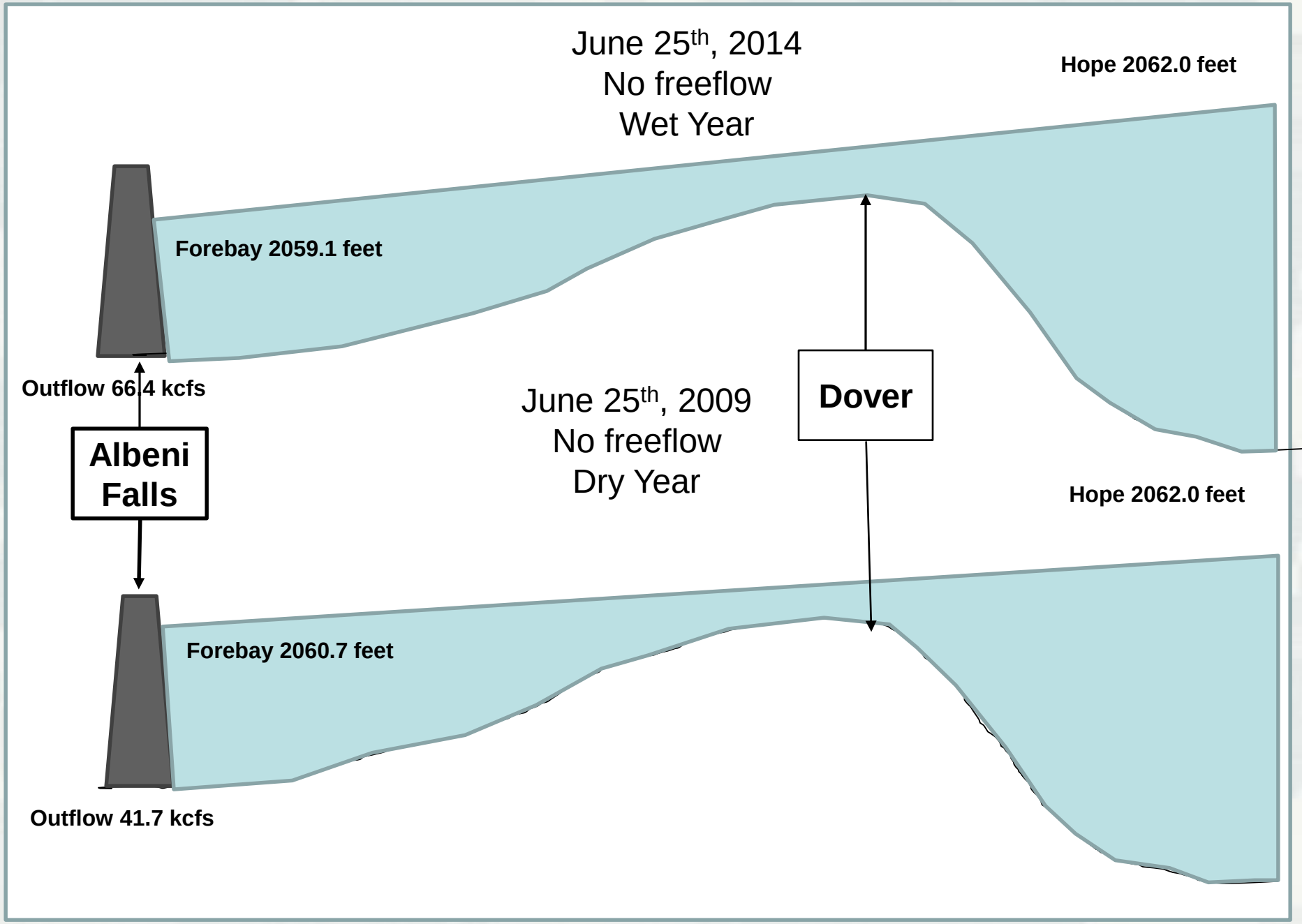
Average Inflows 10 year periods



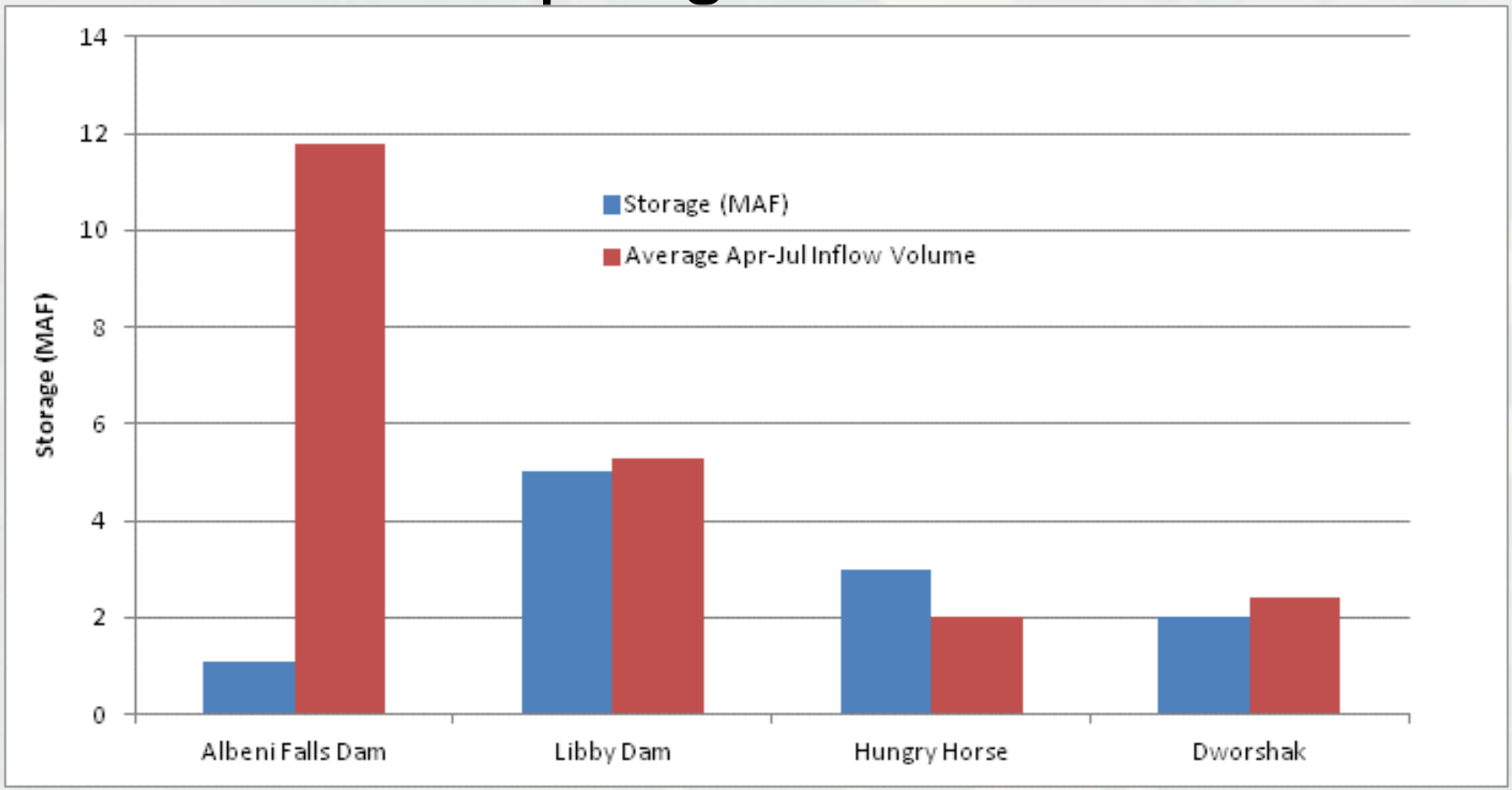
Average Outflows 10 year periods




June 7th, 2013
No freeflow
Hope 2060.6 feet
Forebay 2058.5 feet
Outflow 56.0 kcfs
Albeni Falls
Dover
June 7th, 2014
On freeflow
Hope 2060.6 feet
Forebay 2050.7 feet
Outflow 82.3 kcfs


June 25th, 2014
No freeflow
Wet Year
Hope 2062.0 feet
Forebay 2059.1 feet
Outflow 66.4 kcfs
Albeni Falls
June 25th, 2009
No freeflow
Dry Year
Dover
Hope 2062.0 feet
Forebay 2060.7 feet
Outflow 41.7 kcfs

Columbia River Projects Storage vs Spring Runoff



Flood Risk Operations

- From the Water Control Manual:
  - Flood control benefits are achieved by reducing Lake stages about 0.30 m (1 ft) for floods in the 80,000 cfs-220,000 cfs range. This reduction is the result of channel improvements at AFD completed during project construction. During major spring floods, the Lake may exceed normal full pool (NFP) El 2062.5 ft because of the flood volume and limited Lake outlet capacity.
- Winter Floods:
  - Can fill up to 2060 ft for FRM purposes – local and system
- Spring main operation is to go on freeflow
  - Average inflow is 11 MAF and 1 MAF capacity

Albeni Falls Dam Historic Outflow