WILLAMETTE VALLEY WATER MANAGEMENT

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USACE Portland District

2017 Oregon Dam Safety and
Reservoir Resilience Conference
28 February 2017

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- ❑ Portland District Dams
- ❑ Willamette Valley Dams
- ❑ Willamette Valley Project History
- ❑ Authorized Purposes & Benefits
- ❑ Flood and Conservation Season
- ❑ Water Control Diagram
- ❑ Annual Variability

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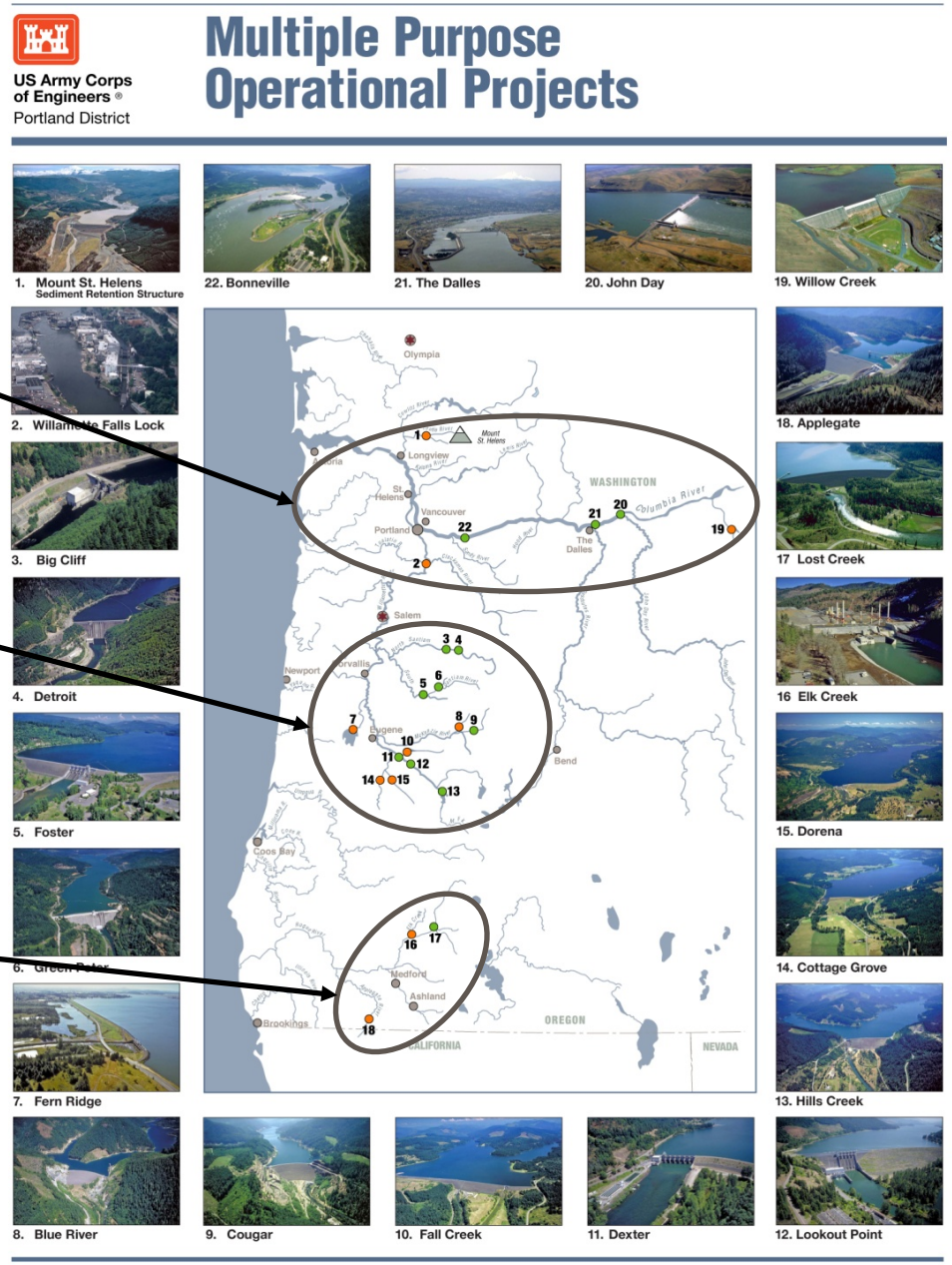
PORTLAND DISTRICT
DAMS & LOCKS

Columbia:
6 Projects

Willamette Valley:
13 Projects

Rogue Valley:
2 Projects



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Willamette Valley Project: 13 multi-purpose dams

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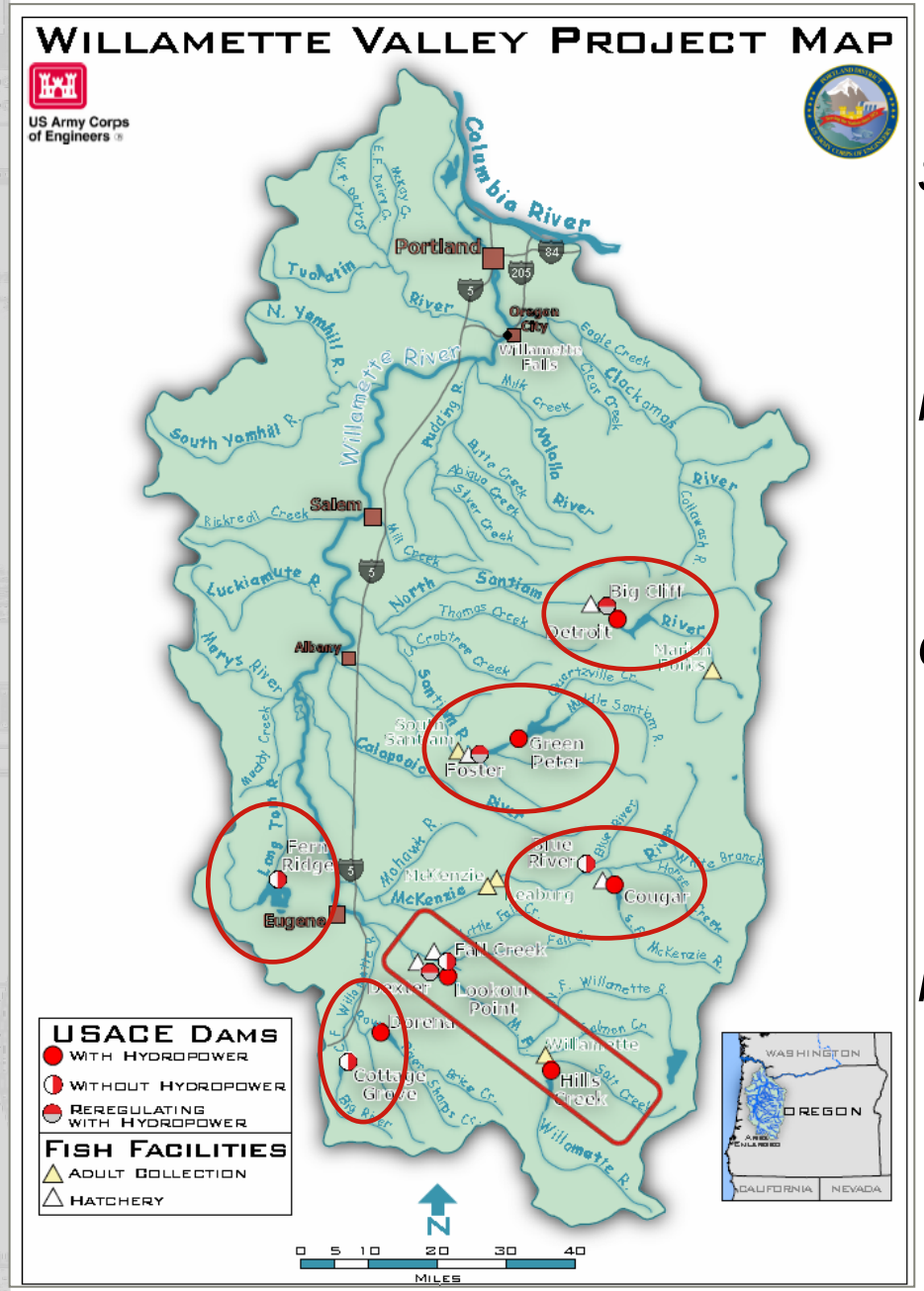
Willamette Valley
Sub-Basin Location & Size



Santiam Subbasin

- Detroit/Big Cliff
- Green Peter/Foster

McKenzie Subbasin

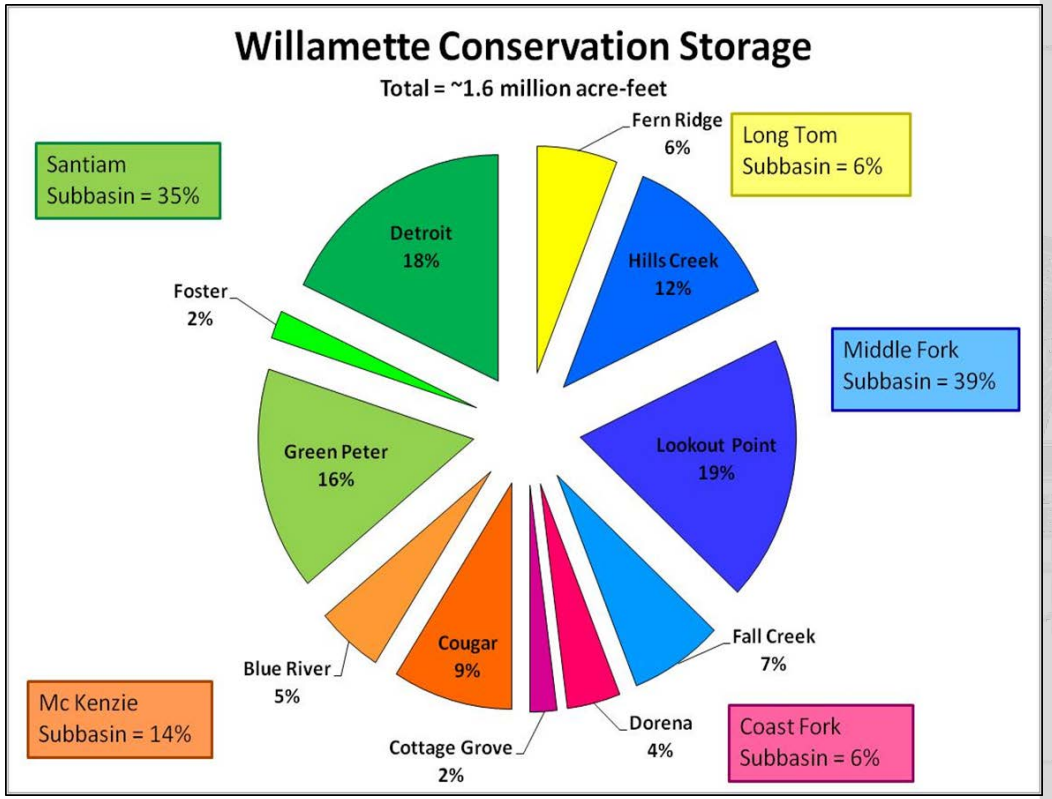
- Cougar
- Blue River

Coastal Basins

- Fern Ridge
- Dorena
- Cottage Grove

Middle Fork Willamette Subbasin

- Hills Creek
- Lookout Point/Dexter
- Fall Creek



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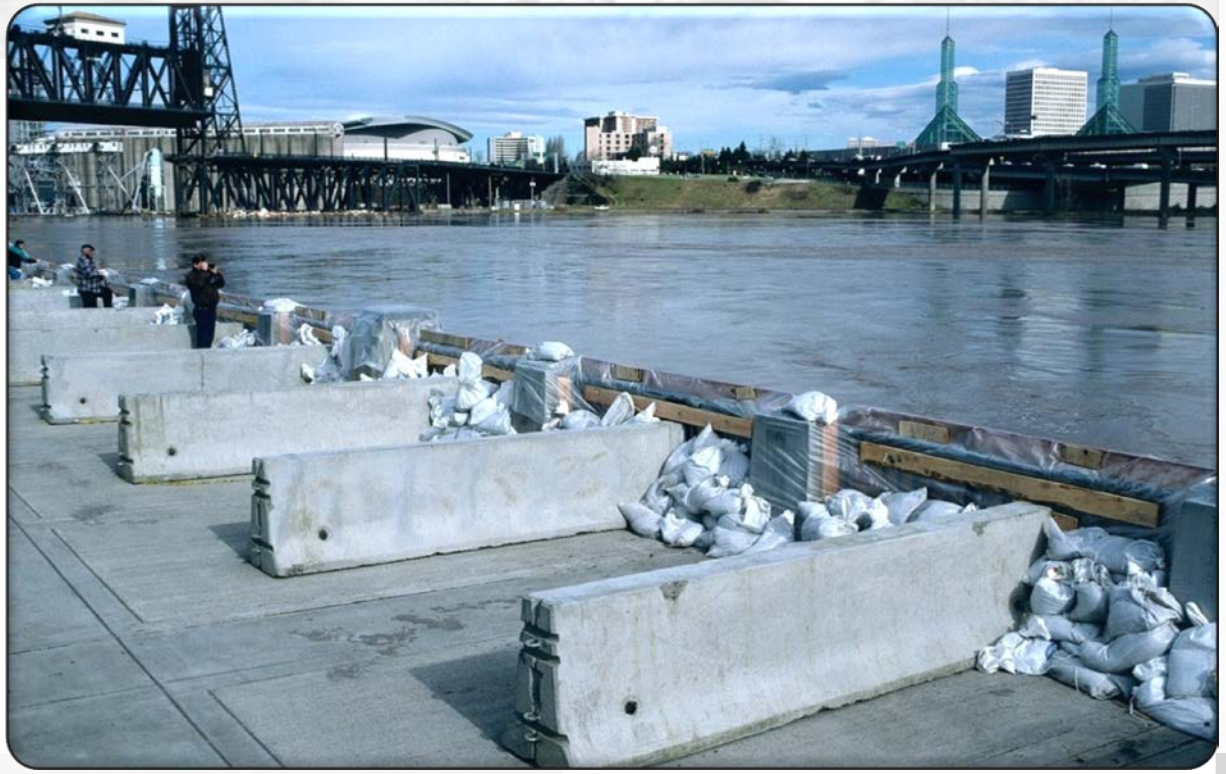
WILLAMETTE VALLEY PROJECT HISTORY



Willamette Flood of 1996

WILLAMETTE VALLEY PROJECT HISTORY

- **1936** Congress passed Flood Control Act authorizing Corps to survey the Willamette Basin
- **1938** Flood Control Act provided for the first seven dams and storage reservoirs
  - Fern Ridge, Cottage Grove, Dorena, Detroit-Big Cliff, Lookout Point-Dexter
- **1940** Corps began construction of Fern Ridge and Cottage Grove dams
- **1950** and **1962** Flood Control Acts authorized additional structures
- **1969** Blue River Dam was completed

Fern Ridge Dam construction 1940

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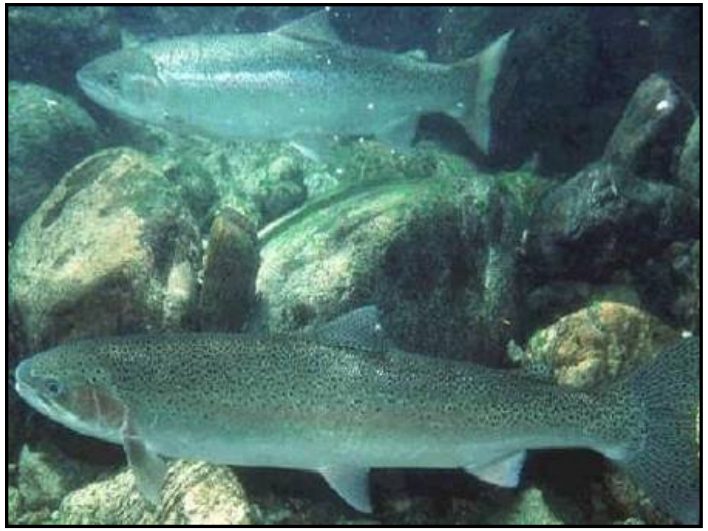
AUTHORIZED PURPOSES

- Flood risk management
- Hydropower
- Fish & wildlife
- Water quality
- Recreation
- Irrigation
- Municipal & industrial water supply
- Navigation

*Not all projects are authorized for hydropower



FLOOD RISK MANAGEMENT

- Corps dams have prevented about $900 million annually in flood damages to the Willamette Valley
- Total project controls 27% of the runoff area in the Willamette River Basin
- Flood reduction occurs annually, typically each winter

Spilling flood waters at LOP Dam - Jan 2006

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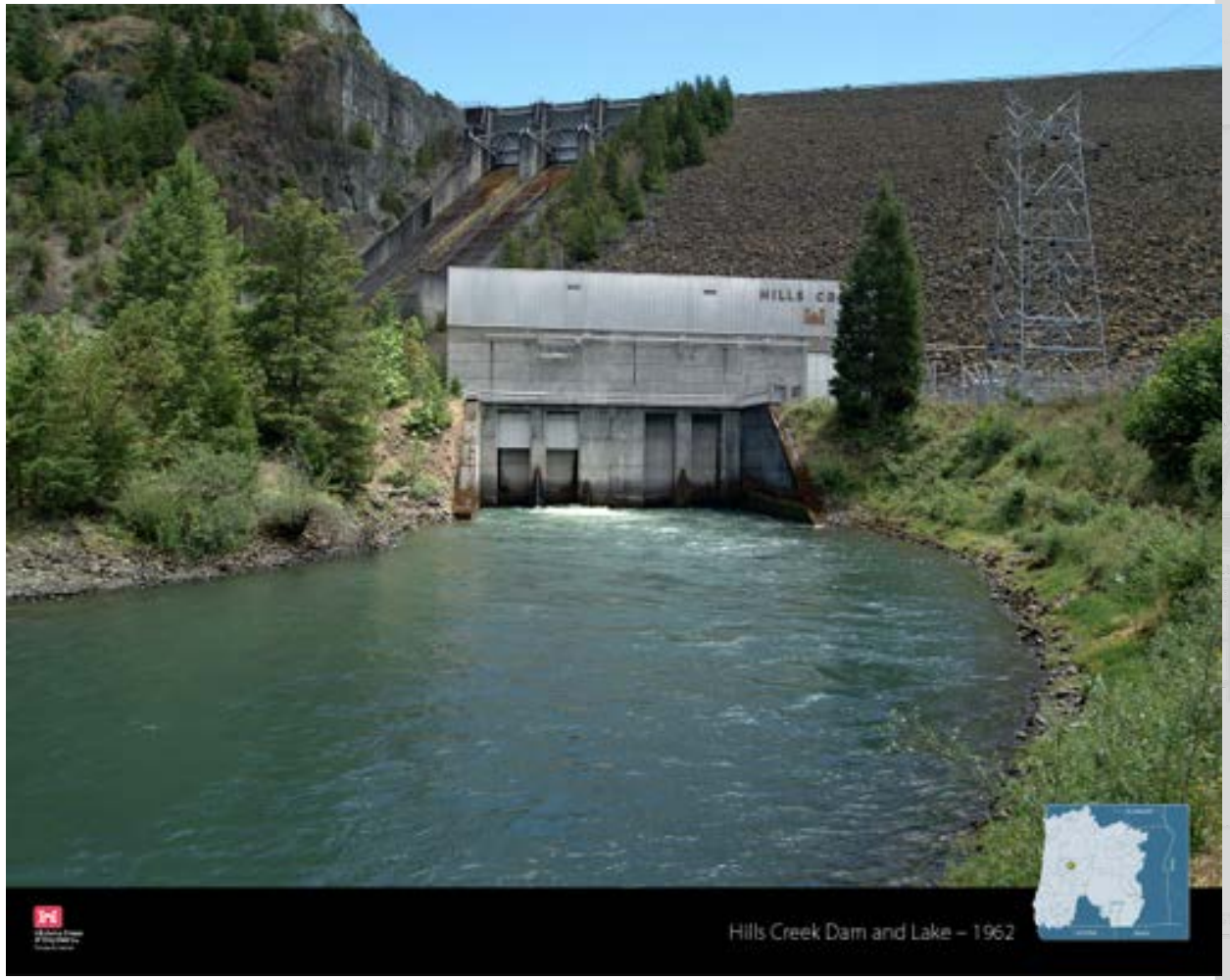
HYDROPOWER

- 8 Portland District Willamette Valley hydropower plants
  (>10% of Corps' plants)
- 15 power generating units with 408 MW total capacity
- Power generation by Corps; sales and transmission by Bonneville Power Administration (BPA)
- 1 FERC facility - 7.5 mw



Hills Creek Powerhouse

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NAVIGATION (WATER QUALITY)

- Authorized storage for navigation is used for water quality benefits
- Augment flows to improve temperature and turbidity conditions for fish
- Maintain statutory minimum flows at Albany/Salem

Willamette River

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RECREATION

- Over 3.5 million visitors annually
- $100 million in economic benefits annually
- 4 campgrounds, 23 day-use areas, and 7 boat ramps managed by Corps
- 19 campgrounds, 32 day-use areas, 27 boat ramps, and 8 marinas managed through lease agreement

Detroit Lake

Pine Meadows Cottage Grove

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IRRIGATION/WATER SUPPLY

- 75,000 acre-feet of stored water is contracted for irrigation
- Bureau of Reclamation manages water sales from federal projects
- Municipal uses for drinking water supply
- Current efforts – Willamette Basin Review

Farmland below Fern Ridge Dam

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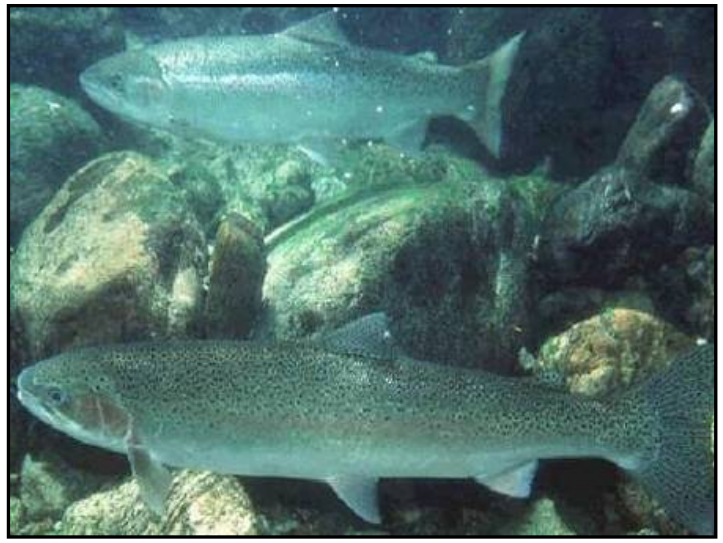
ENVIRONMENTAL STEWARDSHIP

- Stewardship for critical habitat and special status species including:
  - winter steelhead
  - spring Chinook salmon
  - bull trout
  - Fender's blue butterflies
  - Kincaid's lupine
  - Western pond turtles
  - red-legged frogs
  - bald eagles
  - migratory songbirds
  - Oregon chub
    - delisted May, 2015
    - first fish delisting in the nation

FISHERIES GOALS

- Help ESA listed fish (fish that are in jeopardy of becoming extinct).
- Minimize stranding and dewatering of eggs
  - Daily and hourly ramping release rates
- Operate to provide downstream juvenile passage
- Operate to control downstream water temperatures
- Provide spawning, incubation and rearing flows
- Meet Biological Opinion requirements



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FLOOD SEASON GOALS

- Major flood season (November – February)
- Flood Risk Mitigation
  - Operate projects individually and as a system
  - Use project storage to reduce downstream river stages
  - Evacuate stored water in preparation for the next event
  - Whenever possible, avoid exceeding the storm-peak downstream stage during evacuation

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CONSERVATION SEASON GOALS

- Refill in Spring so there is sufficient water to meet authorized purposes
- Release stored water through Summer and Fall
- Balance the needs of the multiple purposes
- Meet or exceed downstream flow targets
- Temp targets below Cougar, Detroit and Lookout Point
- Operate to facilitate maintenance and project improvements at the dams

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WATER STORAGE IN THE BASIN

- Snow pack/runoff <10% of the system storage.
- Snow in the basin is typically melted by June. Snow pack does not sustain runoff. Groundwater is what provides summer base inflows.
- The system relies primarily on rainfall during the months of April, May and early June to fill its system of 13 dams and reservoirs in the Willamette River basin.

Cougar Reservoir

WATER CONTROL DIAGRAM

- Defined in the original authorization of each project
- Analysis based on flood risks and hydrologic science of the day
- Sets guidelines for risk management and balancing project benefits
- Requires reservoir to be at or below rule curve except while storing flood water

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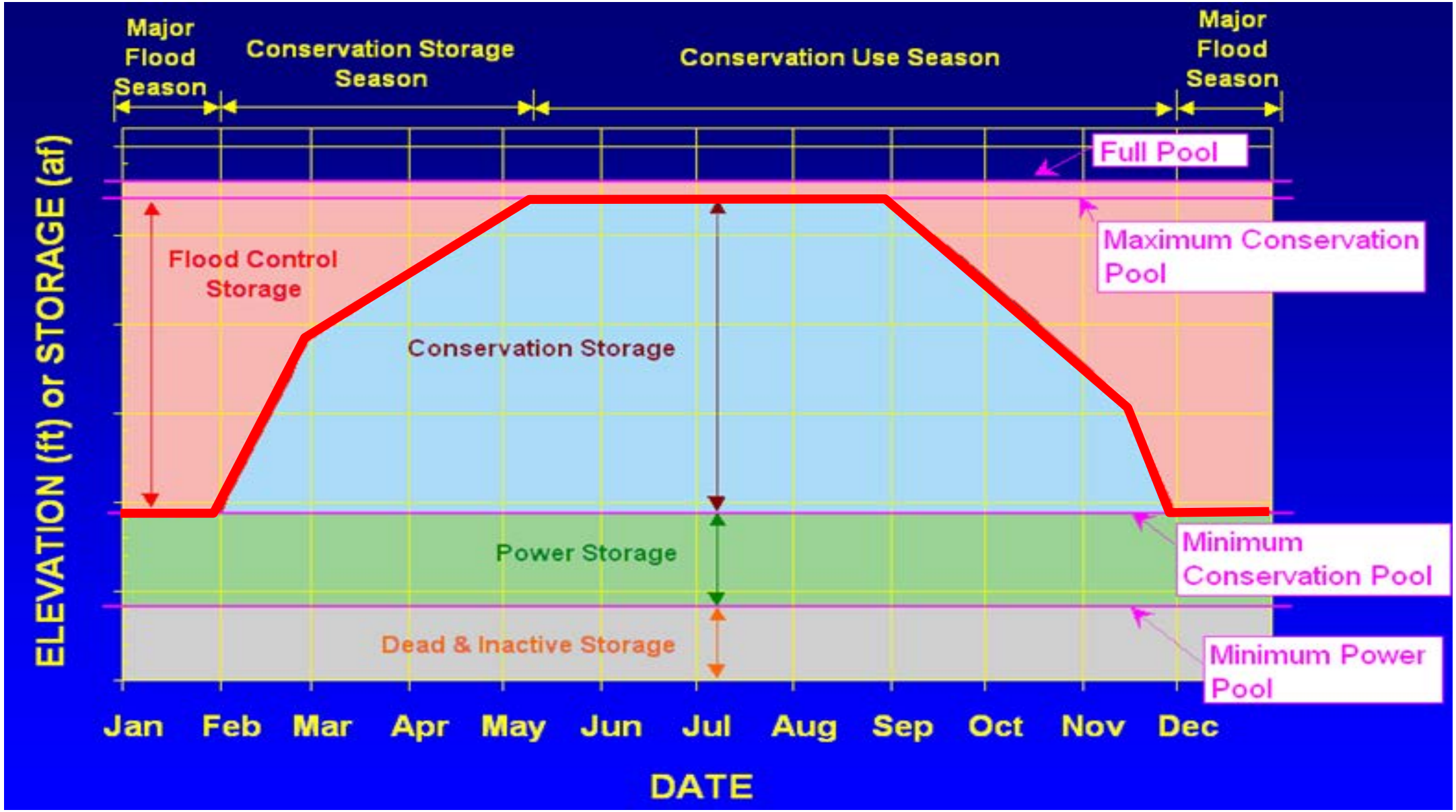
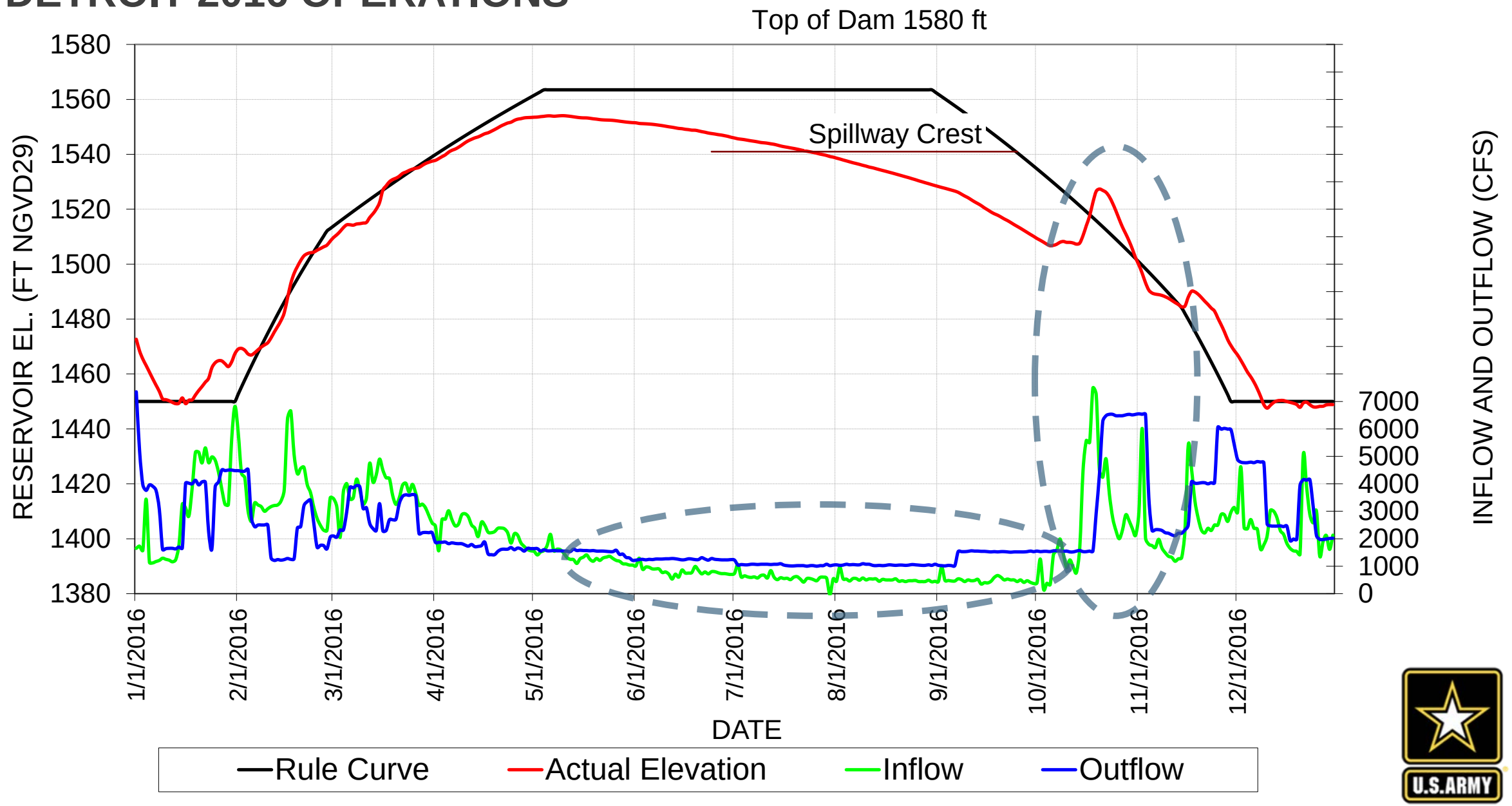
WATER CONTROL DIAGRAM



DETROIT 2016 OPERATIONS



WATER MANAGEMENT PARTNERS

- Corps
- NOAA
  - Weather Service
  - NW River Forecast Center
  - National Marine Fisheries Service
- National Resource Conservation Service
- Bonneville Power Administration
- U.S. Geological Survey
- U.S. Bureau of Reclamation
- U.S. Fish & Wildlife
- U.S. Forest Service
- OR Dept. of Fish & Wildlife
- OR Water Resources Dept.
- OR Dept. of Env. Quality
- OR Dept. of Agriculture
- The Nature Conservancy
- County government
- Elected officials
- Hatcheries
- OR State Marine Board
- OR State University
- City of Corvallis, Eugene, Salem, Springfield, Cottage Grove, Oakridge

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NATURAL RESOURCES CONSERVATION SERVICE
WATER SUPPLY FORECASTS

USDA United States Department of Agriculture

NRCS Natural Resources Conservation Service

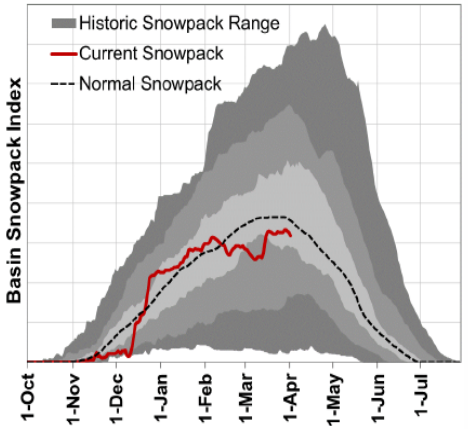
Oregon
Basin Outlook Report
April 1st, 2016

Lumpy spring snowpack makes over-snow travel to monitoring sites challenging *Photo courtesy of Bill Overman (NRCS Oregon)*

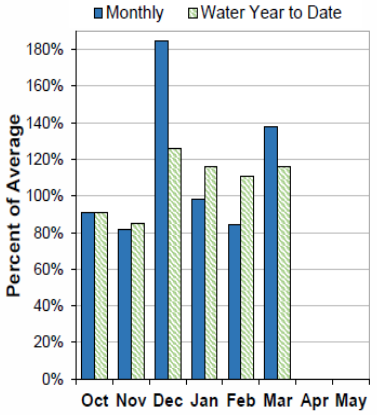
April 1st is typically the end of snow accumulation and the beginning of snowmelt runoff in Oregon's mountains. Early March brought a cooler and wetter period, while sunny and warmer weather dominated the last half of the month. Conditions depicted in the above photo are typical across the state during this transitional period of the snow measurement season. April 1st snowpack conditions are near normal for most basins and summer streamflow forecasts are calling for near normal to above normal volumes across much of the state.

Willamette Basin
April 1, 2016

Mountain Snowpack



Basin Precipitation



Summary of Water Supply Conditions

SNOWPACK

As of April 1, the basin snowpack was 91% of normal. This is significantly higher than last month when the snowpack was 82% of normal. In general, SNOTEL sites in the basin peaked around 50% to 90% of normal peak snowpack levels. Snowpack conditions in the basin are among the lowest in the state.

PRECIPITATION

March precipitation was 138% of average. Precipitation since the beginning of the water year (October 1 - April 1) has been 116% of average.

RESERVOIR

As of April 1, storage at major reservoirs in the basin ranges from 70% of average at Foster Reservoir to 113% of average at Lookout Point Reservoir.

STREAMFLOW FORECAST

As of April 1, summer streamflow forecasts in the basin range from 89% to 116% of average. Overall, forecasts increased slightly from last month's report.

NATURAL RESOURCES CONSERVATION SERVICE
WATER SUPPLY FORECASTS

- Water year type determined by mid-May NRCS Water Supply Forecast
- Prescribes mainstem Willamette at Salem & Albany and tributary minimum flow targets

Characteristics of Water Year Types	Abundant	Adequate	Insufficient	Deficit
Mid-May storage (MAF)[1]	≥ 1.48	1.20 to 1.47	0.90 to 1.19	< 0.90
Frequency	58%	17%	9%	16%
Meet all mainstem flow objectives?	Yes	Yes	No	No
Alternative flow targets below objectives	N/A	N/A	Linear sliding scale based on flow targets used during 2001 water year [2]	Balance seasonal flows to retain some control of discharge [2]
Likely status of priority recreational reservoirs[3]	Full throughout most or all of recreation season	Full through most of recreation season	May fill; unlikely to remain full throughout season	Unlikely to fill
Likely Status of Other Reservoirs	Likely to fill; drafted as necessary to meet mainstem flows	May fill; unlikely to remain full throughout season	Unlikely to fill	Unlikely to fill

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RESERVOIR DRAWDOWN PRIORITIES

April - June

- Green Peter
- Cougar
- Lookout Point, Hills Creek
- Blue River
- Fall Creek, Dorena, Cottage Grove
- Detroit, Fern Ridge, Foster

July - October

- Lookout Point
- Cougar
- Hills Creek
- Green Peter, Blue River
- Fall Creek, Dorena, Cottage Grove
- Detroit, Fern Ridge, Foster

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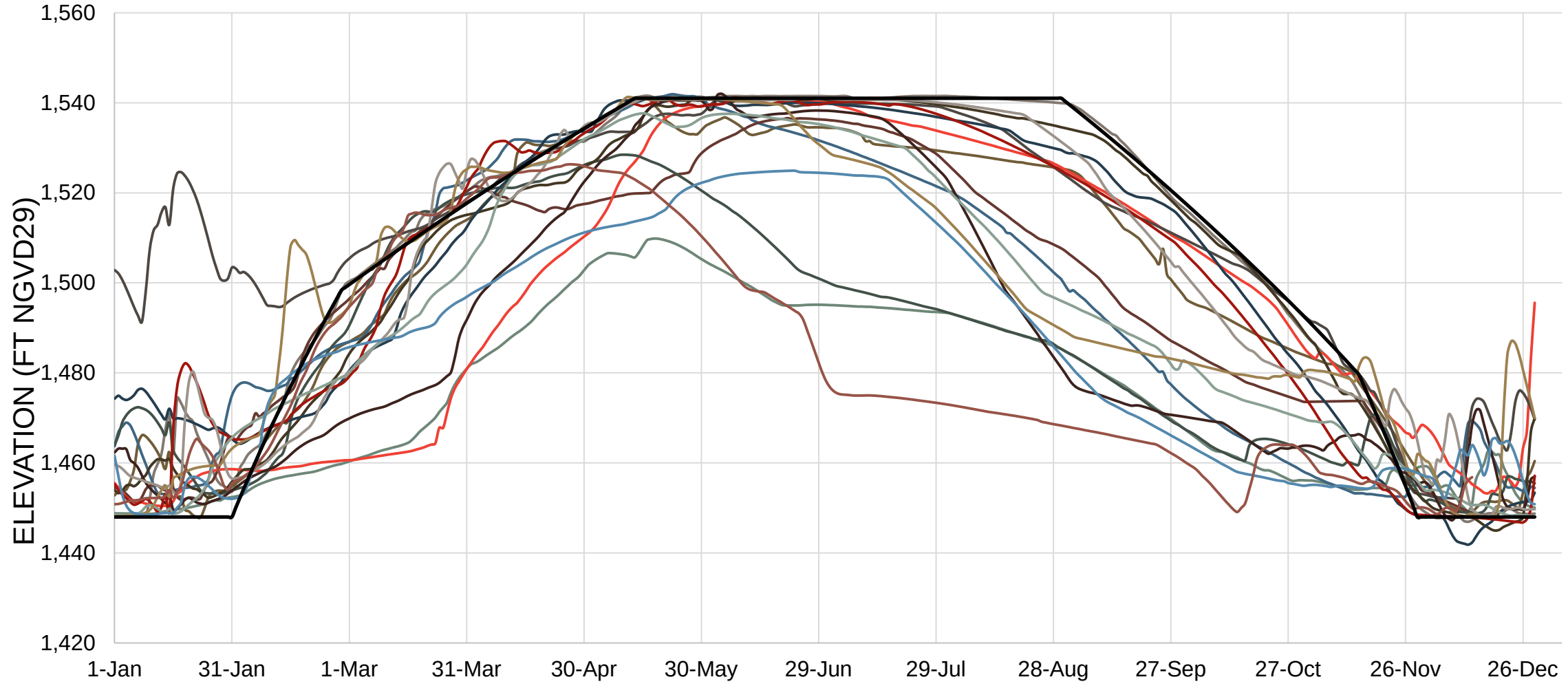
ANNUAL VARIABILITY

- Climate
- BiOp implementation (minimum flows)
- Competition for water (Willamette Basin Review)
- Dam safety / Aging infrastructure

Foster

Cougar

ANNUAL VARIABILITY - HILLS CREEK (MIDDLE FORK WILLAMETTE)



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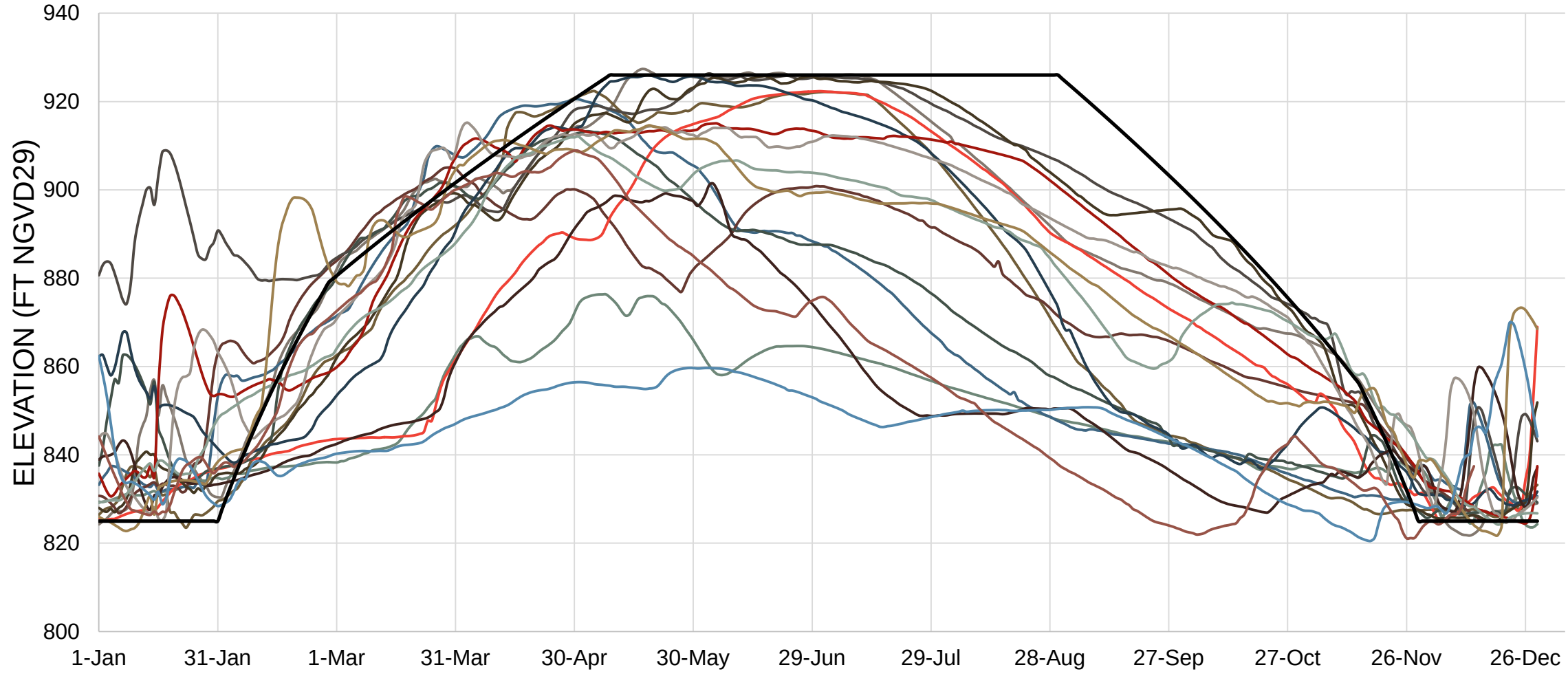
ANNUAL VARIABILITY - LOOKOUT POINT (MIDDLE FORK WILLAMETTE)



WY2000 WY2001 WY2002 WY2003 WY2004 WY2005
WY2006 WY2007 WY2008 WY2009 WY2010 WY2011
WY2012 WY2013 WY2014 WY2015 WY2016 Rule Curve

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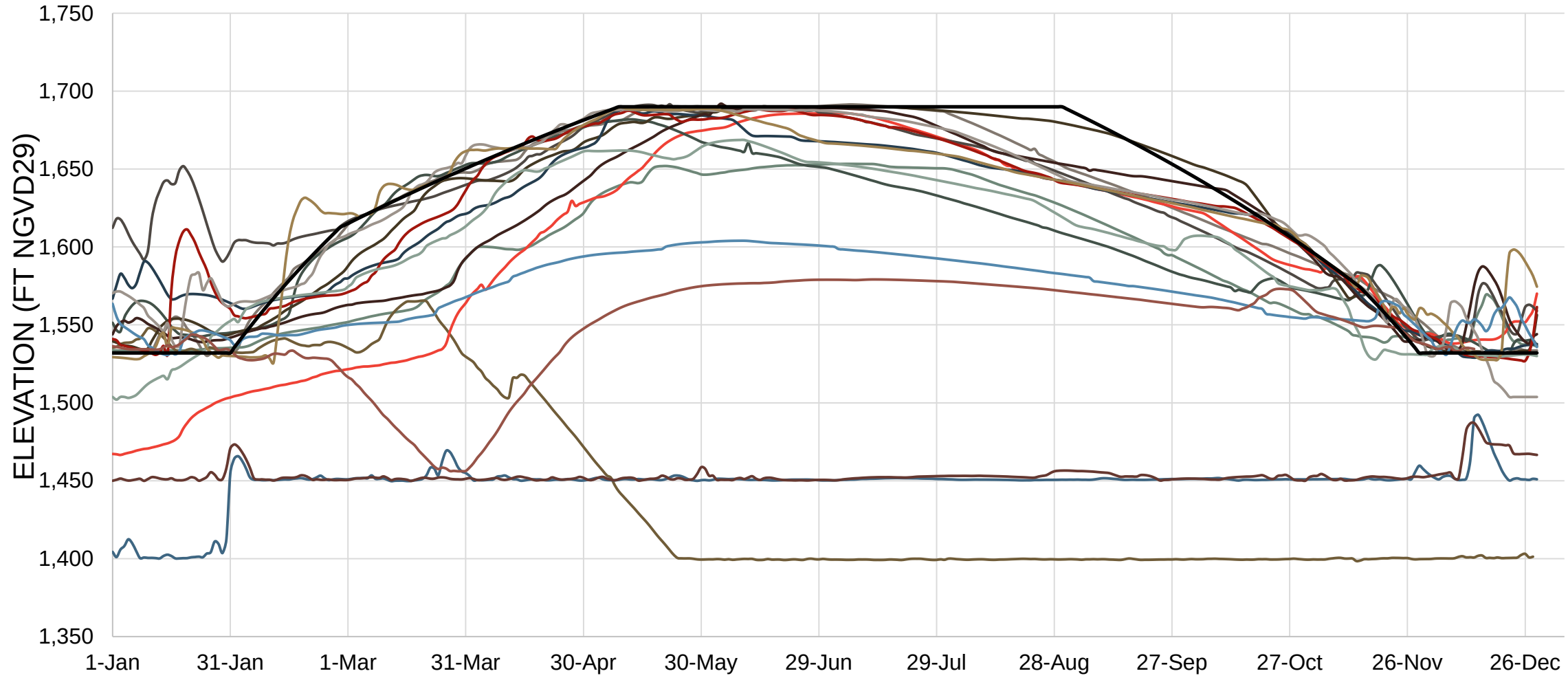
ANNUAL VARIABILITY – COUGAR (MCKENZIE)



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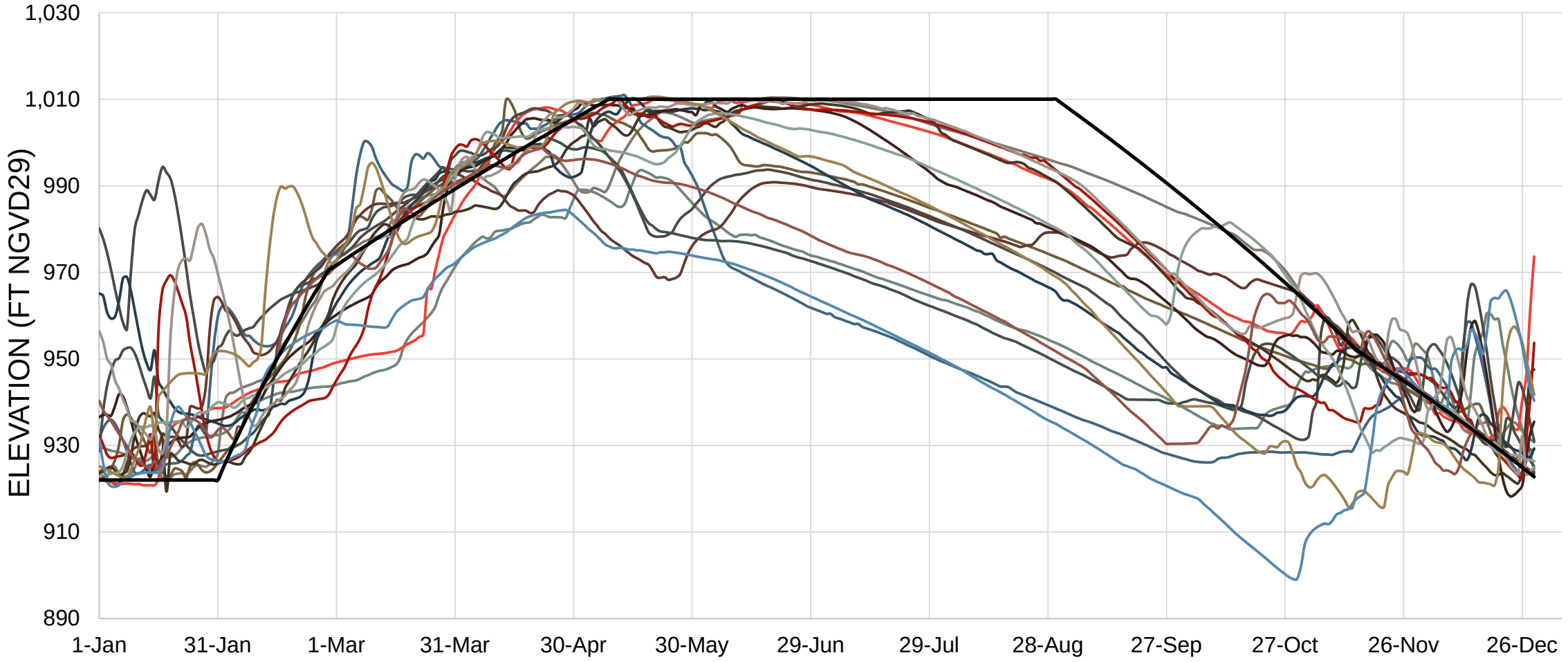
ANNUAL VARIABILITY – GREEN PETER (SOUTH SANTIAM)



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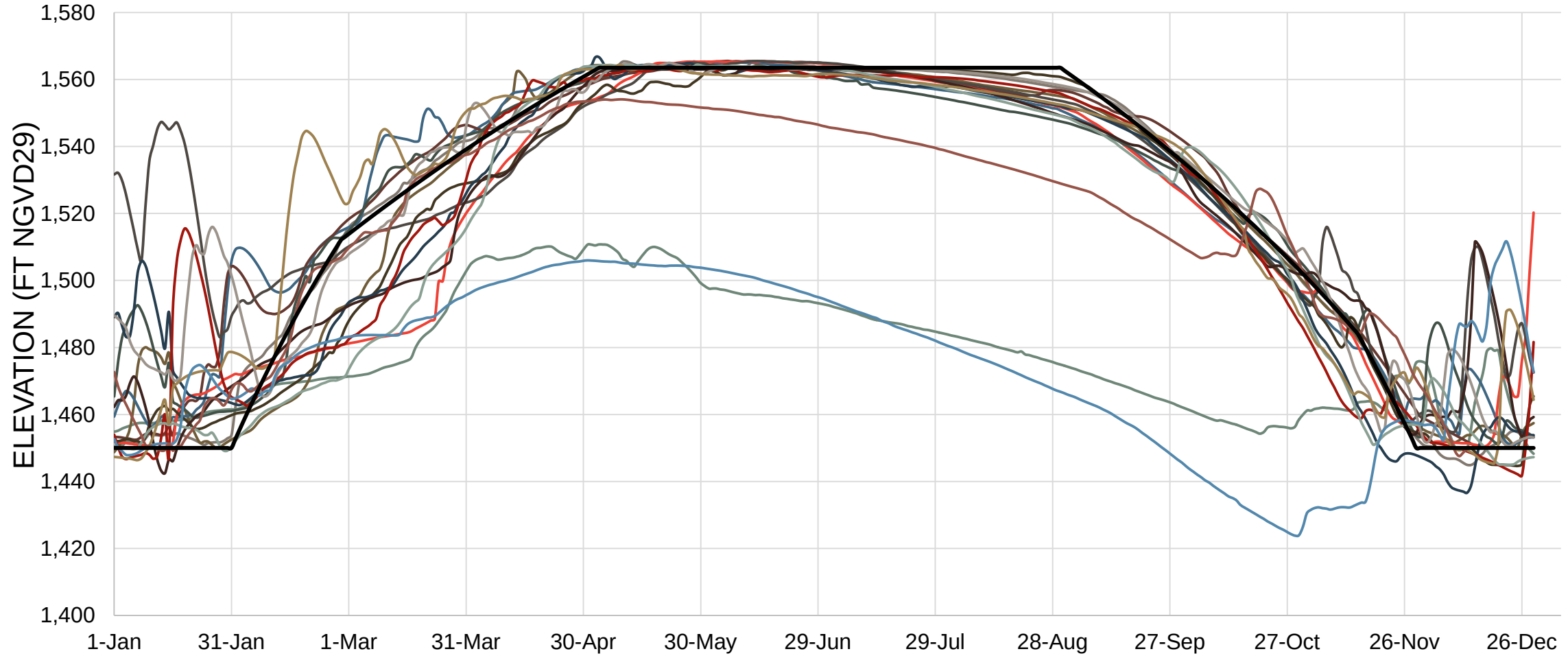
ANNUAL VARIABILITY – DETROIT (NORTH SANTIAM)



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SUMMARY

- Dams in the Willamette Valley provide many benefits to the region.
- Regional Coordination with our Water Management partners occur frequently.
- The Water Control Diagram was developed to minimize risk and balancing project benefits.
- The Willamette Basin reservoirs are dependent on rain during late spring for refill.

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FOR MORE INFORMATION:

About the Corps: (Portland District web site)
www.nwp.usace.army.mil

Portland District Water Management Reservoir Regulation and Water Quality Section
http://www.nwd-wc.usace.army.mil/nwp/wm/

Videos of the Willamette system:
http://www.youtube.com/user/PortlandCorps

Portland District Public Affairs Office: 503-808-4510

Willamette Storage
27 February 2017