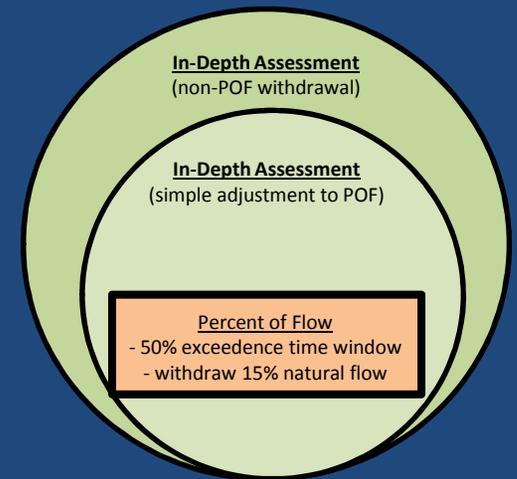


# Percent of Flow Assessment

## Ken Stahr



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## Chapter 1. When Water Is Available for Storage: Diverting a Percent of Flow

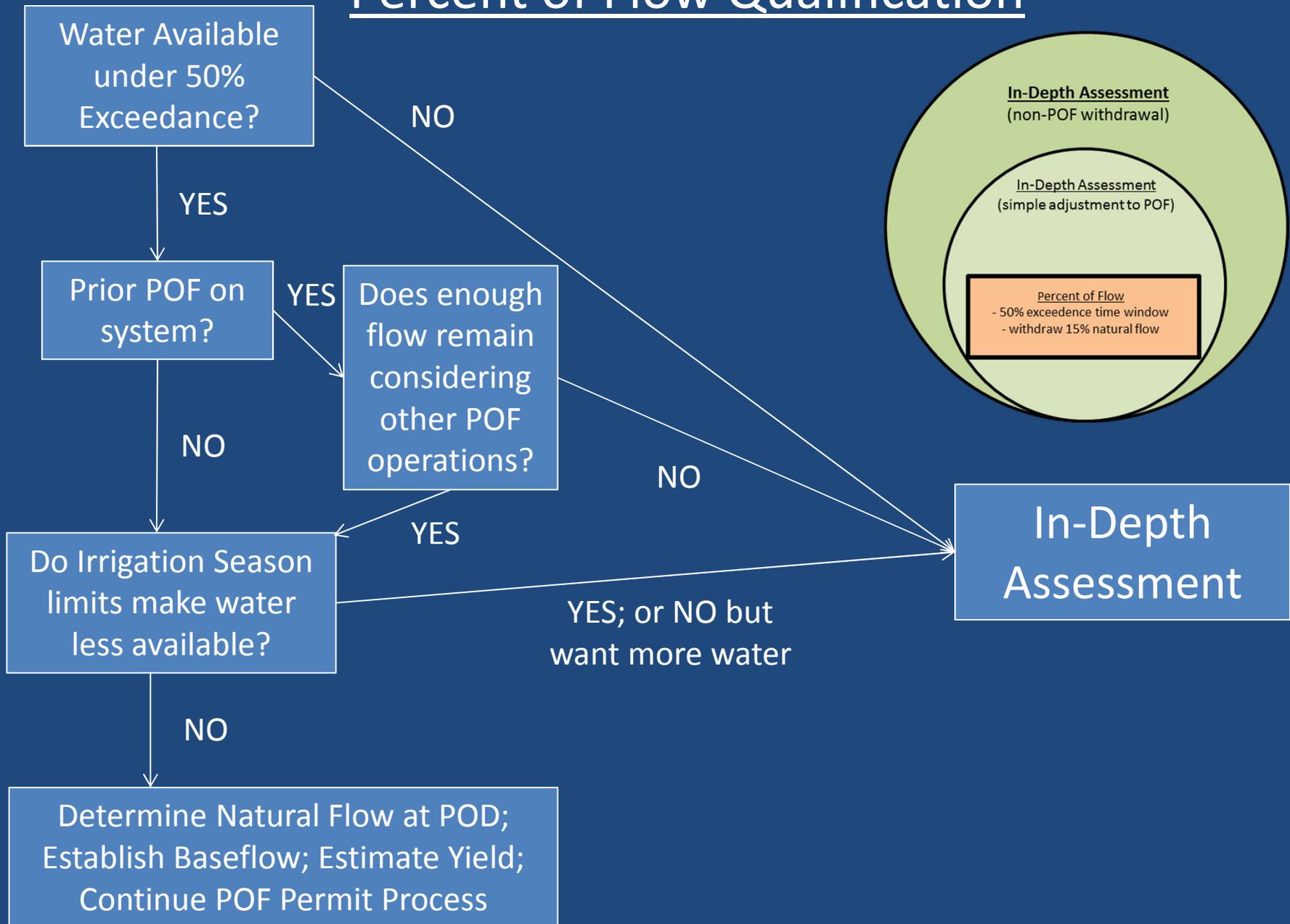
---

*All streams and rivers should have instream flows that maintain or restore, to the greatest extent possible, ecological functions and processes similar to those exhibited in their natural or unaltered state.*  
(Instream Flow Council 2008)

*A strong consensus now exists within the scientific community around the need to maintain some semblance of natural flow variability to sustain the ecological health of river ecosystems and the array of goods and services they provide to society. (Richter 2009)*

*A strong consensus now exists within the scientific community around the need to maintain some semblance of natural flow variability to sustain the ecological health of river ecosystems and the array of goods and services they provide to society. (Richter 2009)*

# Percent of Flow Qualification



# Water Availability Analysis

- Used by Department as a first line of analysis for new applications
- Help establish allowable season
- Determine downstream demand
- Accounting tool

# Water Availability Analysis

GRANDE RONDE R > SNAKE R - AB HAYWIRE CAN  
 GRANDE RONDE BASIN

Water Availability as of 10/29/2013

Watershed ID #: 230 [\(Map\)](#)

Exceedance Level: 50%

Date: 10/29/2013

Time: 9:53 AM

**Water Availability**

Limiting Watersheds

Complete Water Availability Analysis

Text

## Water Availability

Select any Watershed for Details

	Nesting Order	Watershed ID #	Stream Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Sto
<a href="#">Select</a>	1	227	GRANDE RONDE R> SNAKE R- AT MOUTH	Yes	No	No	Yes	No	Yes	Yes						
<a href="#">Select</a>	2	228	GRANDE RONDE R> SNAKE R- AB SHEEP CR	Yes	No	No	Yes	No	Yes	Yes						
<a href="#">Select</a>	3	30810416	GRANDE RONDE R> SNAKE R- AB WALLOWA R	Yes	No	No	Yes	No	Yes	Yes						
<a href="#">Select</a>	4	30810406	GRANDE RONDE R> SNAKE R- AB GORDON CR	Yes	No	No	Yes	No	Yes	Yes						
<a href="#">Select</a>	5	30810407	GRANDE RONDE R> SNAKE R- AB WILLOW CR	Yes	No	No	Yes	No	Yes	Yes						
<a href="#">Select</a>	6	230	GRANDE RONDE R> SNAKE R- AB HAYWIRE CAN	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	No	Yes	Yes

Search

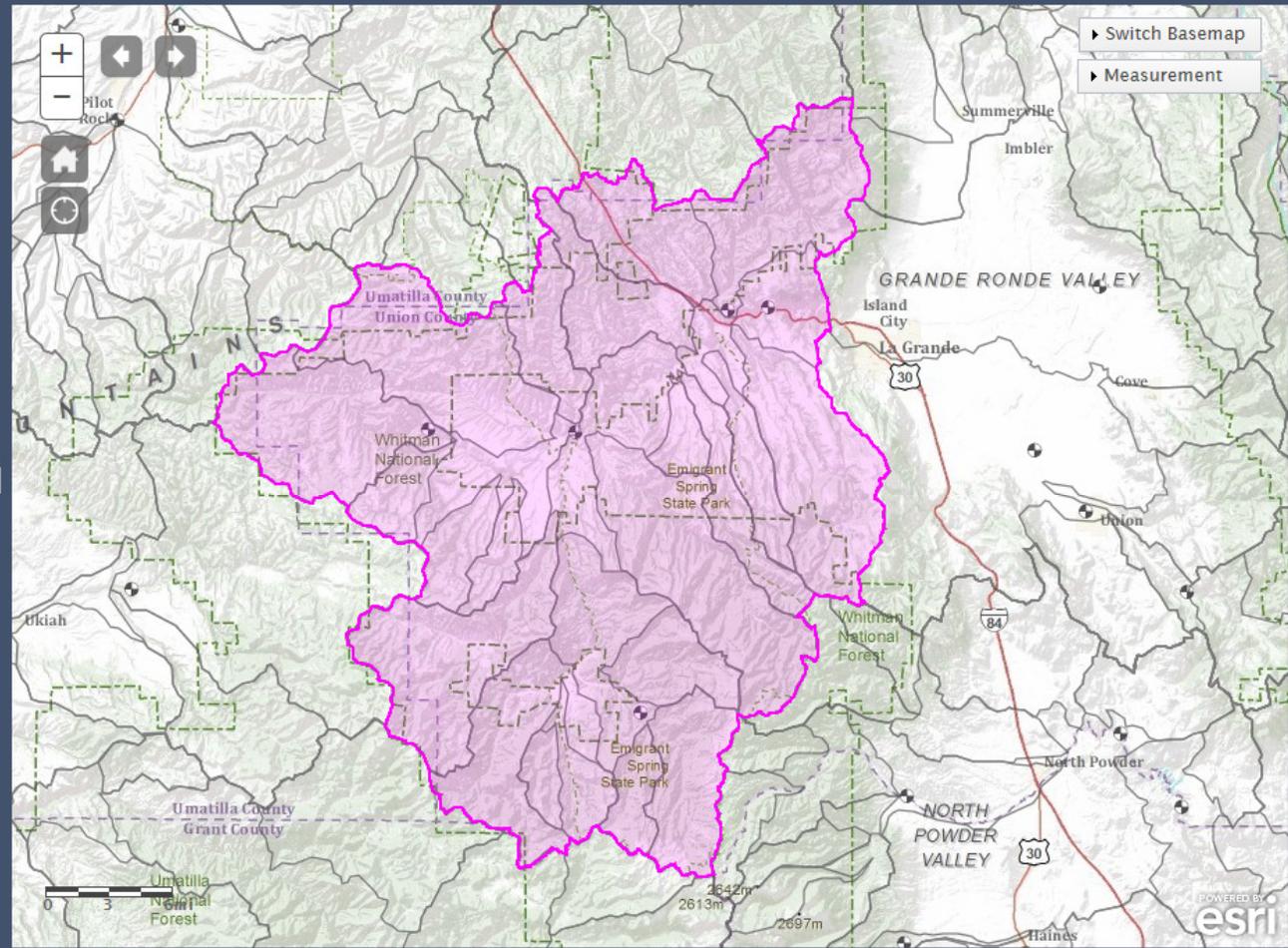
Identify Non-Water Right Features

Tools

Legend

Layers

- Water Rights by Type
- Water Rights by Use
- Water Rights by Type-Use
- Water Rights by Prim./Suppl
- Water Rights - Municipal Only
- Administrative Boundaries
- Rules
- Surface Water
- Hydrography
- Stream Gages
  - Active Gaging Stations
  - Inactive Gaging Stations
- PLSS



Print

POD POU

# Water Availability Analysis

GRANDE RONDE R > SNAKE R - AB HAYWIRE CAN  
 GRANDE RONDE BASIN

Water Availability as of 10/29/2013

Watershed ID #: 230 ([Map](#))

Date: 10/29/2013

Exceedance Level: 50%

Time: 9:58 AM

Water Availability

**Limiting Watersheds**

Complete Water Availability Analysis

Text

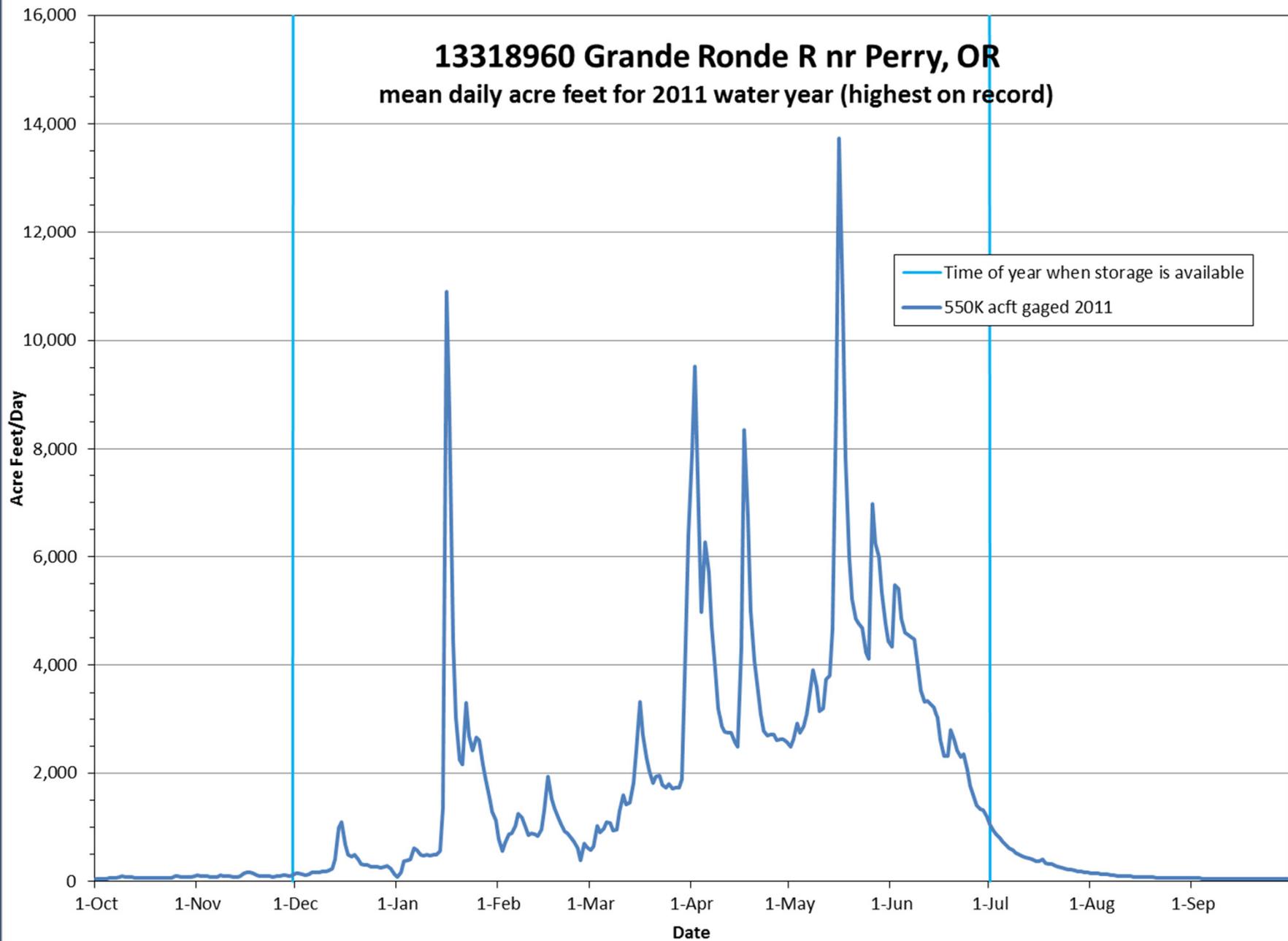
## Limiting Watersheds

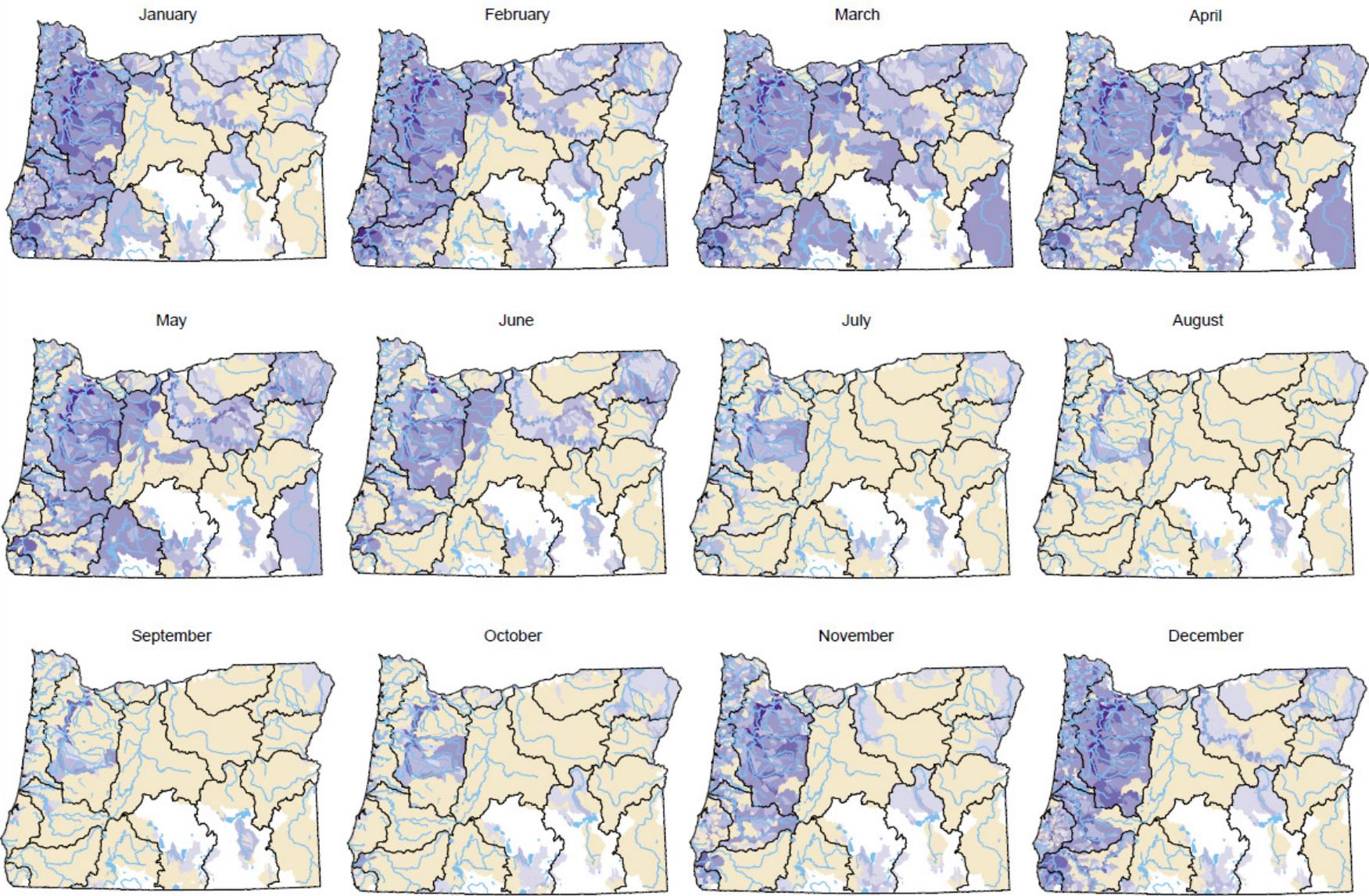
Monthly Streamflow in Cubic Feet per Second  
 Annual Volume at 50% Exceedance in Acre-Feet

Month	Limiting Watershed ID #	Stream Name	Water Available?	Net Water Available
JAN	230	GRANDE RONDE R > SNAKE R - AB HAYWIRE CAN	Yes	42.80
FEB	230	GRANDE RONDE R > SNAKE R - AB HAYWIRE CAN	Yes	171.00
MAR	230	GRANDE RONDE R > SNAKE R - AB HAYWIRE CAN	Yes	311.00
APR	227	GRANDE RONDE R > SNAKE R - AT MOUTH	Yes	219.00
MAY	230	GRANDE RONDE R > SNAKE R - AB HAYWIRE CAN	Yes	560.00
JUN	230	GRANDE RONDE R > SNAKE R - AB HAYWIRE CAN	Yes	55.20
JUL	230	GRANDE RONDE R > SNAKE R - AB HAYWIRE CAN	No	-30.50
AUG	227	GRANDE RONDE R > SNAKE R - AT MOUTH	No	-134.00
SEP	227	GRANDE RONDE R > SNAKE R - AT MOUTH	No	-27.10
OCT	230	GRANDE RONDE R > SNAKE R - AB HAYWIRE CAN	Yes	0.27
NOV	227	GRANDE RONDE R > SNAKE R - AT MOUTH	No	-178.00
DEC	230	GRANDE RONDE R > SNAKE R - AB HAYWIRE CAN	Yes	6.47
ANN	230	GRANDE RONDE R > SNAKE R - AB HAYWIRE CAN	Yes	82,500.00

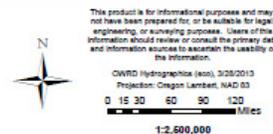
# 13318960 Grande Ronde R nr Perry, OR

mean daily acre feet for 2011 water year (highest on record)



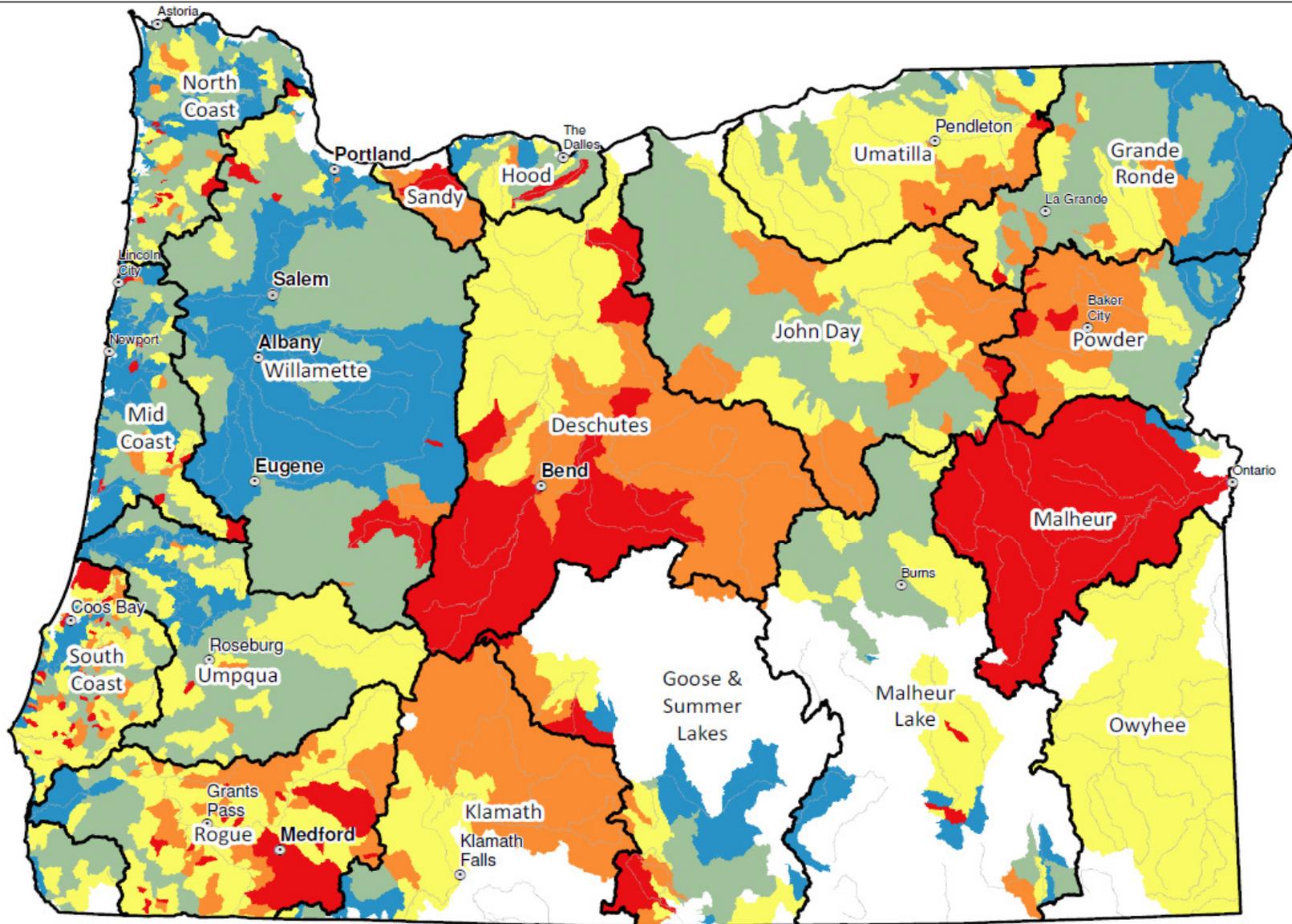


**Oregon Twelve Month Available Streamflow**  
 Calculated at 50% Exceedance



This product is for informational purposes and may not have been prepared for, or be suitable for, legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.



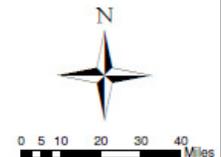
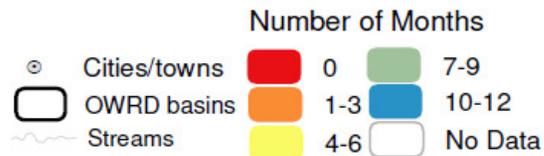


## Months of Available Streamflow DRAFT



OWRD Hydrographics (rfl), 4/8/2014, Projection: Oregon Lambert NAD 83  
 This product is for informational purposes only and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. Users of the information should review or consult the primary data and information sources to ascertain the usability of the information.

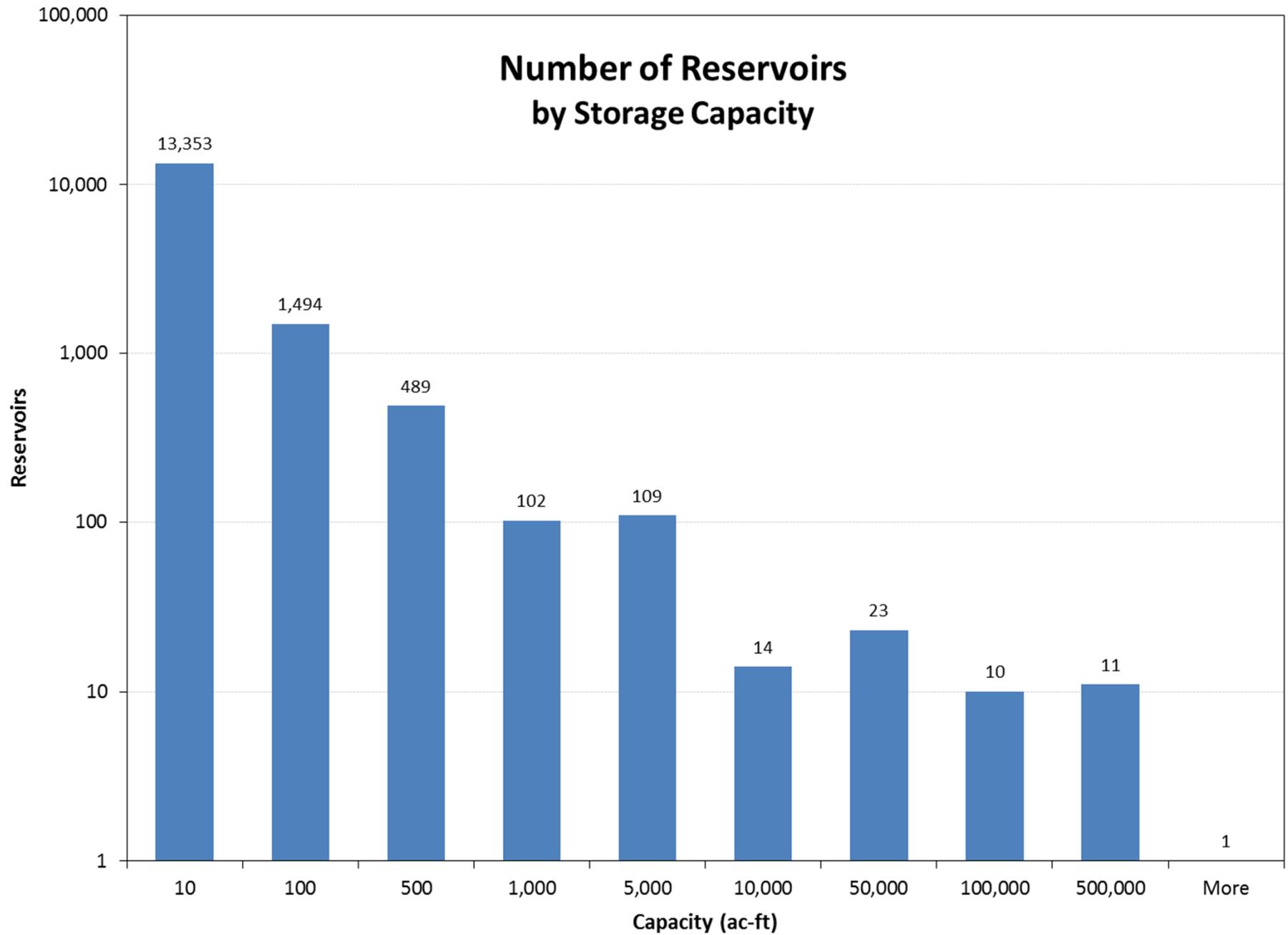
OWRD Hydrographics (rfl), 5/13/2014, Projection: Oregon Lambert NAD 83, M:\SB 839\maps\wateravailability\_storage\_statewide\_allyear

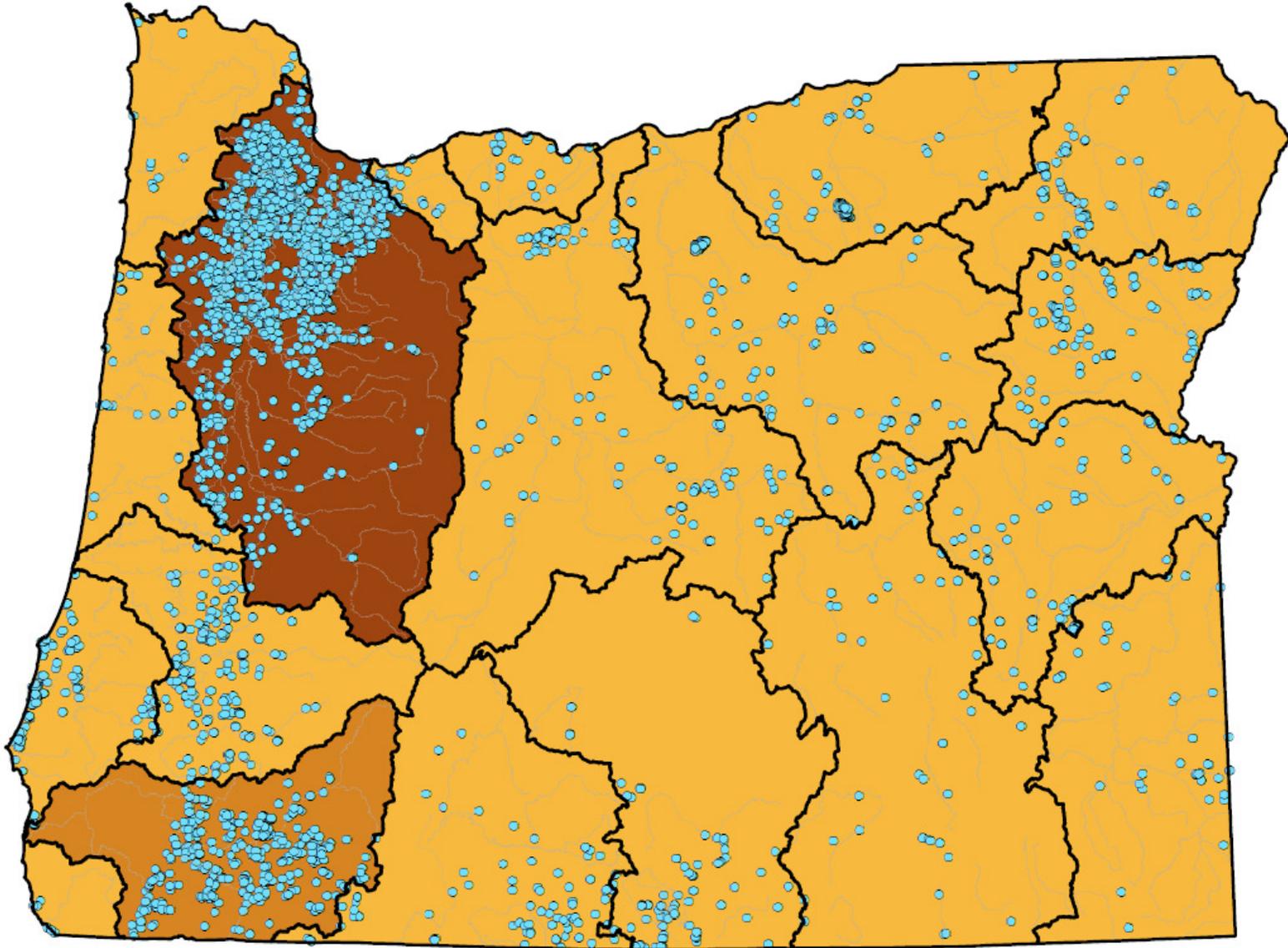


# The State of Storage In Oregon



## Number of Reservoirs by Storage Capacity





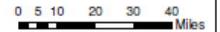
## Storage Permits by Administrative Basin

This product is for informational purposes only and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. Users of the information should review or consult the primary data and information sources to ascertain the usability of the information.

OWRD Hydrographics (rfl), 3/28/2014, Projection: Oregon Lambert NAD 83, M:\SB 839\maps\water\availability\_storage\_byadminbasin\_140327

### Count of Storage Permits

-  OWRD Basins
-  Streams
-  Storage Diversions
-  <300
-  301 - 600
-  >601



# Lost Creek Reservoir

465,000 acre-feet; Flood control, Water Quality, Irrigation, Habitat, Power, and Recreation.



# Approximation of Fill Rates and Acres Irrigated

- Rate of Diversion Estimate =

Project Volume / # of months when storage would occur then convert to rate

Ex. 1,000 acre feet / 6 months = 2.8 cfs

- Acres Irrigated =

Project Volume / 3 acre feet per acre (typical)

Ex. 1,000 acre feet / 3 acre feet per acre = 333 acres

# Lost Creek Reservoir

465,000 acre-feet; @ 6 months, 1,284 cfs, 155,000 acres



# Warm Springs Reservoir

170,000 acre feet; Irrigation, recreation  
@ 6 months, 470 cfs, 57,000 acres



# Bully Creek Reservoir

31,650 acre feet; Irrigation, recreation  
@ 6 months, 87.4 cfs, 10,600 acres



# Wolf Creek Reservoir

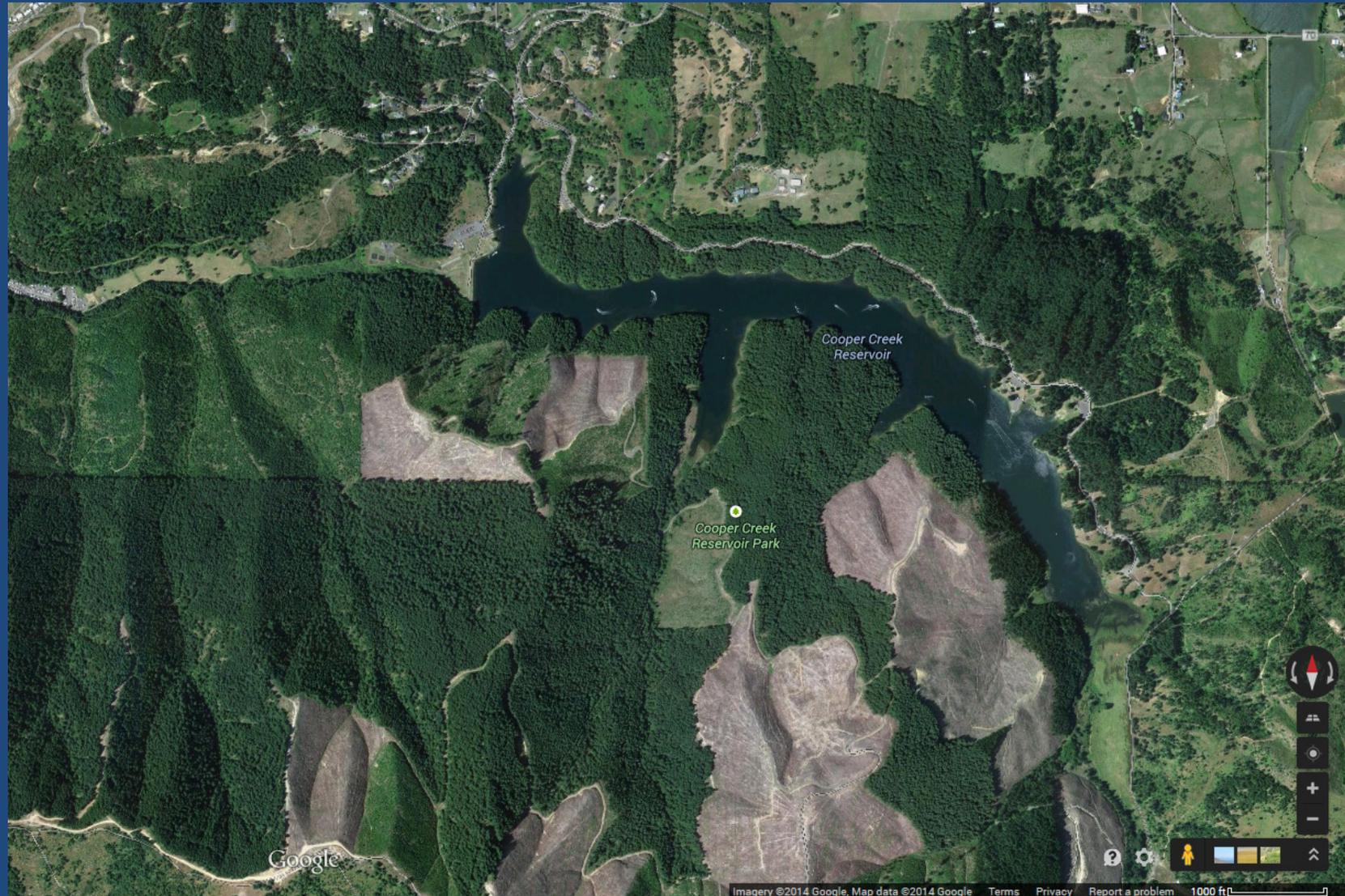
11,000 acre feet; Irrigation and Recreation

@ 6 months, 30 cfs, 3,700 acres



# Cooper Creek Reservoir

5,200 Acre-Feet; Recreation and Municipal  
6 months, 14.4 cfs, 15-18K households/year



# Katz Farm-Baily Nurseries

675 Acre-Feet, Off channel; Agriculture,  
Irrigation, and Wildlife  
6 months, 1.9 cfs, 225 acres



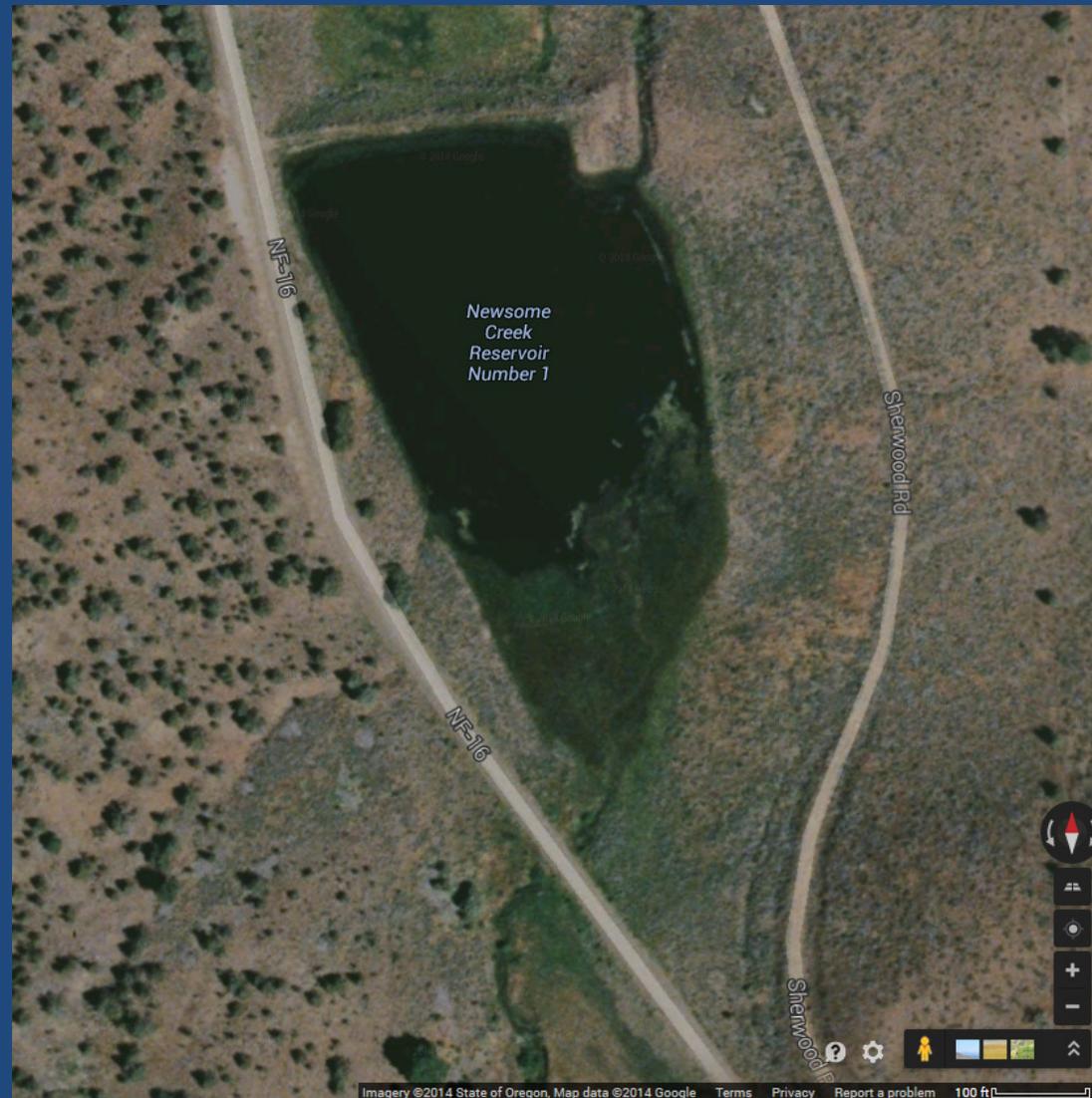
# Private Reservoir

200 Acre-Feet; Irrigation  
6 months, 0.6 cfs, 67 acres

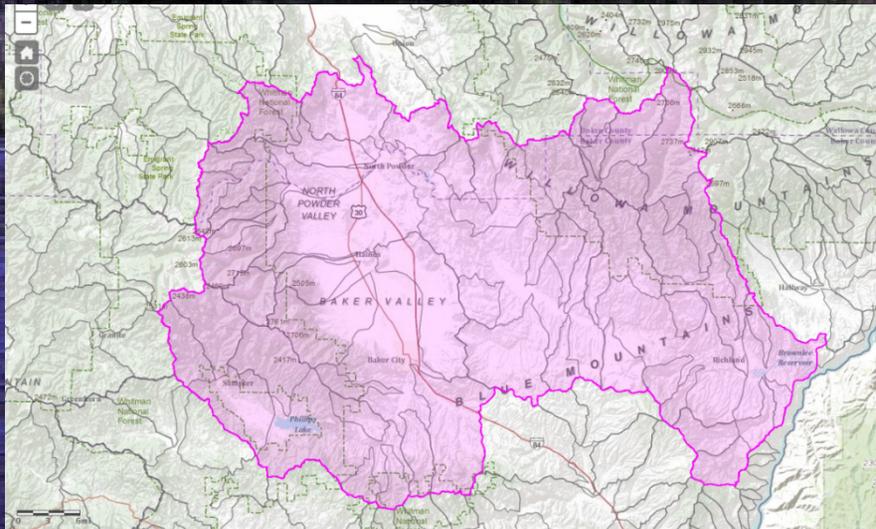


# Sherwood Creek Reservoir

37.5 Acre-Feet; Supplemental Irrigation  
6 months, 0.1 cfs, 12.5 acres



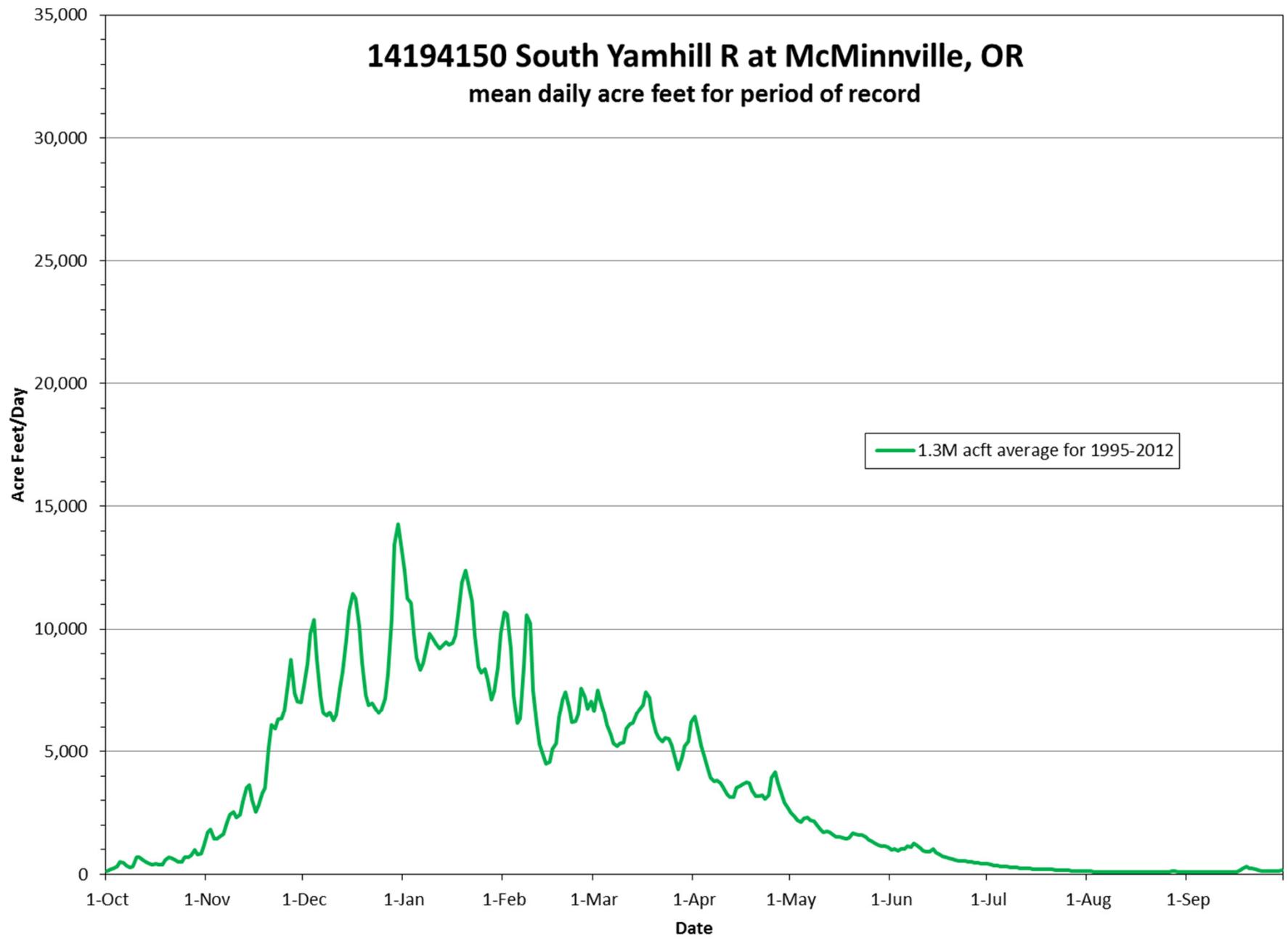
# Sample Hydrographs



14194150 South Yamhill River  
at McMinnville, OR

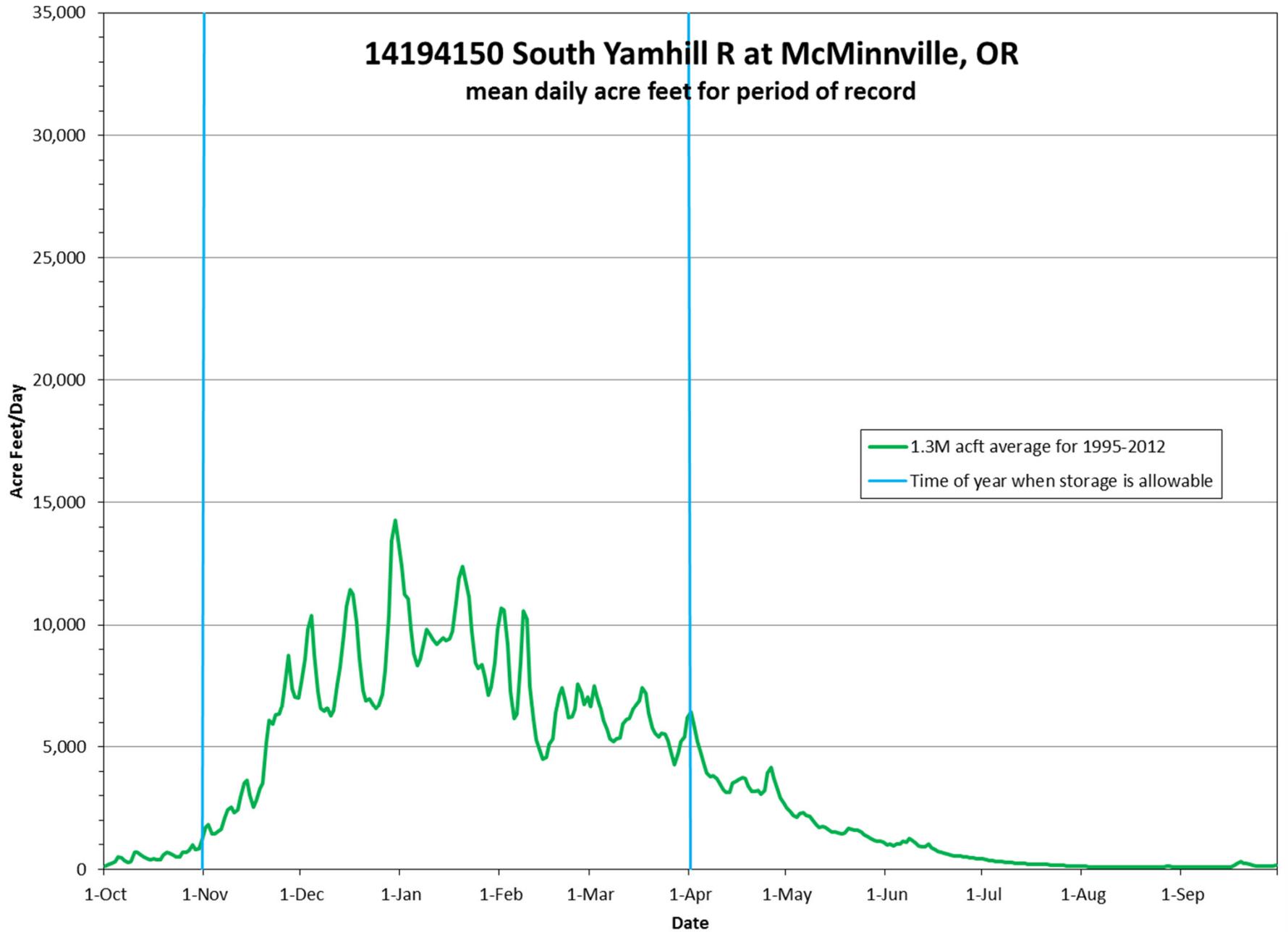
# 14194150 South Yamhill R at McMinnville, OR

mean daily acre feet for period of record



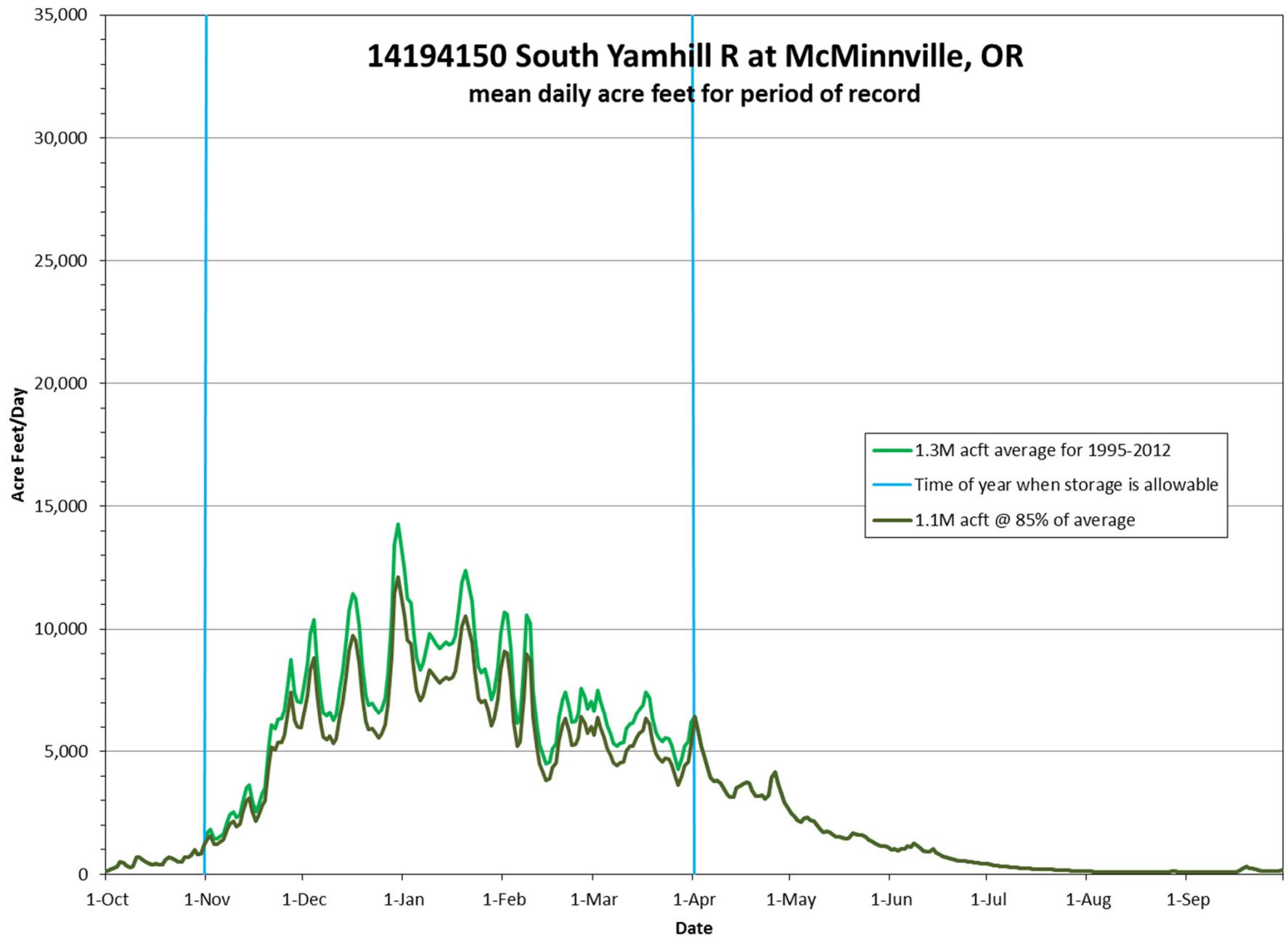
# 14194150 South Yamhill R at McMinnville, OR

mean daily acre feet for period of record



# 14194150 South Yamhill R at McMinnville, OR

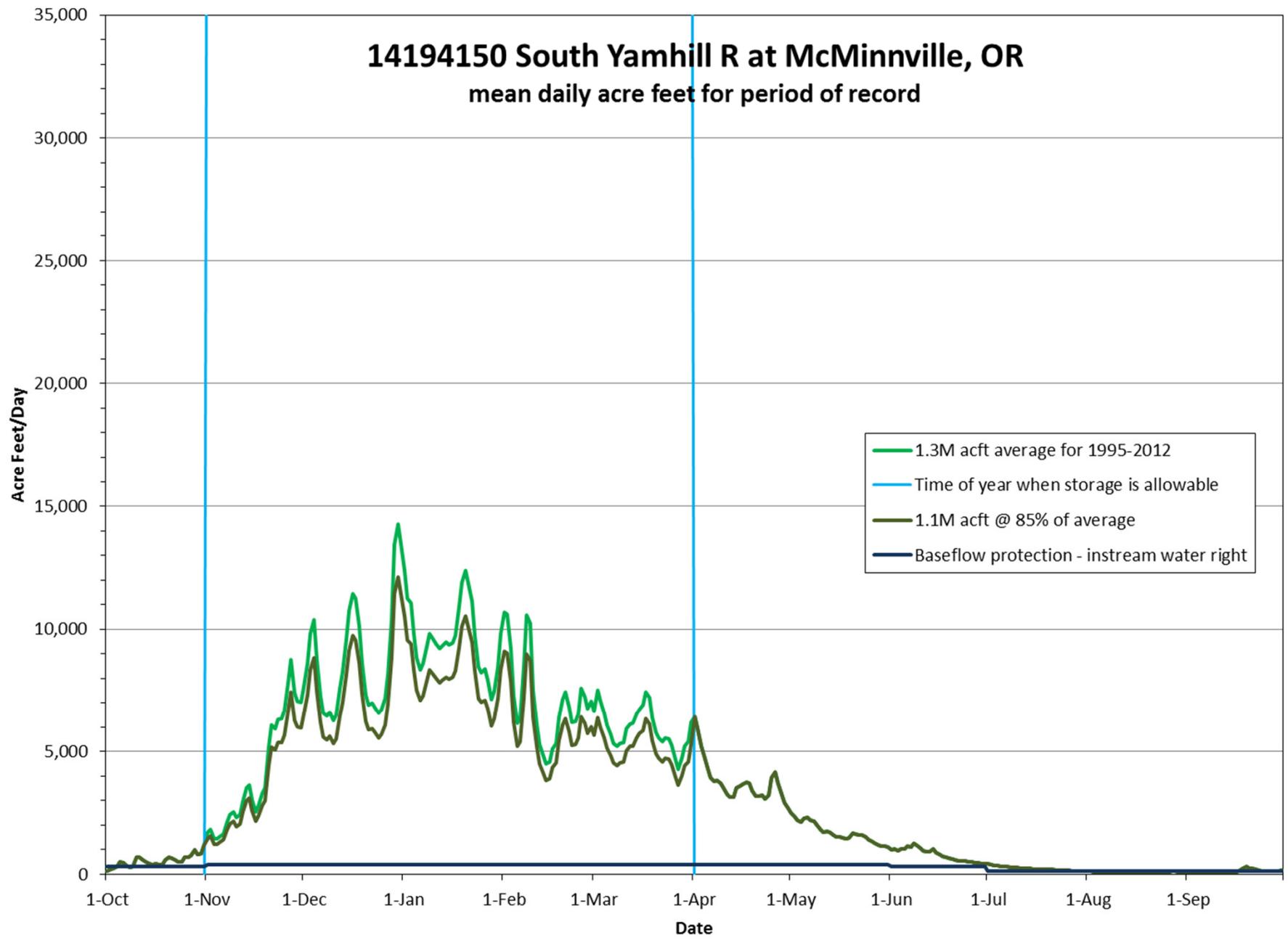
mean daily acre feet for period of record



— 1.3M acft average for 1995-2012  
— Time of year when storage is allowable  
— 1.1M acft @ 85% of average

# 14194150 South Yamhill R at McMinnville, OR

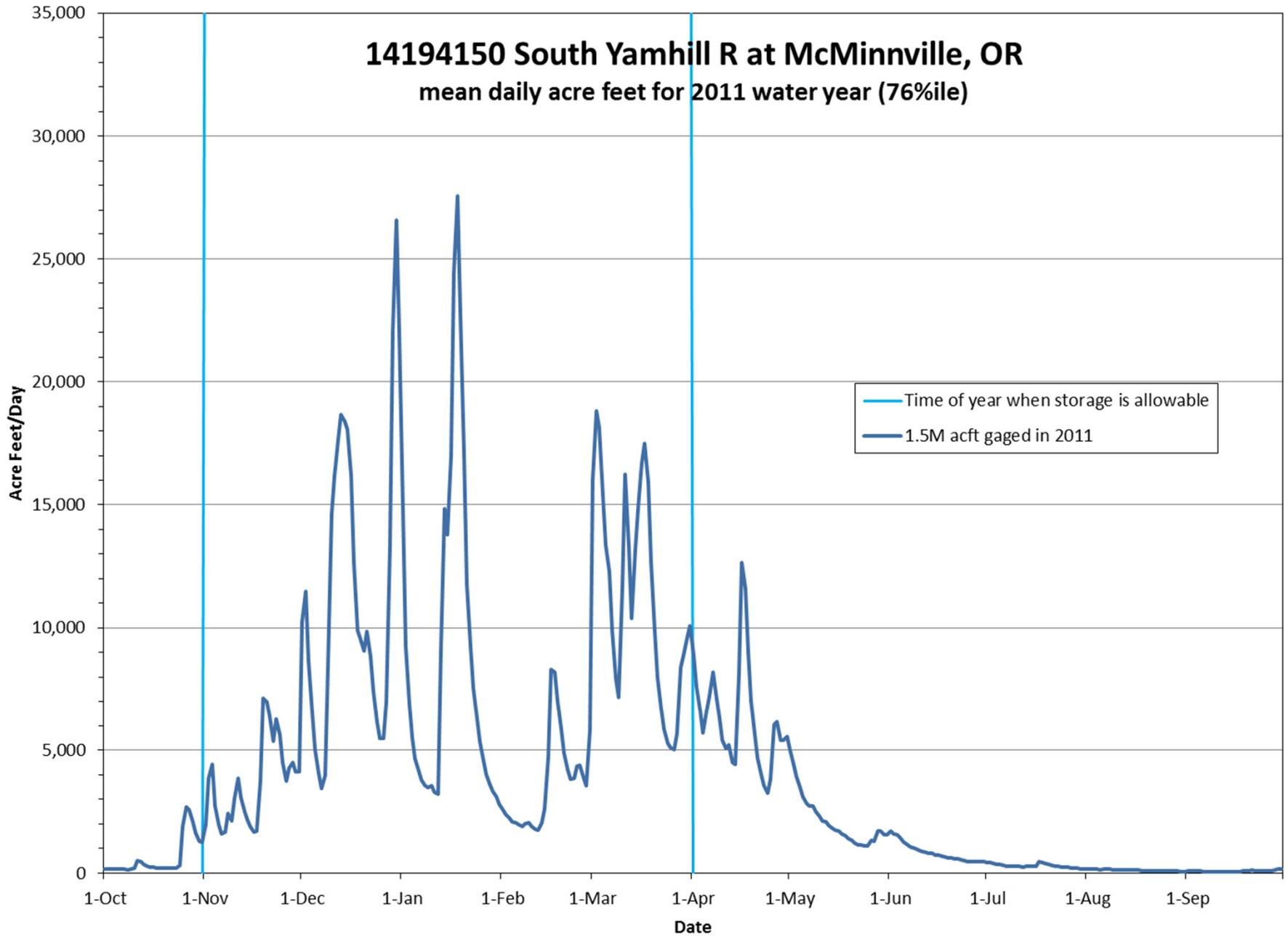
mean daily acre feet for period of record



- 1.3M acft average for 1995-2012
- Time of year when storage is allowable
- 1.1M acft @ 85% of average
- Baseflow protection - instream water right

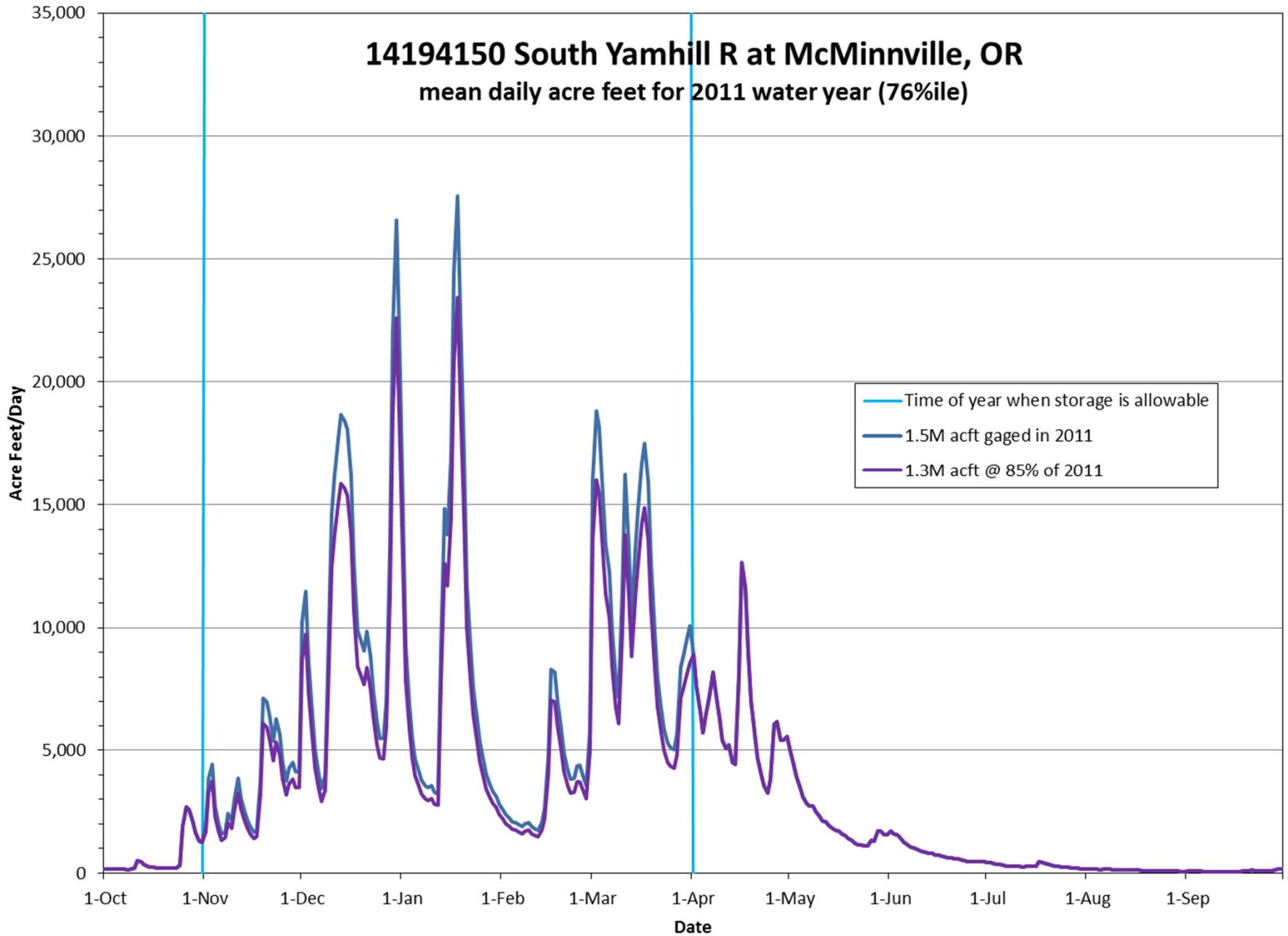
# 14194150 South Yamhill R at McMinnville, OR

mean daily acre feet for 2011 water year (76%ile)



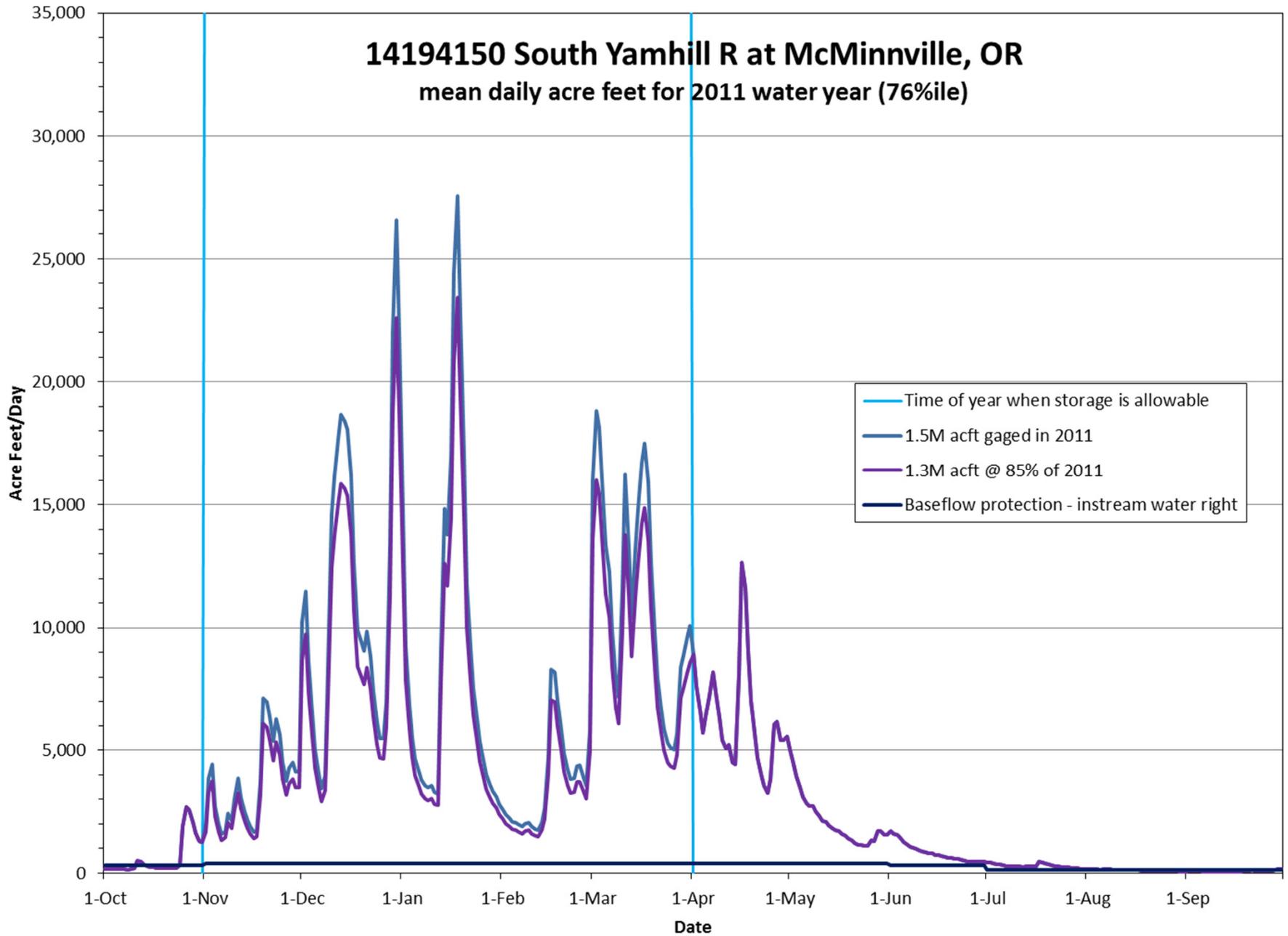
# 14194150 South Yamhill R at McMinnville, OR

mean daily acre feet for 2011 water year (76%ile)



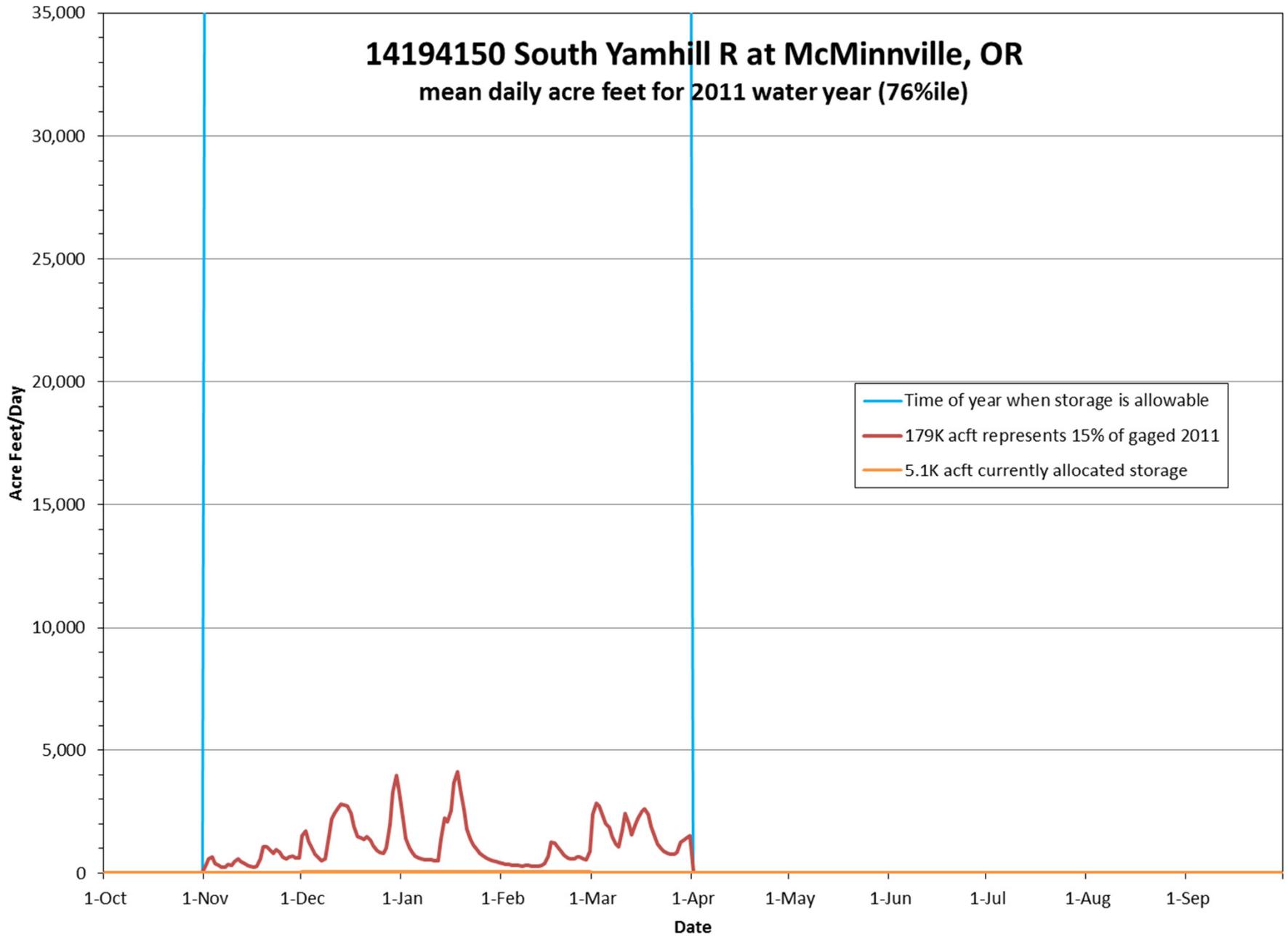
# 14194150 South Yamhill R at McMinnville, OR

mean daily acre feet for 2011 water year (76%ile)



# 14194150 South Yamhill R at McMinnville, OR

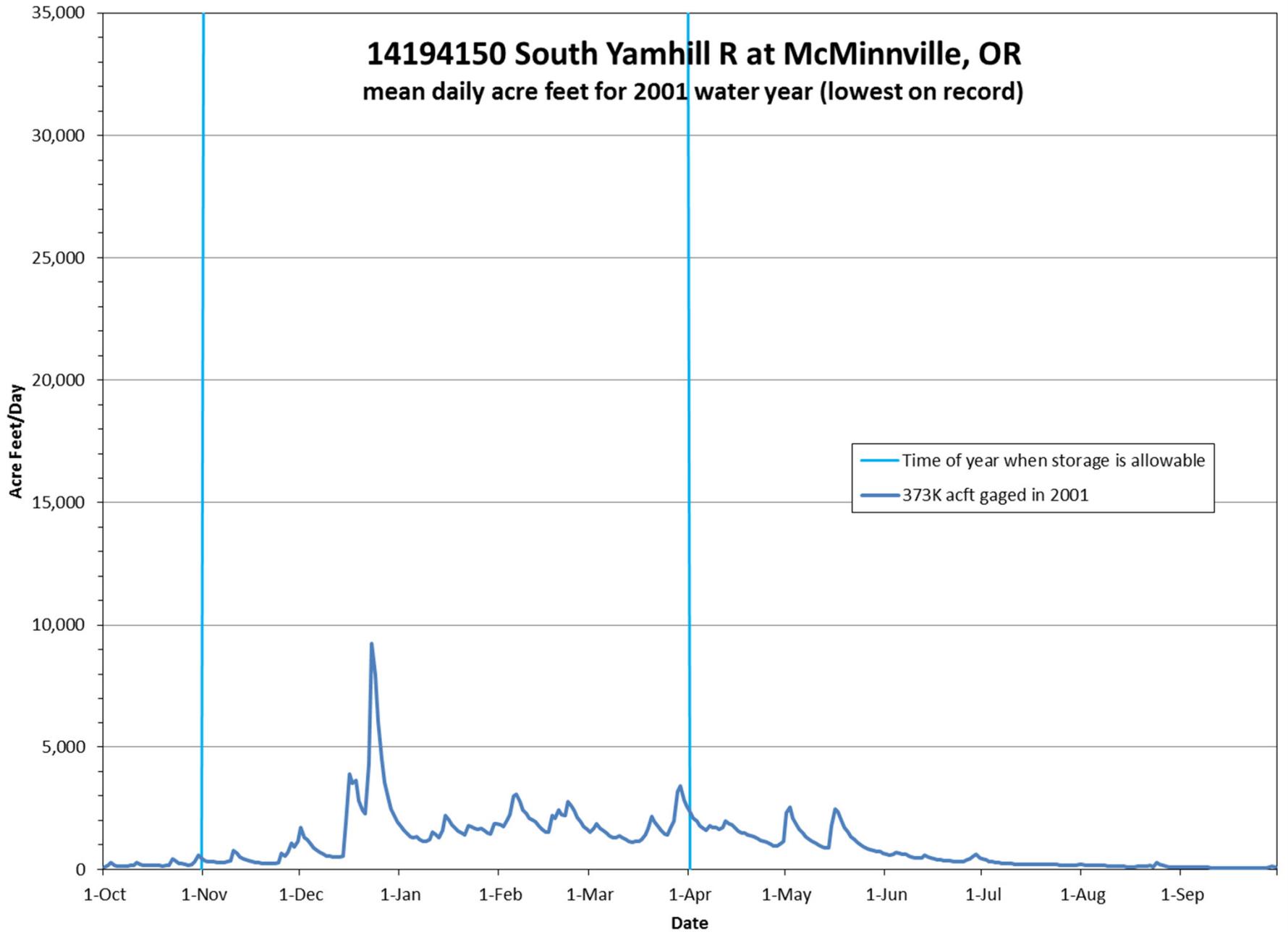
mean daily acre feet for 2011 water year (76%ile)



— Time of year when storage is allowable  
— 179K acft represents 15% of gaged 2011  
— 5.1K acft currently allocated storage

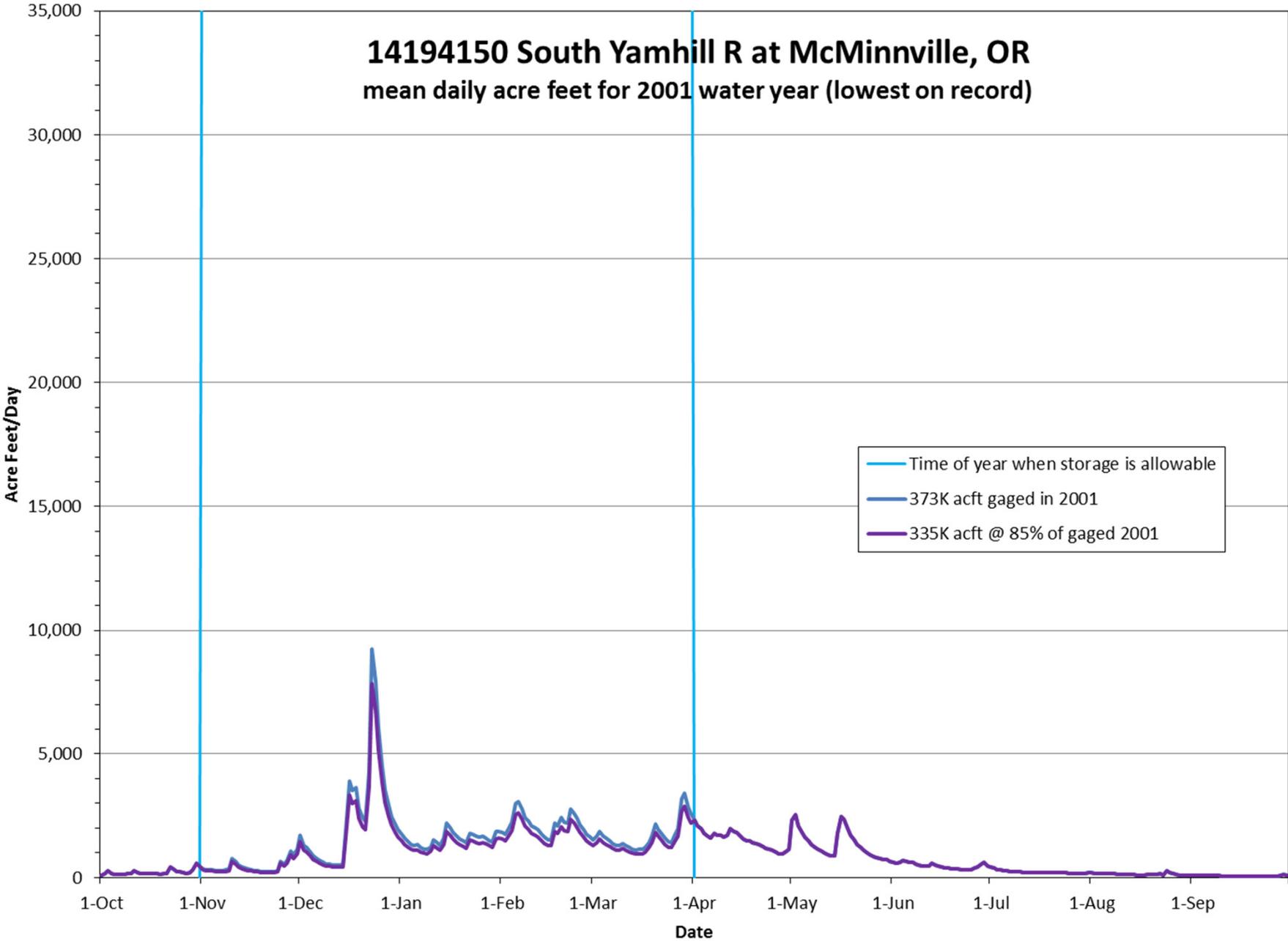
# 14194150 South Yamhill R at McMinnville, OR

mean daily acre feet for 2001 water year (lowest on record)



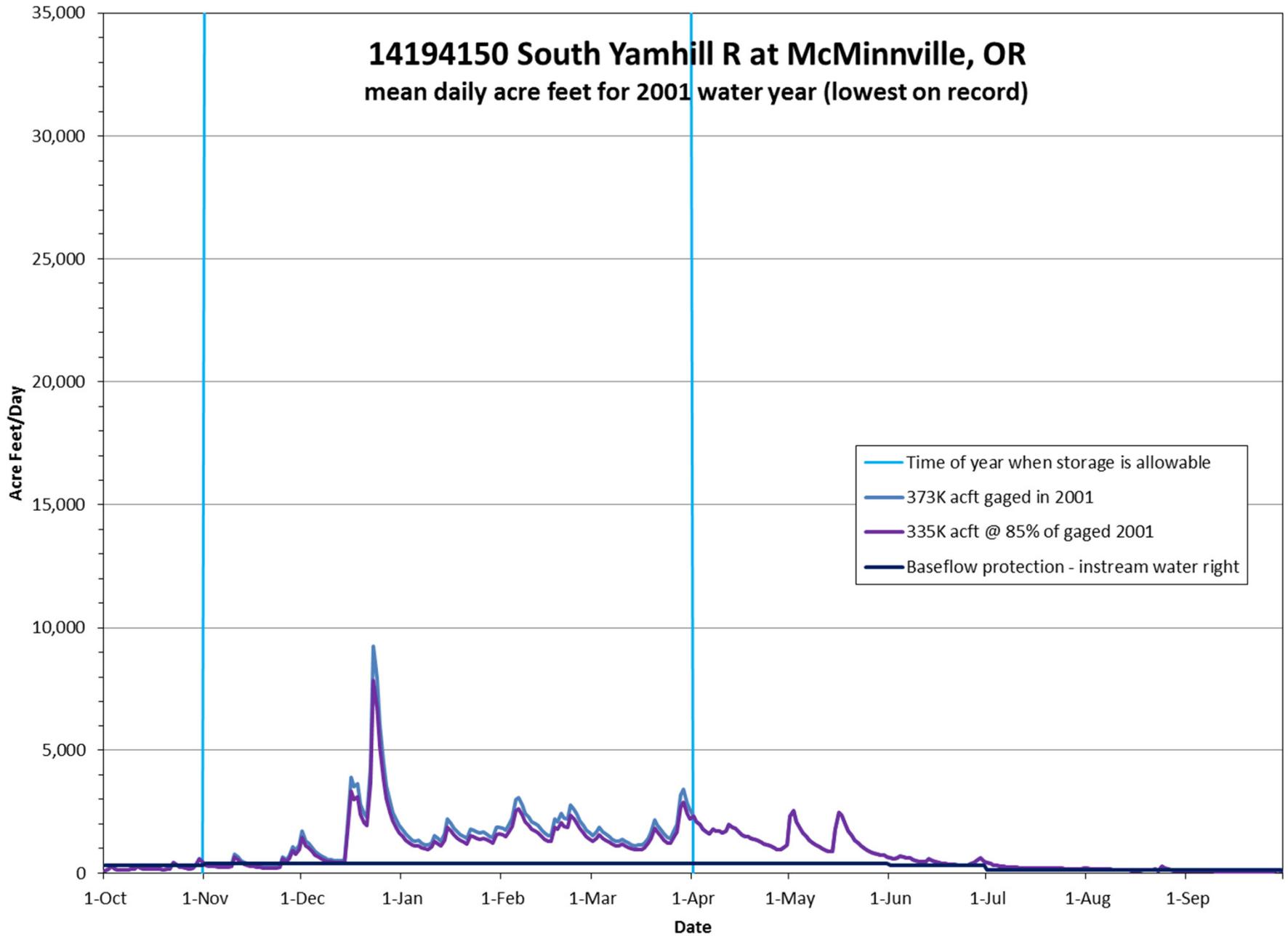
# 14194150 South Yamhill R at McMinnville, OR

mean daily acre feet for 2001 water year (lowest on record)



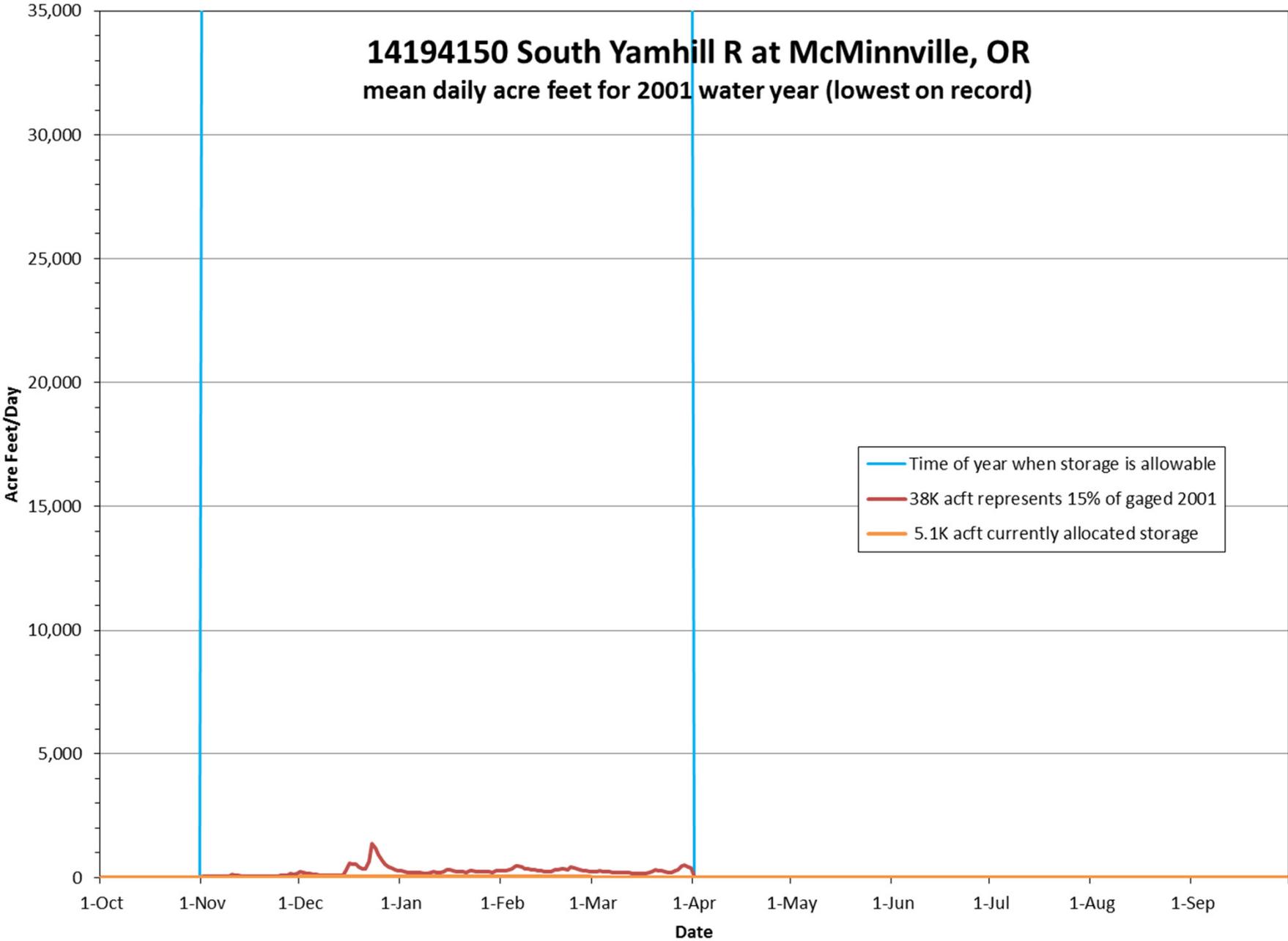
# 14194150 South Yamhill R at McMinnville, OR

mean daily acre feet for 2001 water year (lowest on record)



# 14194150 South Yamhill R at McMinnville, OR

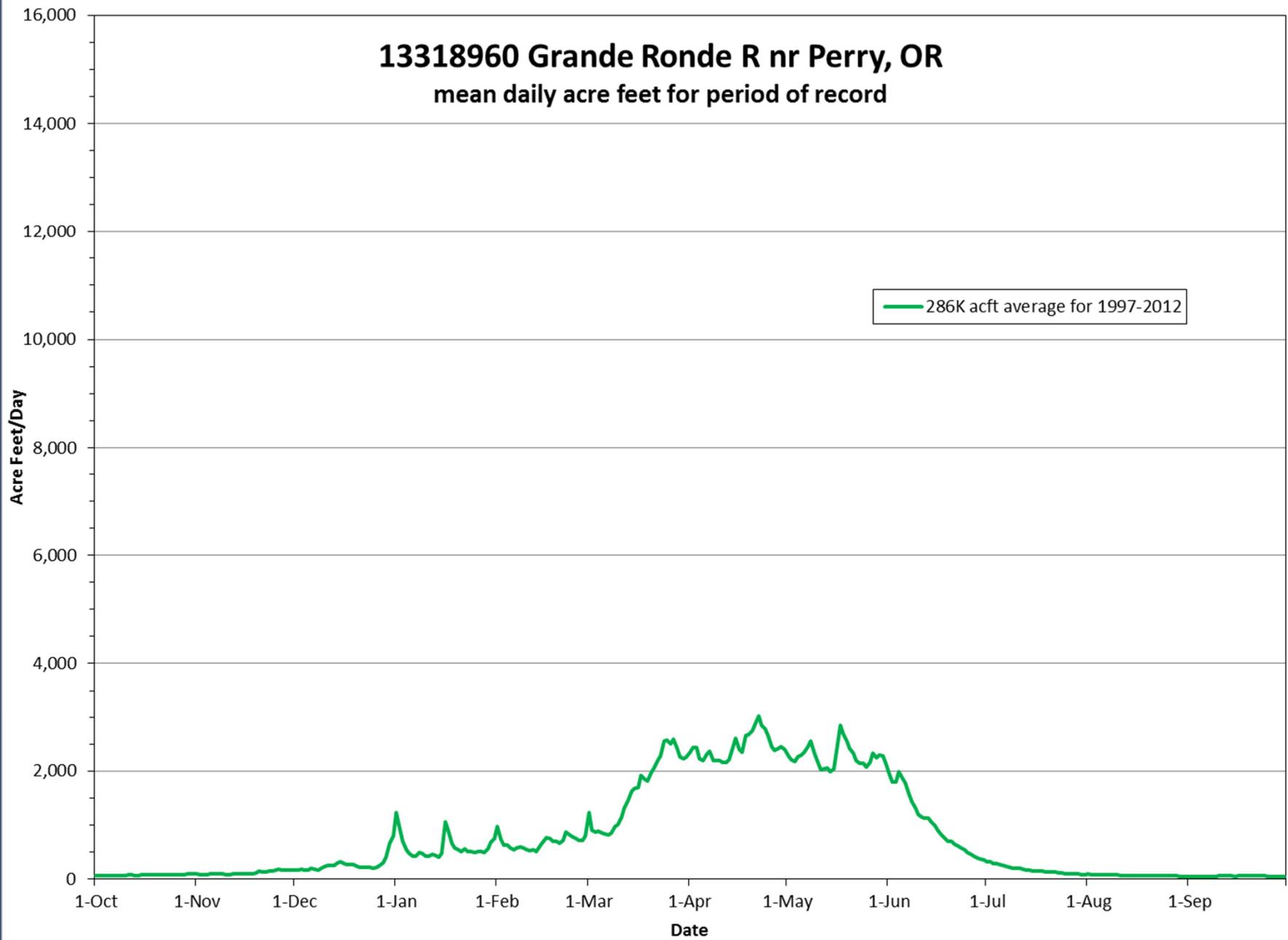
mean daily acre feet for 2001 water year (lowest on record)



13318960 Grande Ronde River  
near Perry, OR

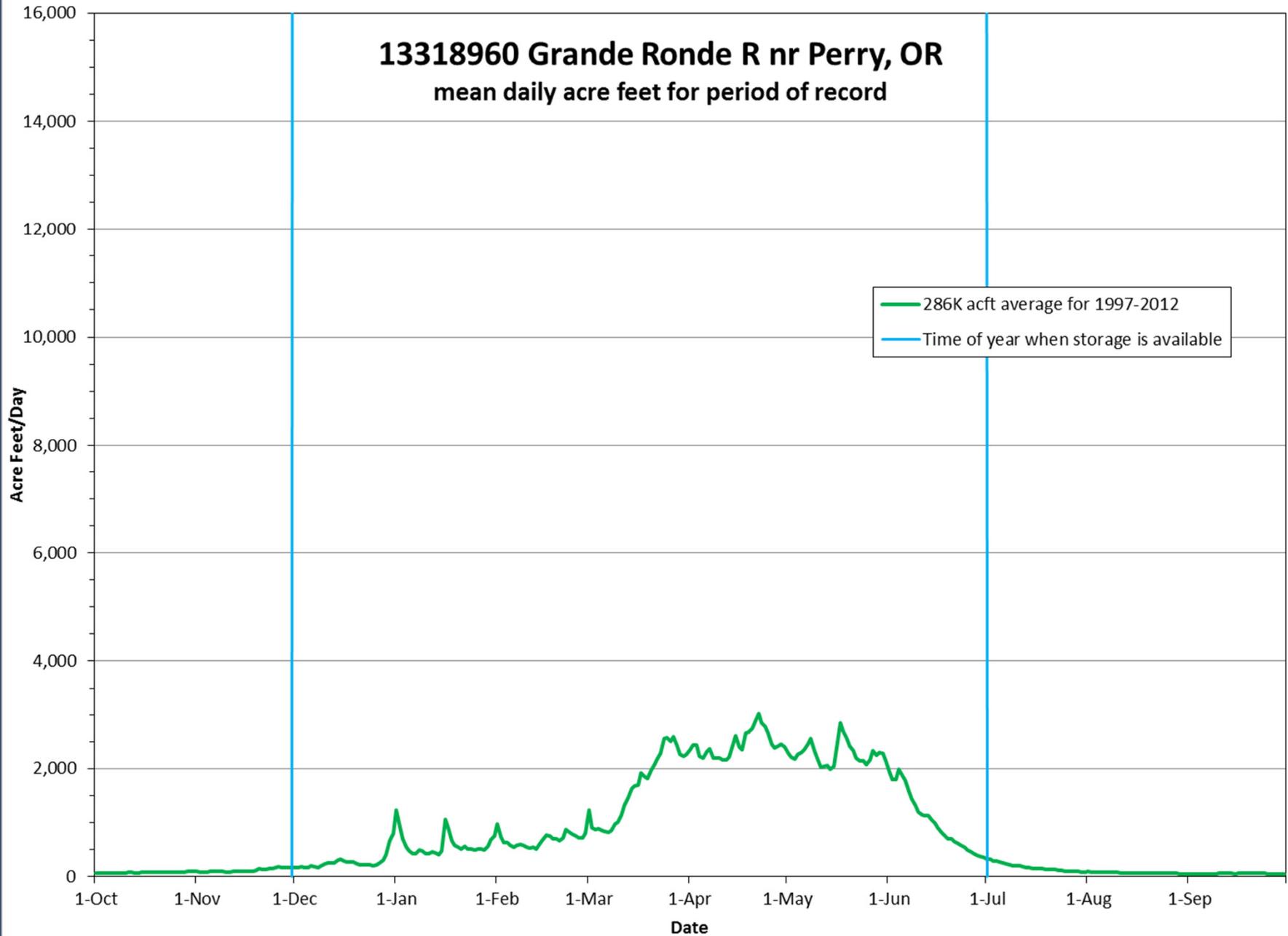
# 13318960 Grande Ronde R nr Perry, OR

mean daily acre feet for period of record



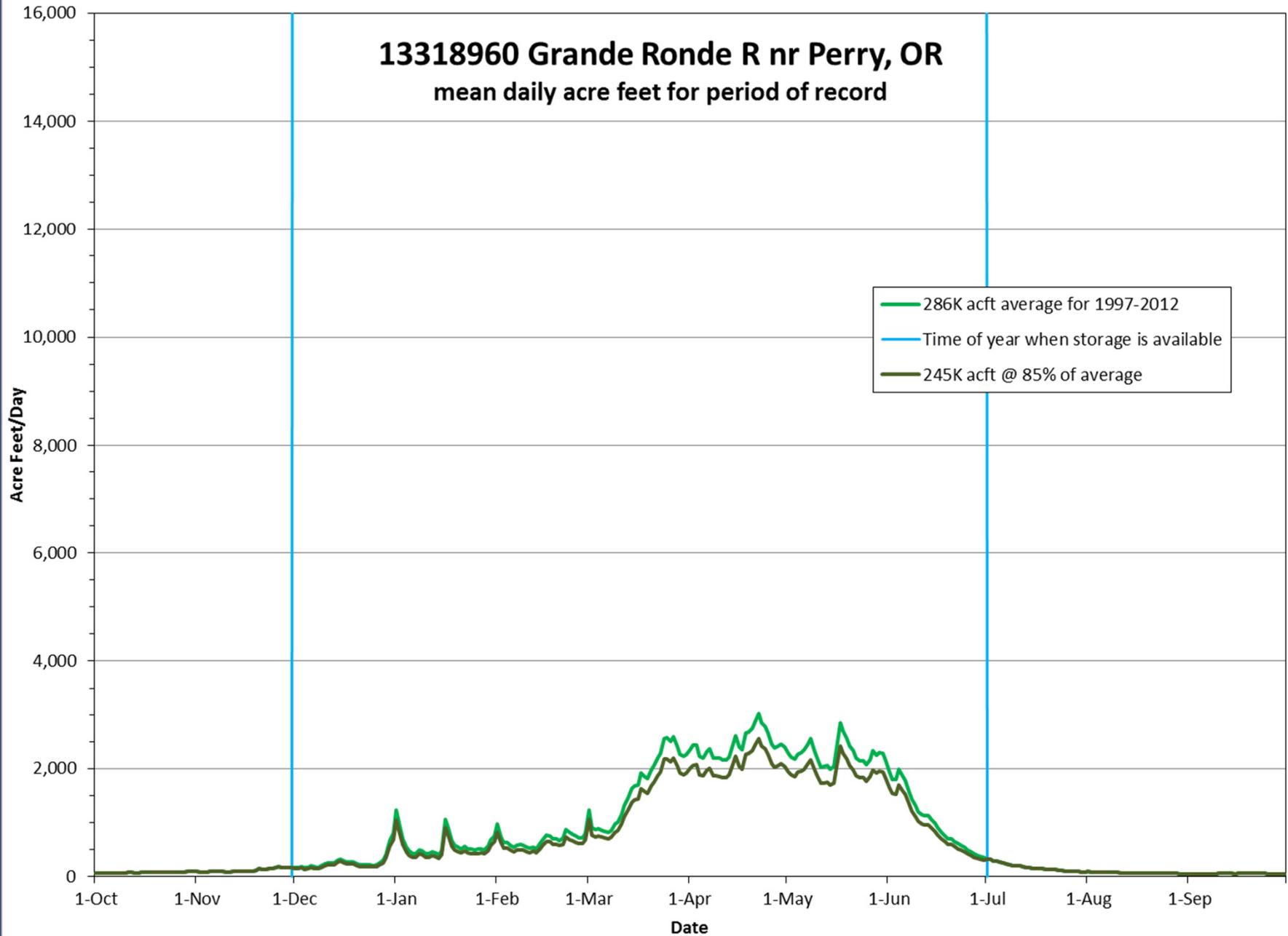
# 13318960 Grande Ronde R nr Perry, OR

mean daily acre feet for period of record



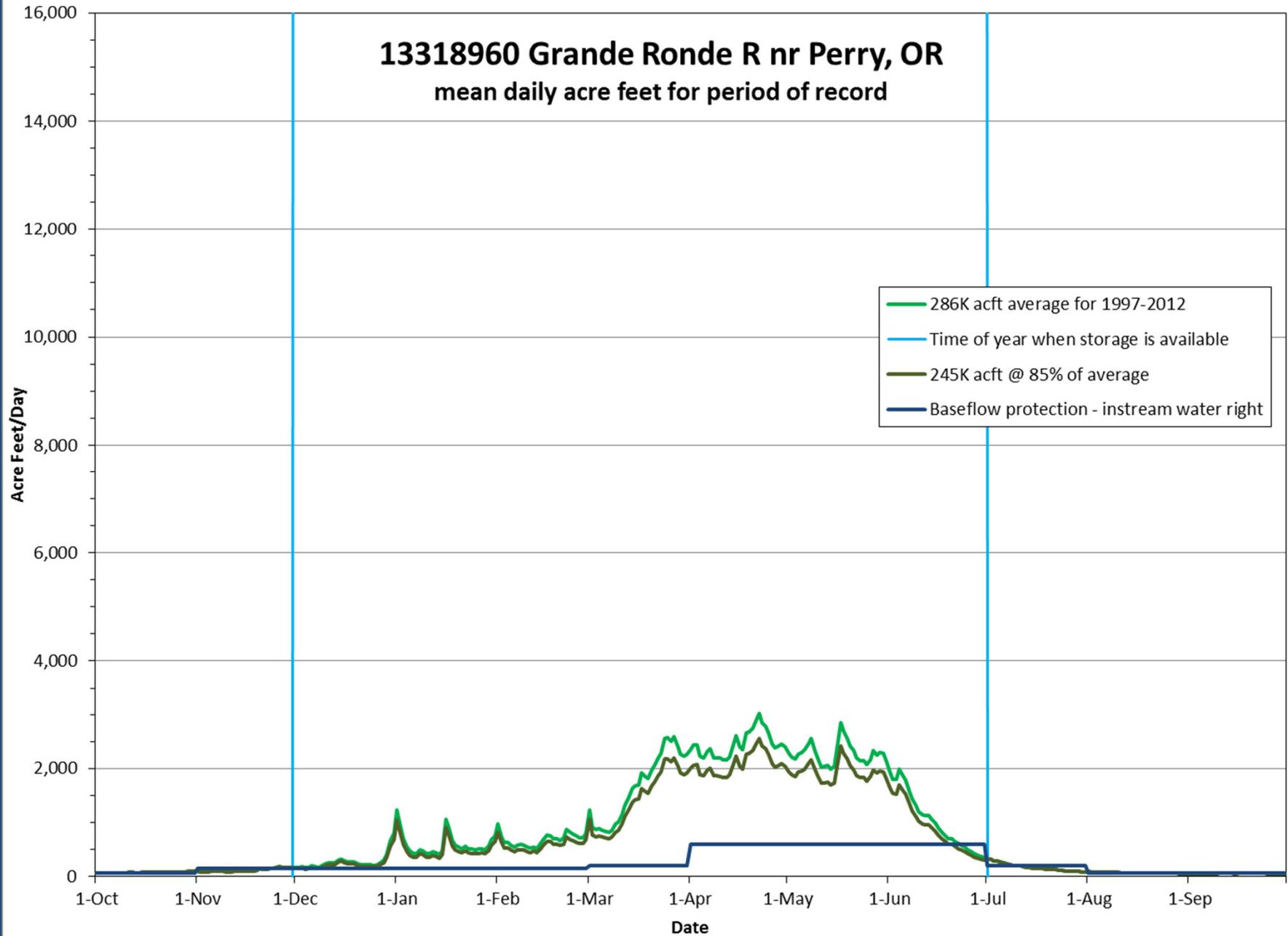
# 13318960 Grande Ronde R nr Perry, OR

mean daily acre feet for period of record



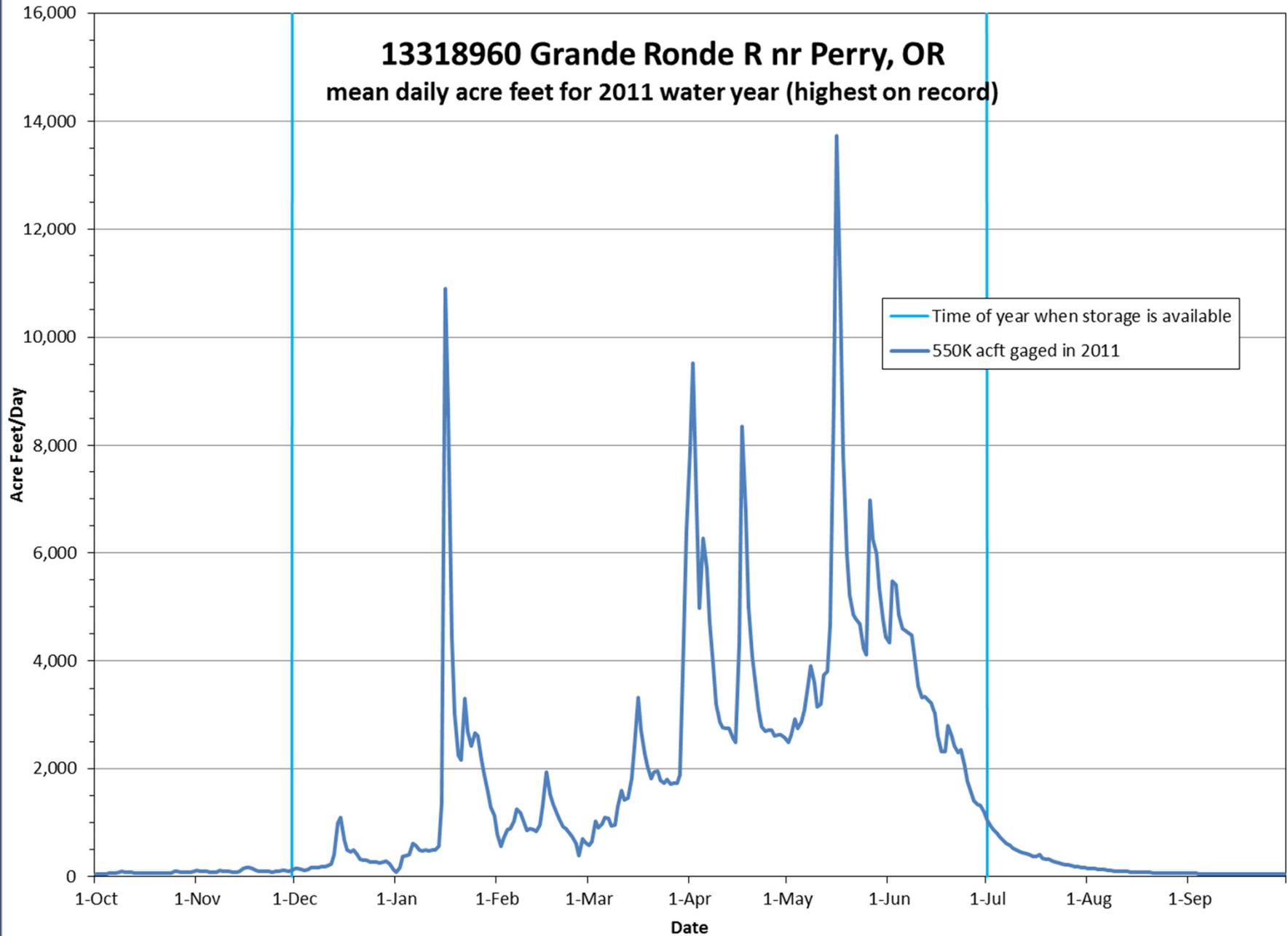
# 13318960 Grande Ronde R nr Perry, OR

mean daily acre feet for period of record



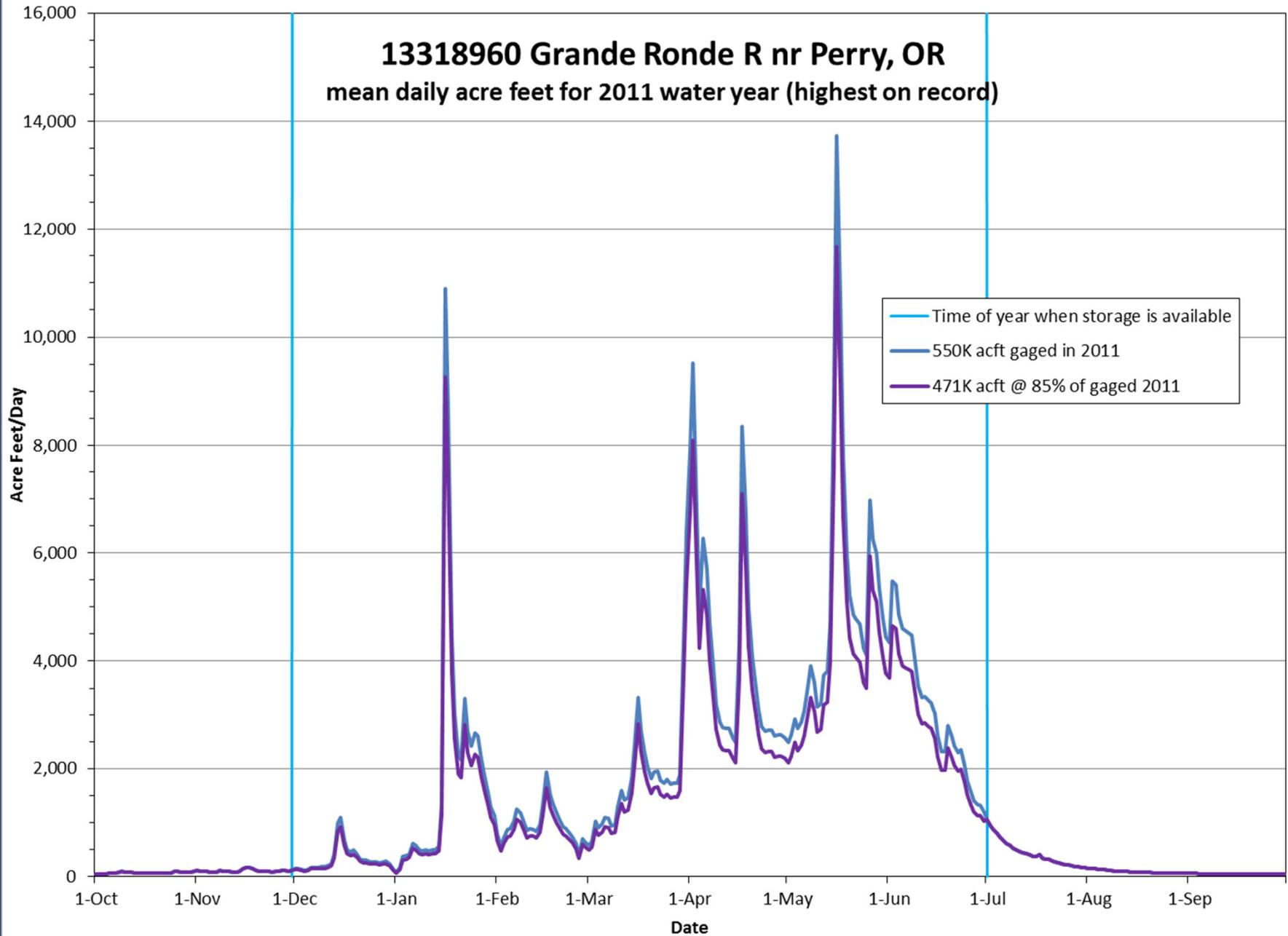
# 13318960 Grande Ronde R nr Perry, OR

mean daily acre feet for 2011 water year (highest on record)



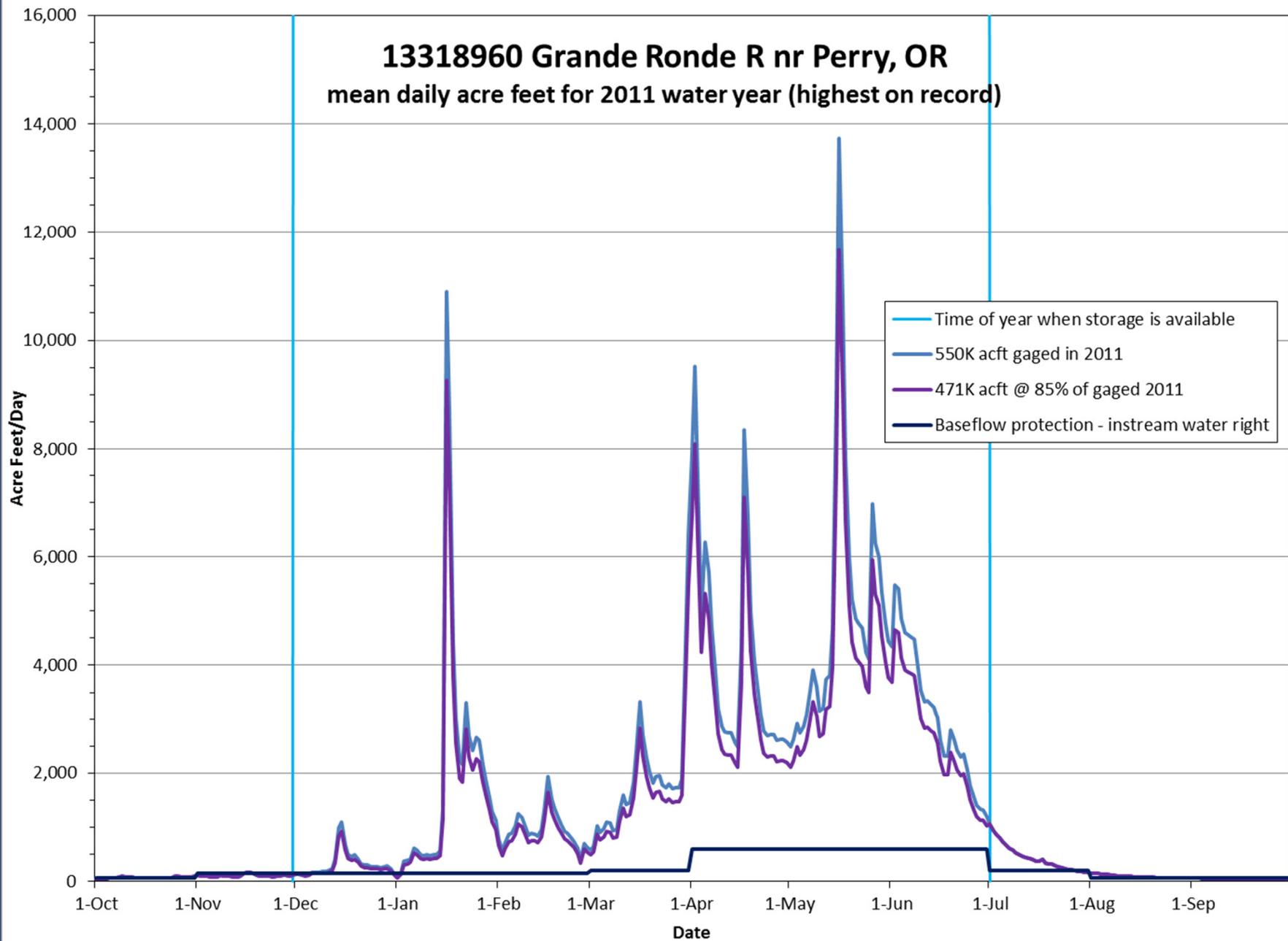
# 13318960 Grande Ronde R nr Perry, OR

mean daily acre feet for 2011 water year (highest on record)



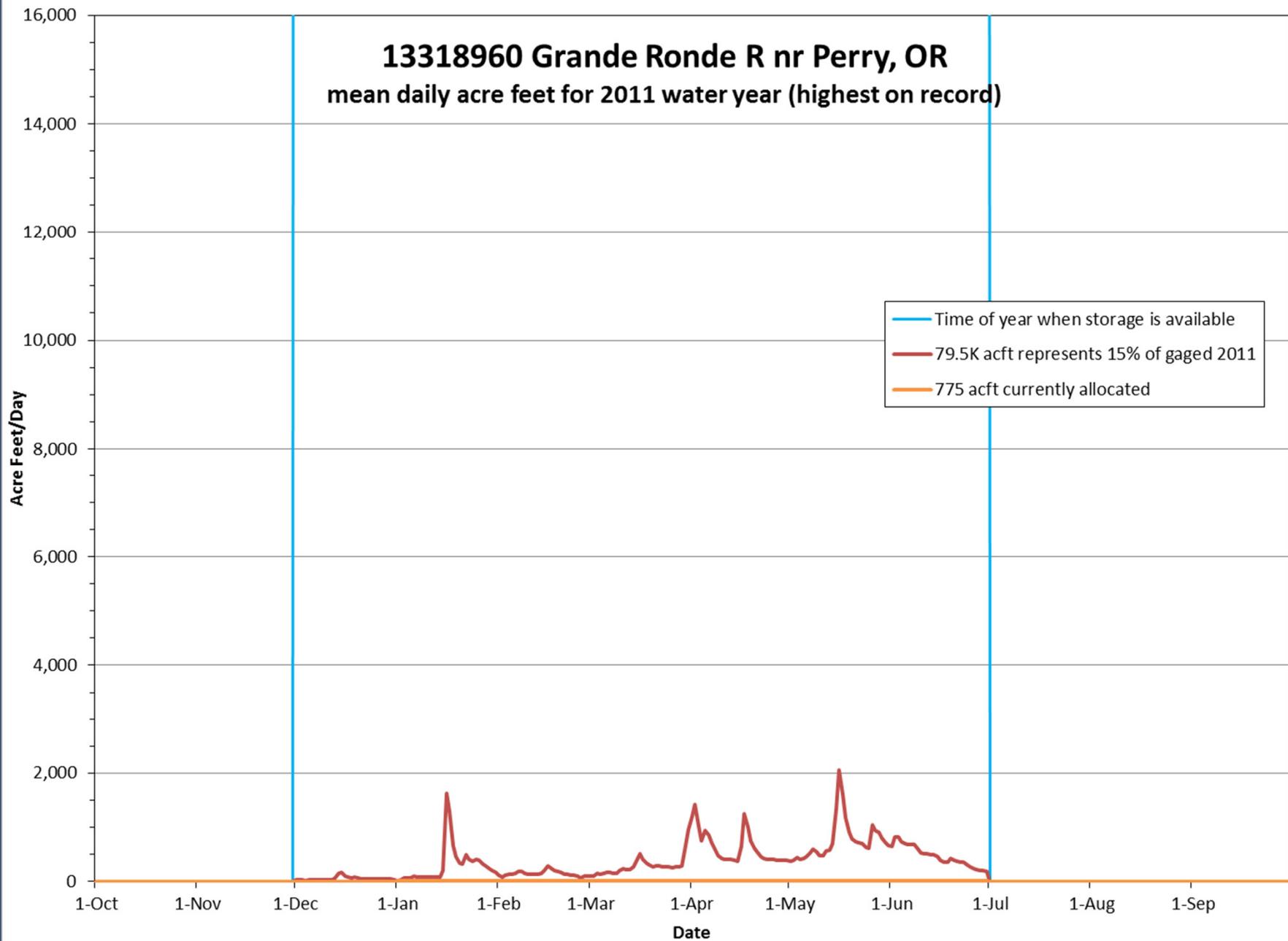
# 13318960 Grande Ronde R nr Perry, OR

mean daily acre feet for 2011 water year (highest on record)

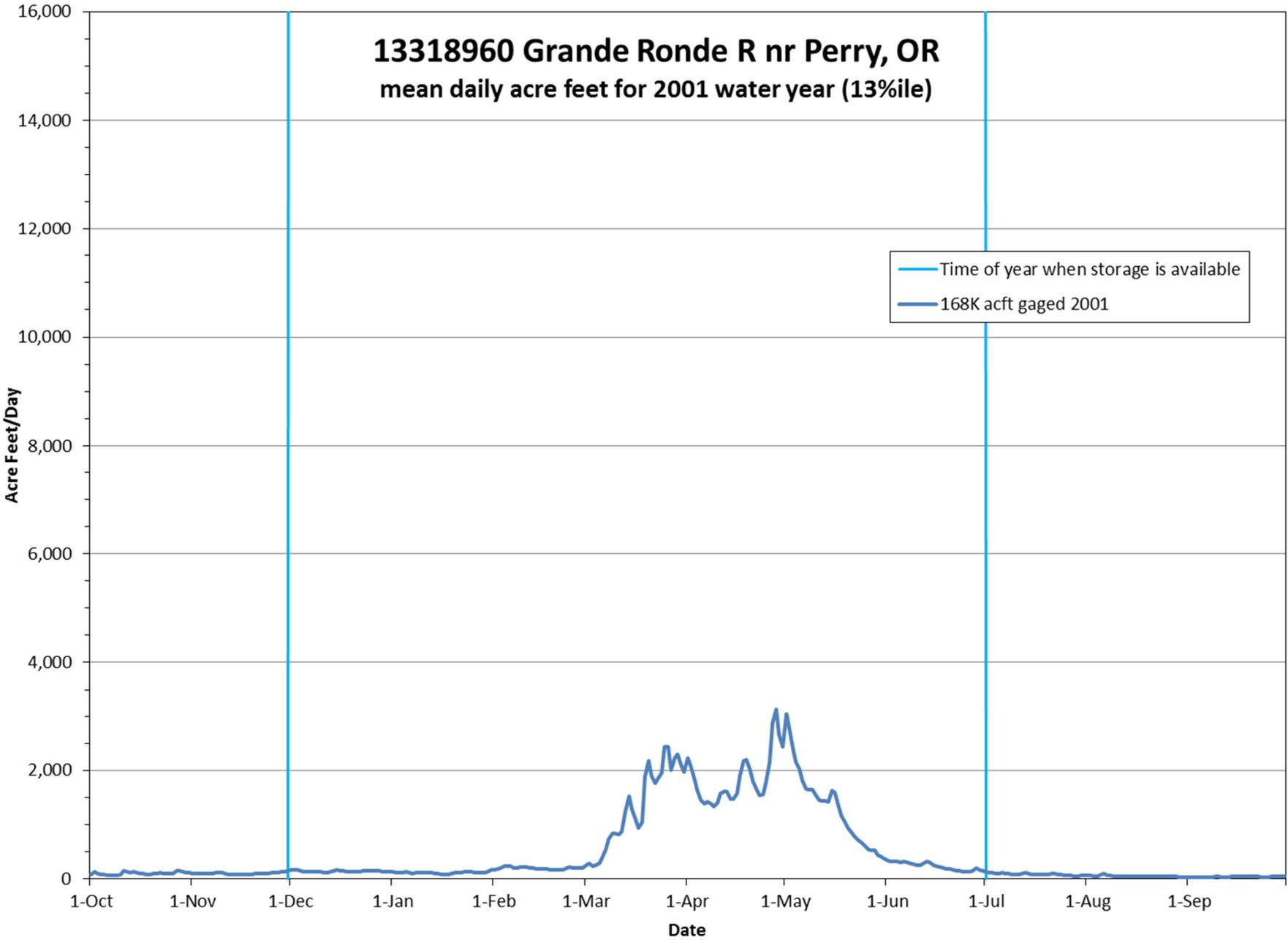


# 13318960 Grande Ronde R nr Perry, OR

mean daily acre feet for 2011 water year (highest on record)

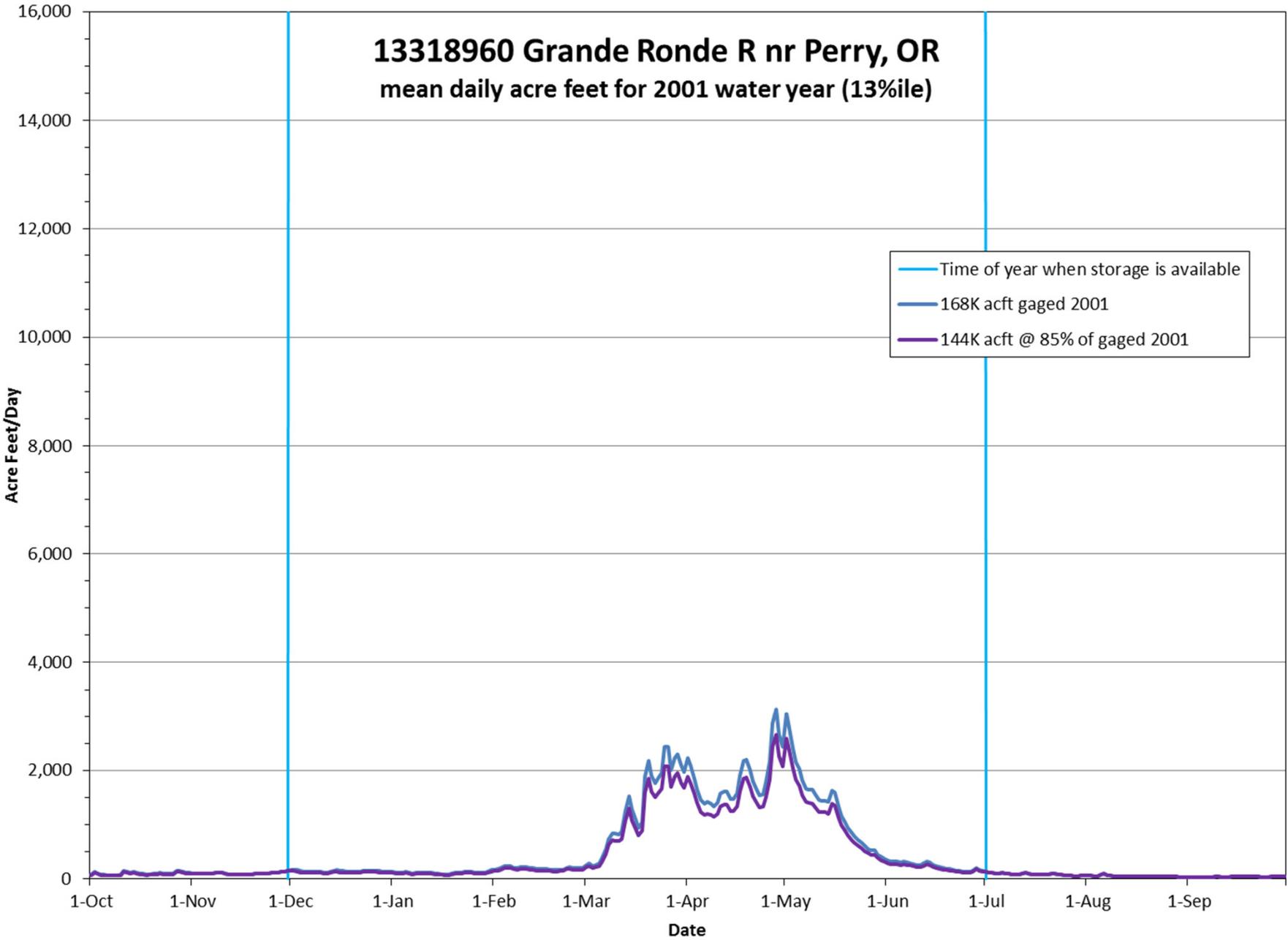


# 13318960 Grande Ronde R nr Perry, OR mean daily acre feet for 2001 water year (13%ile)



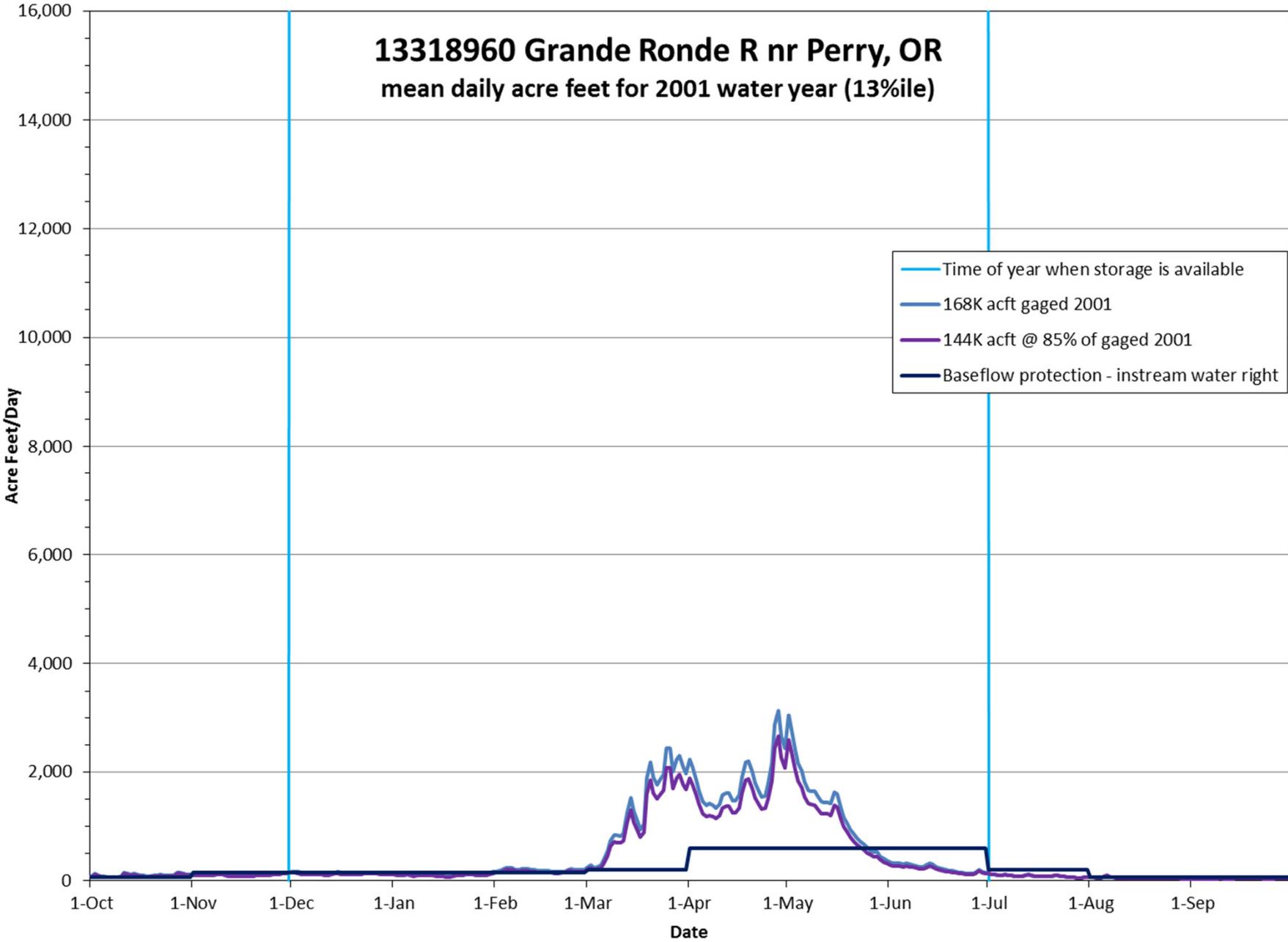
— Time of year when storage is available  
— 168K acft gaged 2001

**13318960 Grande Ronde R nr Perry, OR**  
mean daily acre feet for 2001 water year (13%ile)



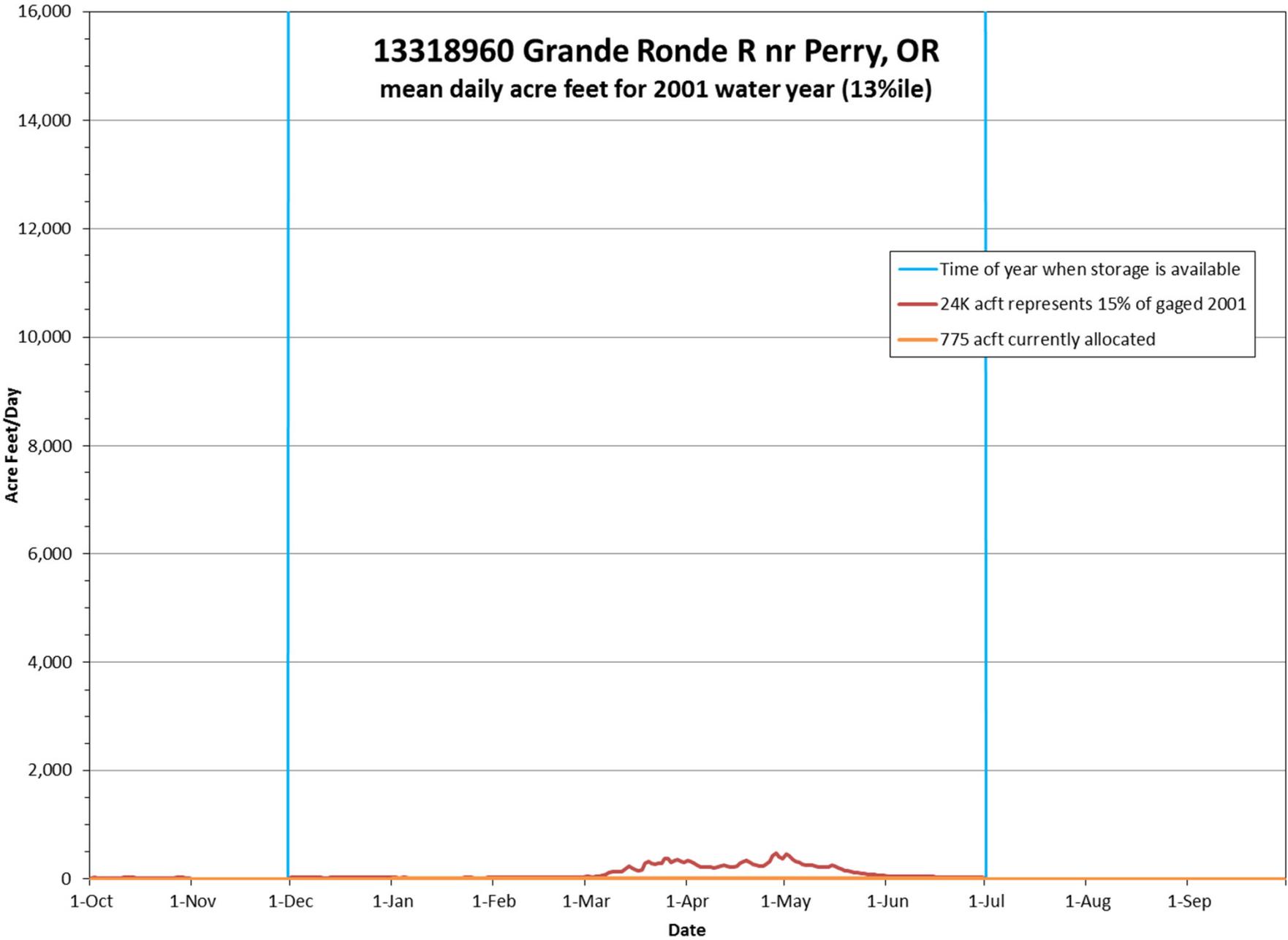
# 13318960 Grande Ronde R nr Perry, OR

mean daily acre feet for 2001 water year (13%ile)



# 13318960 Grande Ronde R nr Perry, OR

mean daily acre feet for 2001 water year (13%ile)

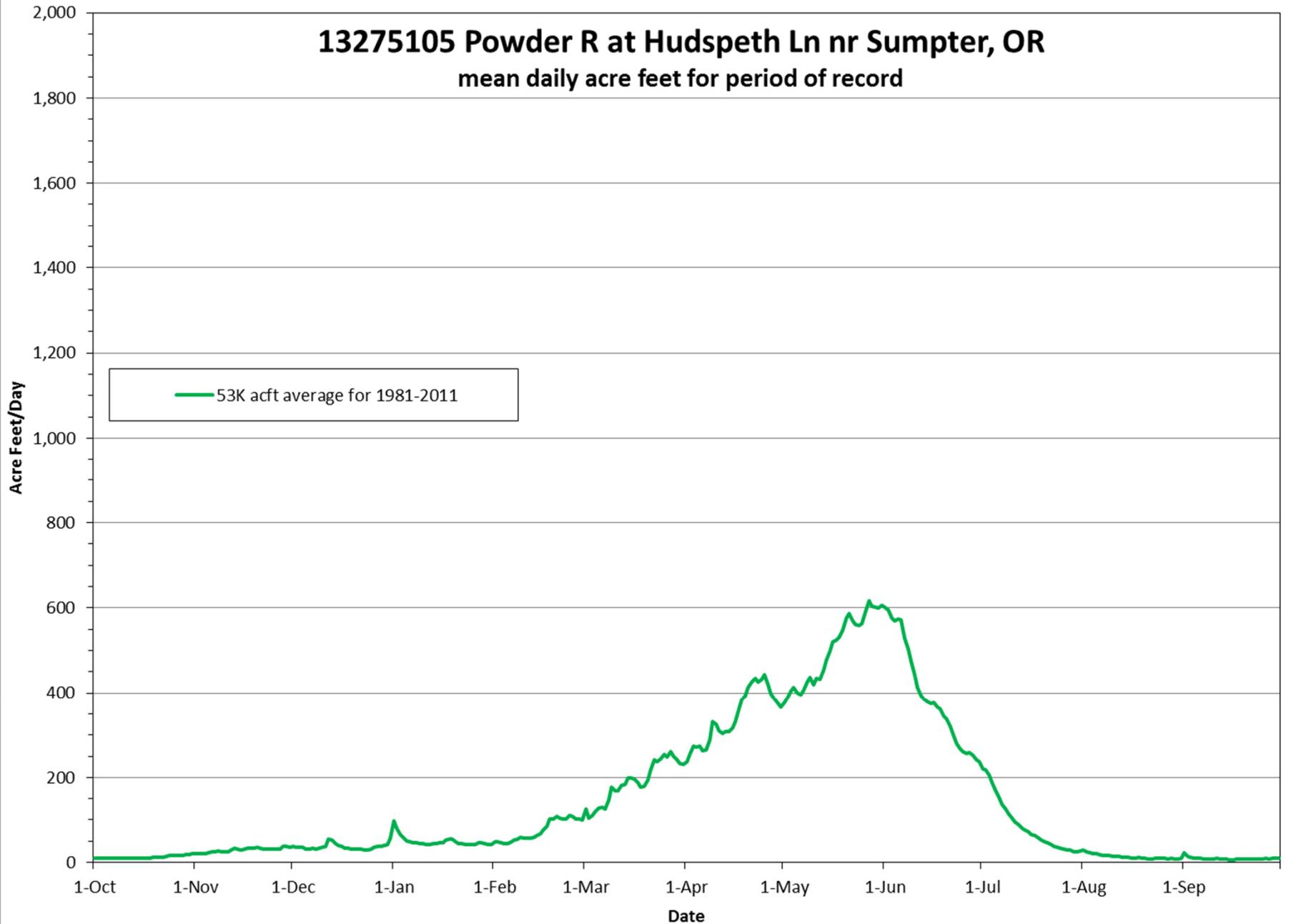


— Time of year when storage is available  
— 24K acft represents 15% of gaged 2001  
— 775 acft currently allocated

13275105 Powder River  
at Hudspeth Ln. near Sumpter, OR

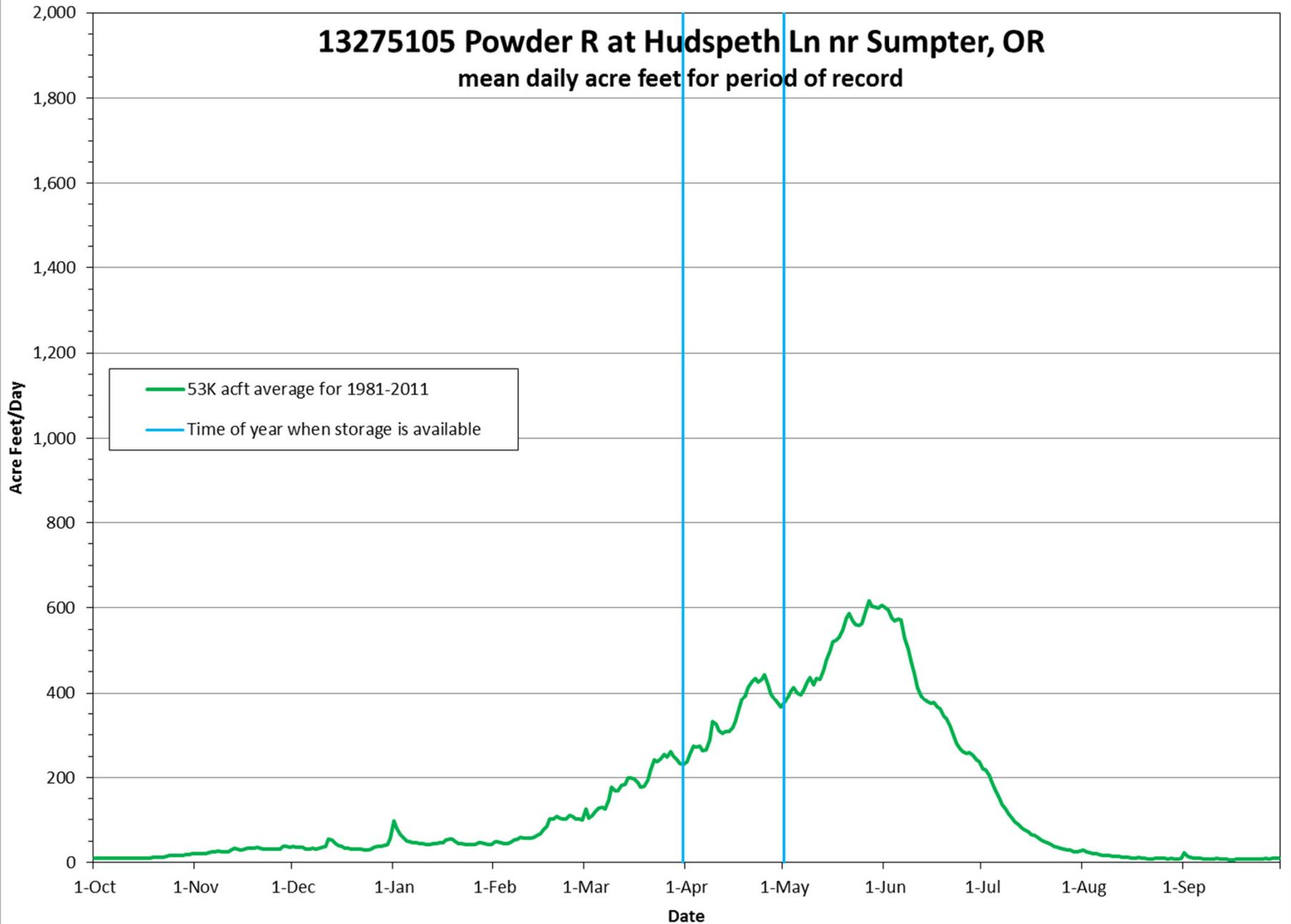
# 13275105 Powder R at Hudspeth Ln nr Sumpter, OR

mean daily acre feet for period of record



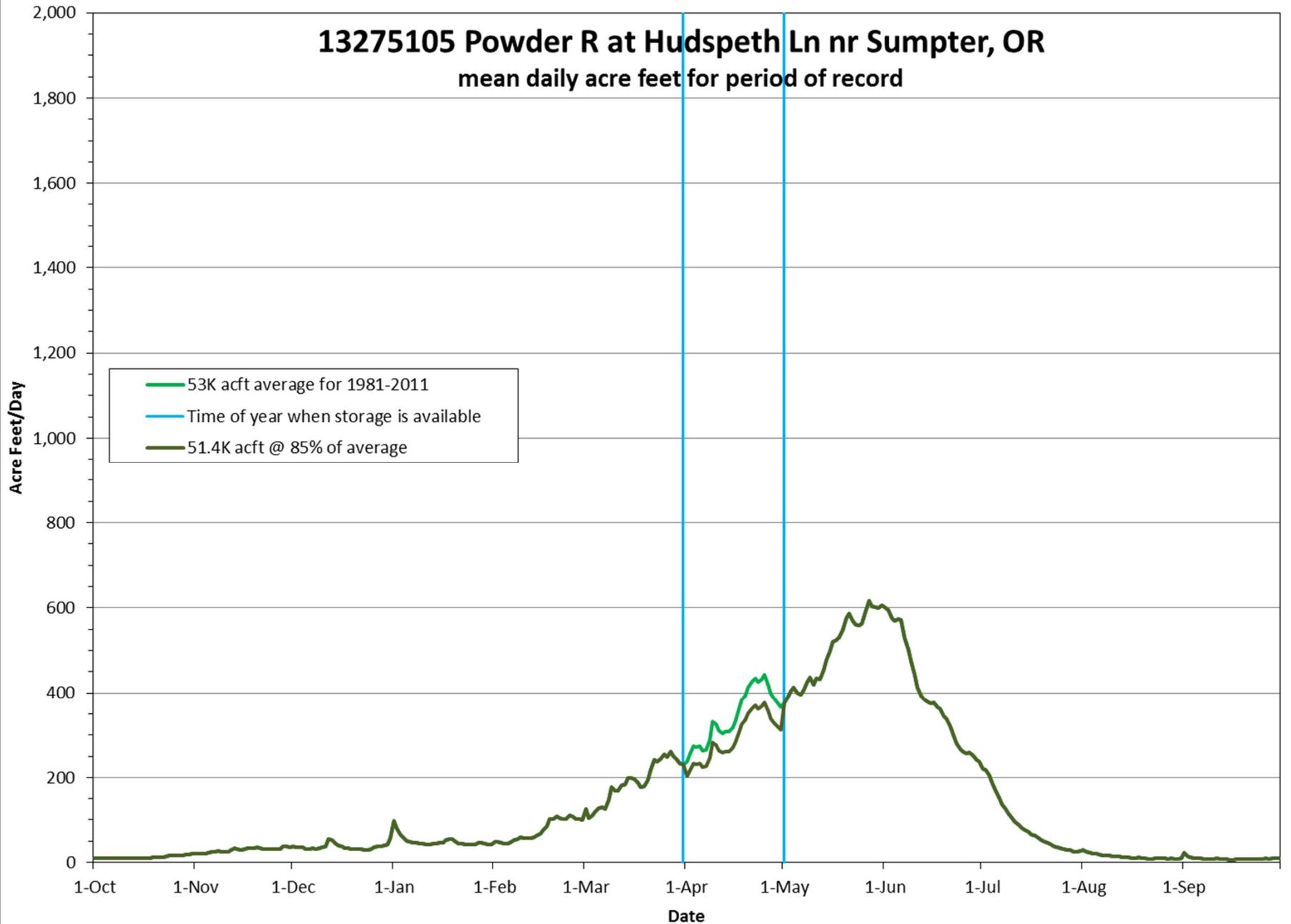
# 13275105 Powder R at Hudspeth Ln nr Sumpter, OR

mean daily acre feet for period of record



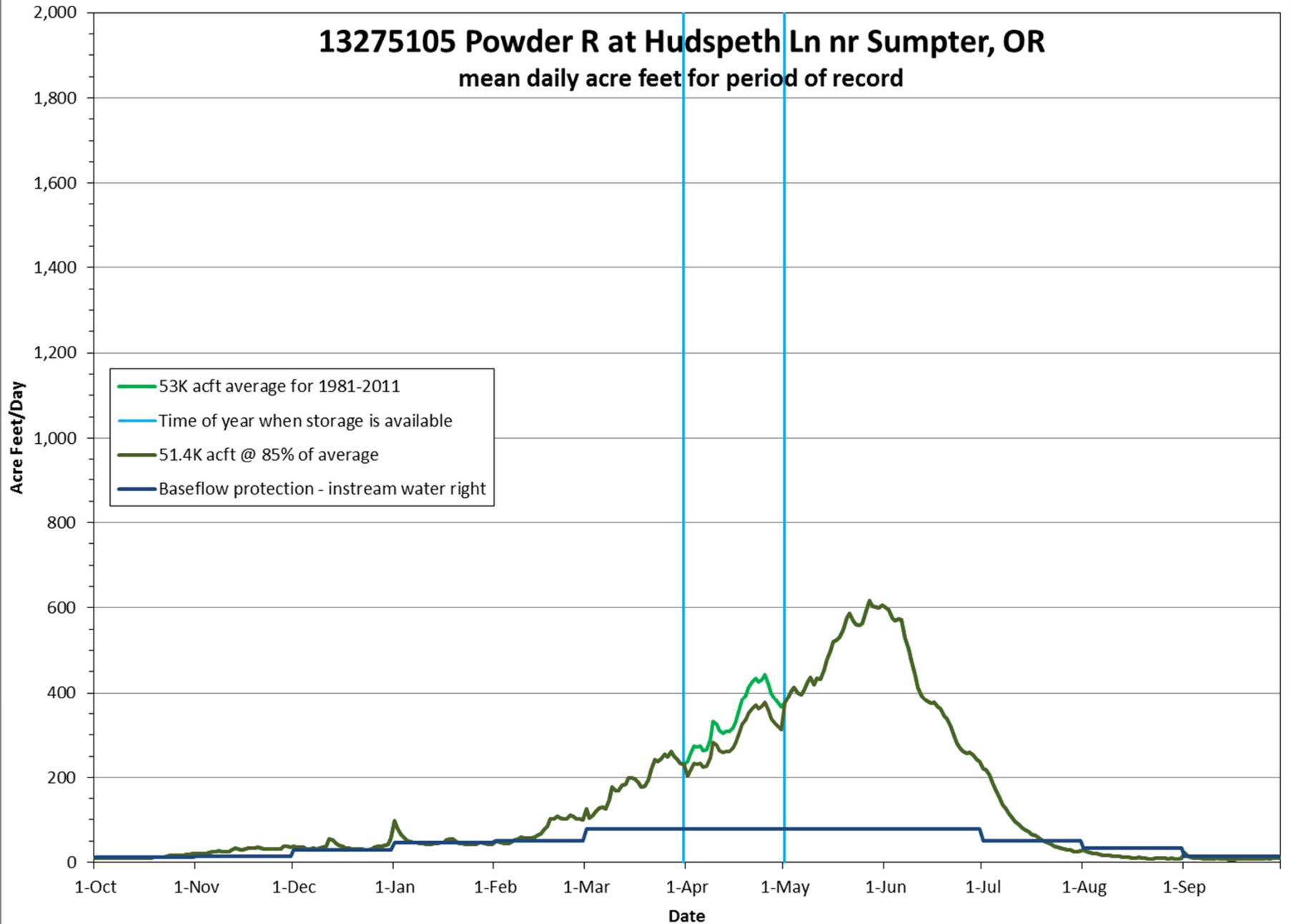
# 13275105 Powder R at Hudspeth Ln nr Sumpter, OR

mean daily acre feet for period of record



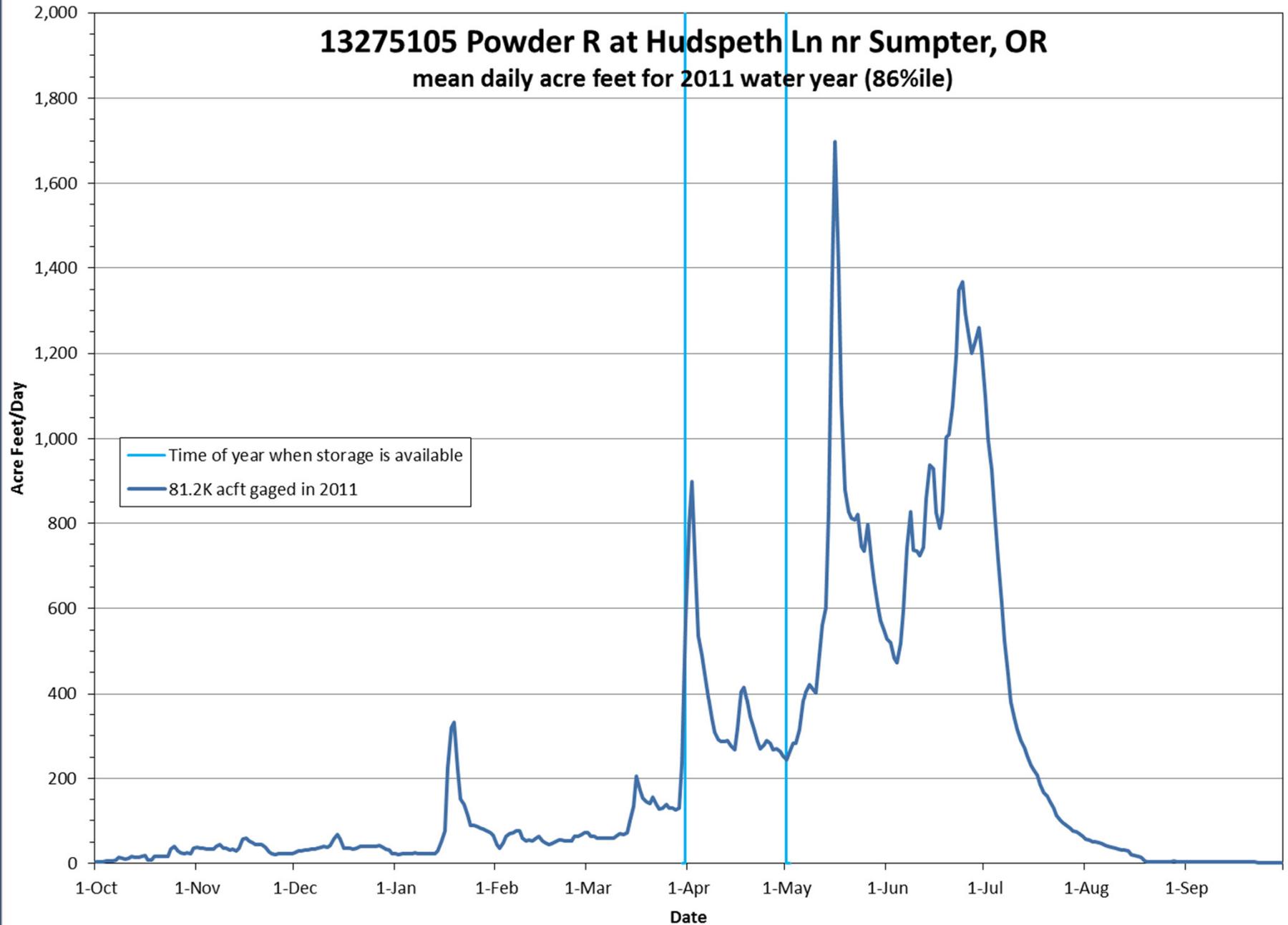
# 13275105 Powder R at Hudspeth Ln nr Sumpter, OR

mean daily acre feet for period of record



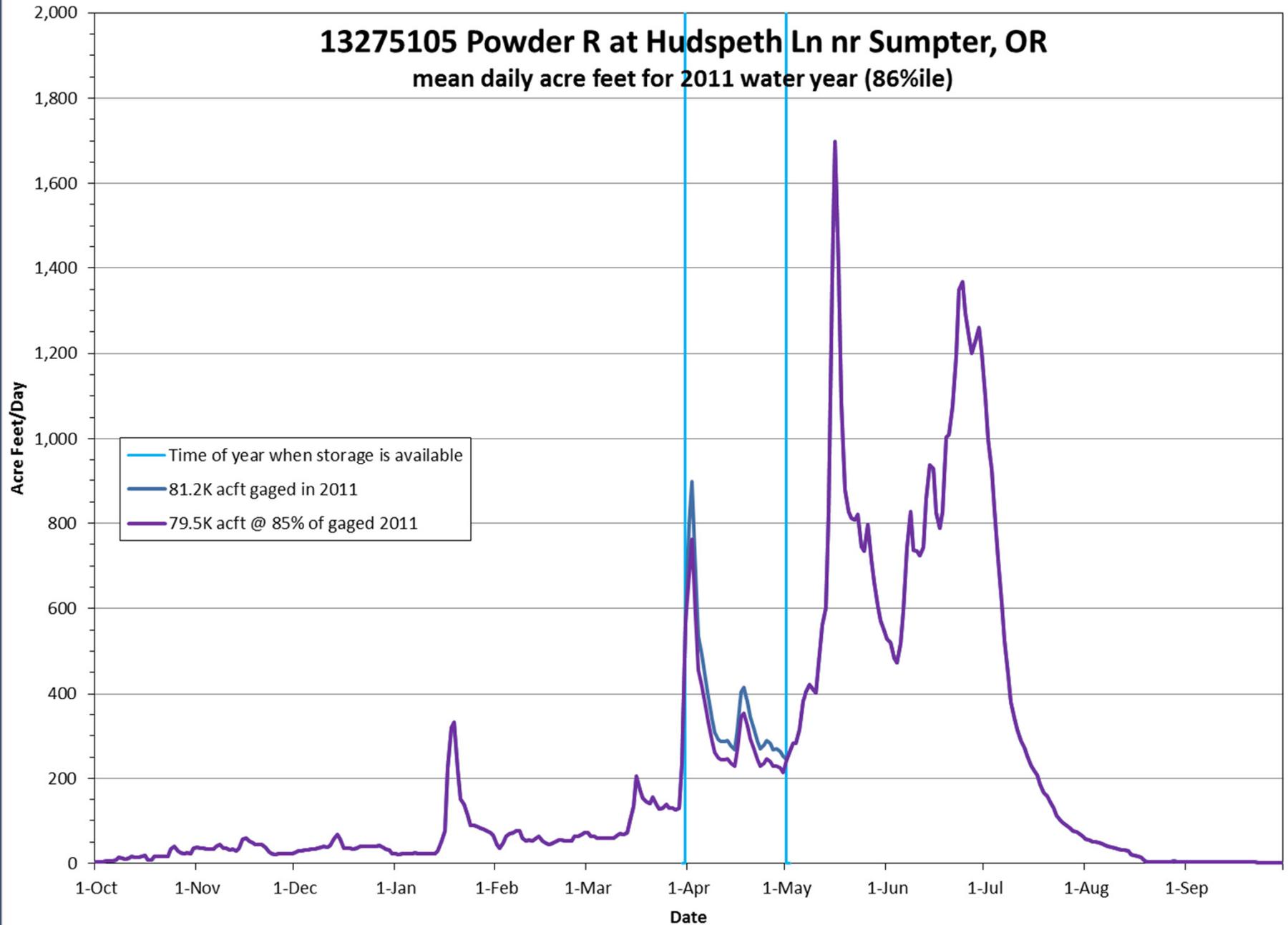
# 13275105 Powder R at Hudspeth Ln nr Sumpter, OR

mean daily acre feet for 2011 water year (86%ile)



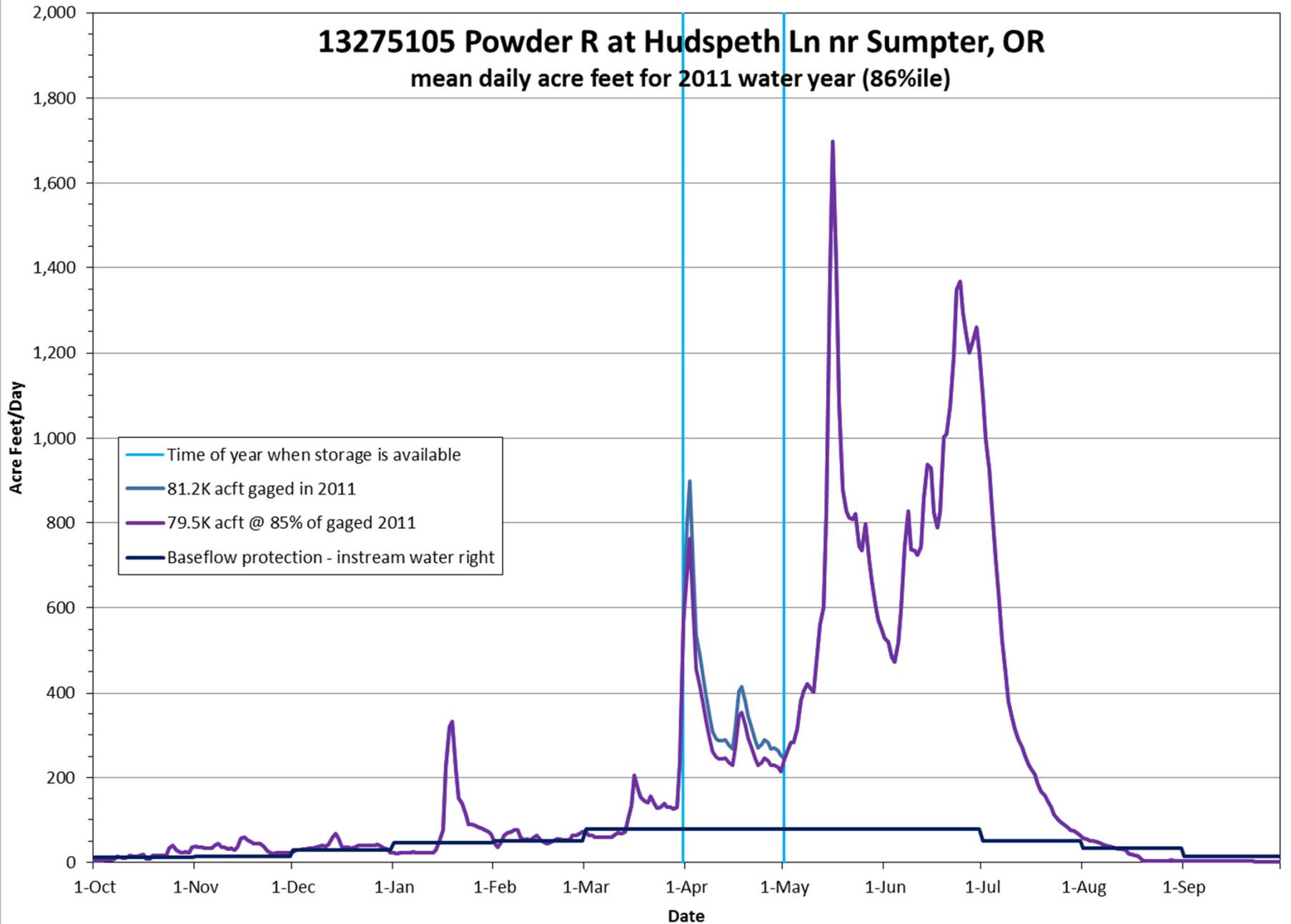
# 13275105 Powder R at Hudspeth Ln nr Sumpter, OR

mean daily acre feet for 2011 water year (86%ile)



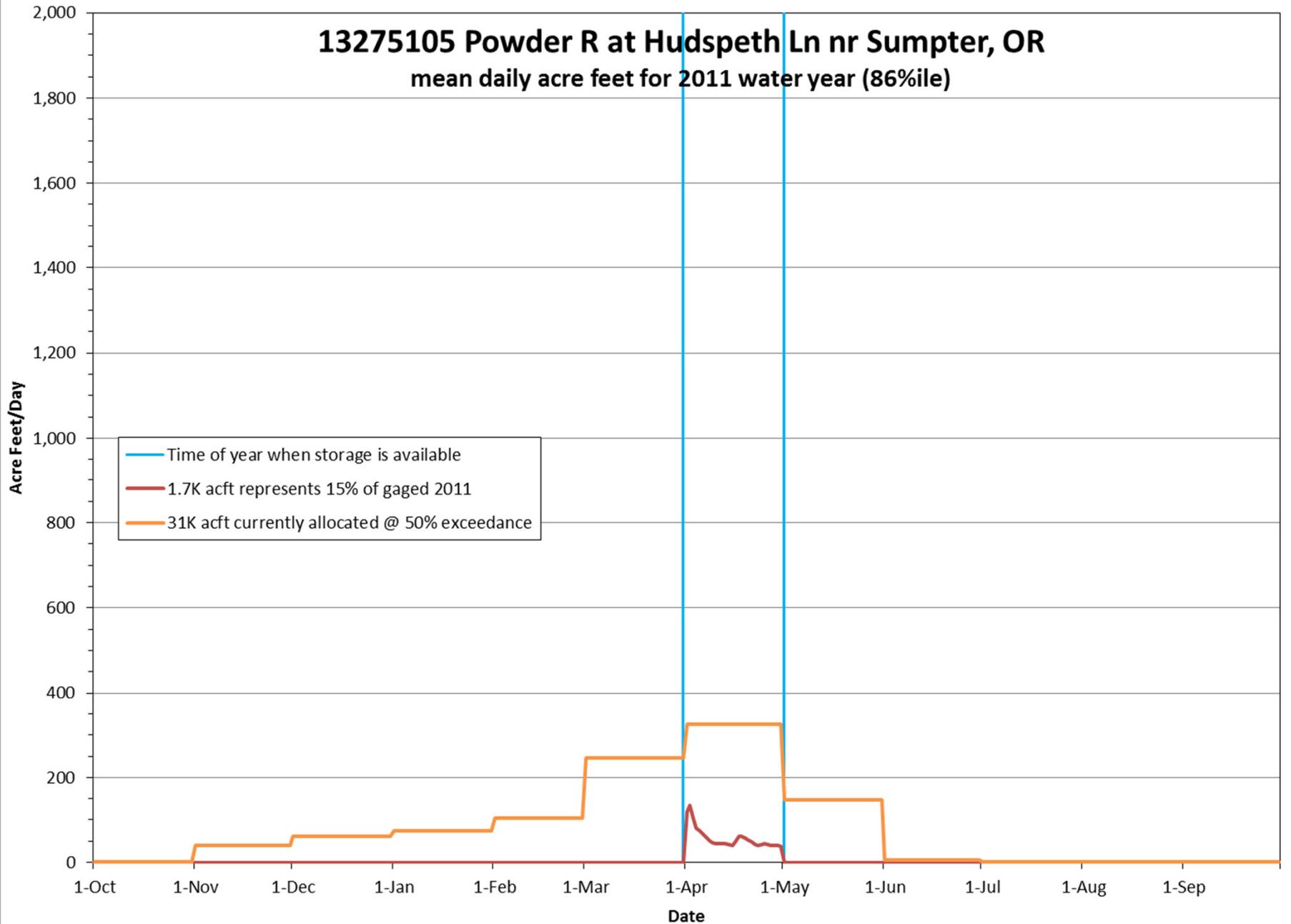
# 13275105 Powder R at Hudspeth Ln nr Sumpter, OR

mean daily acre feet for 2011 water year (86%ile)



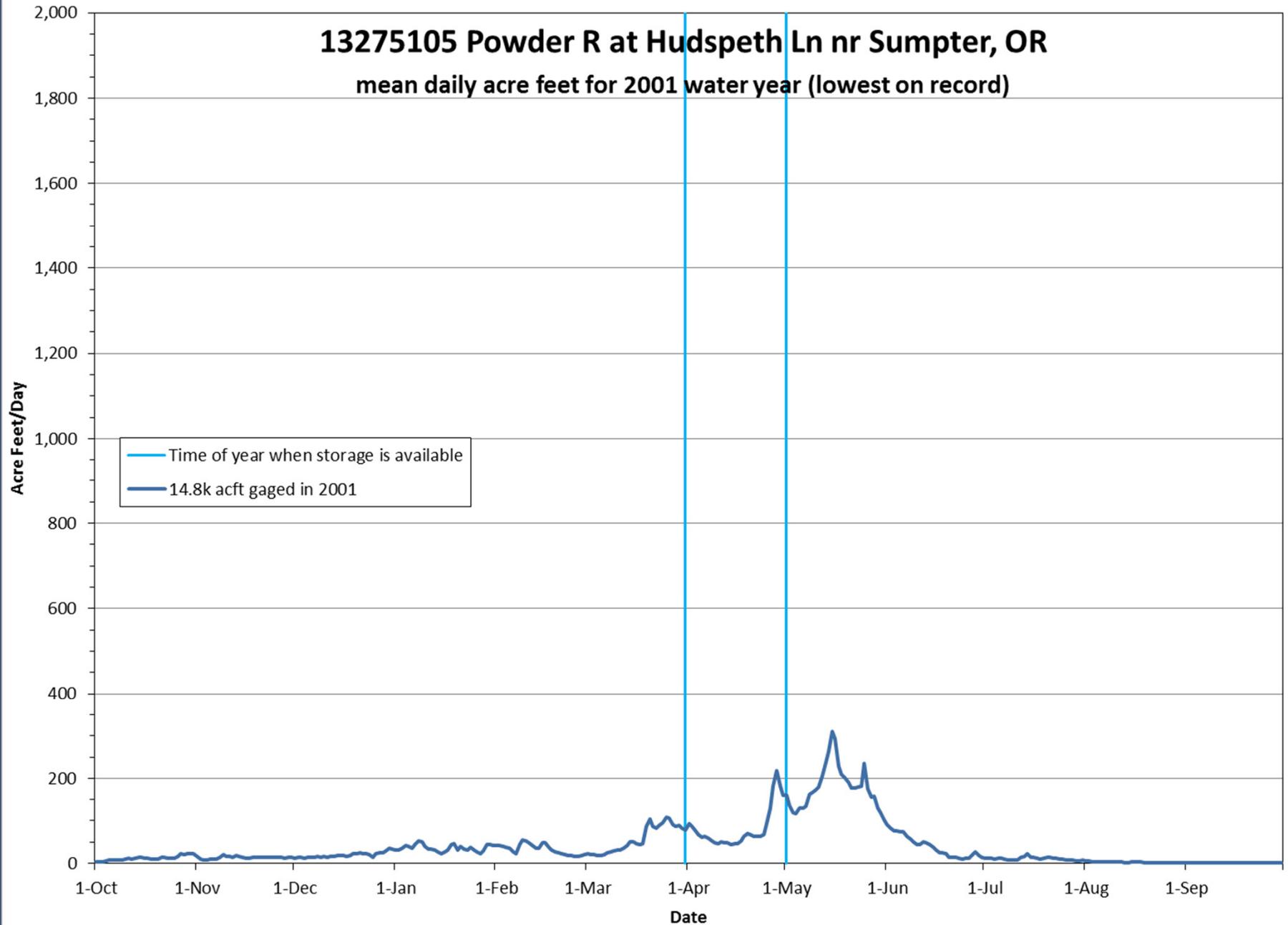
# 13275105 Powder R at Hudspeth Ln nr Sumpter, OR

mean daily acre feet for 2011 water year (86%ile)



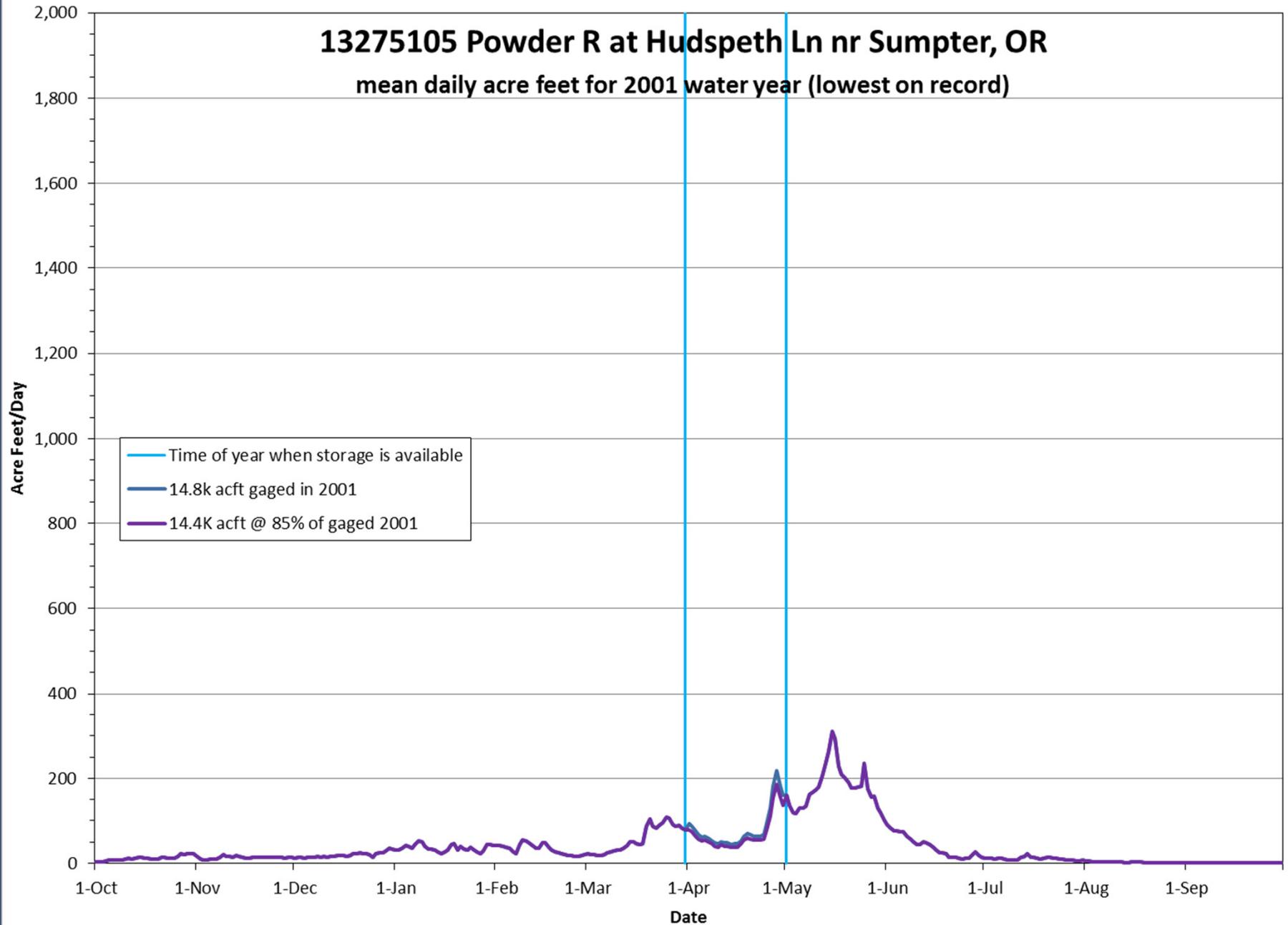
# 13275105 Powder R at Hudspeth Ln nr Sumpter, OR

mean daily acre feet for 2001 water year (lowest on record)



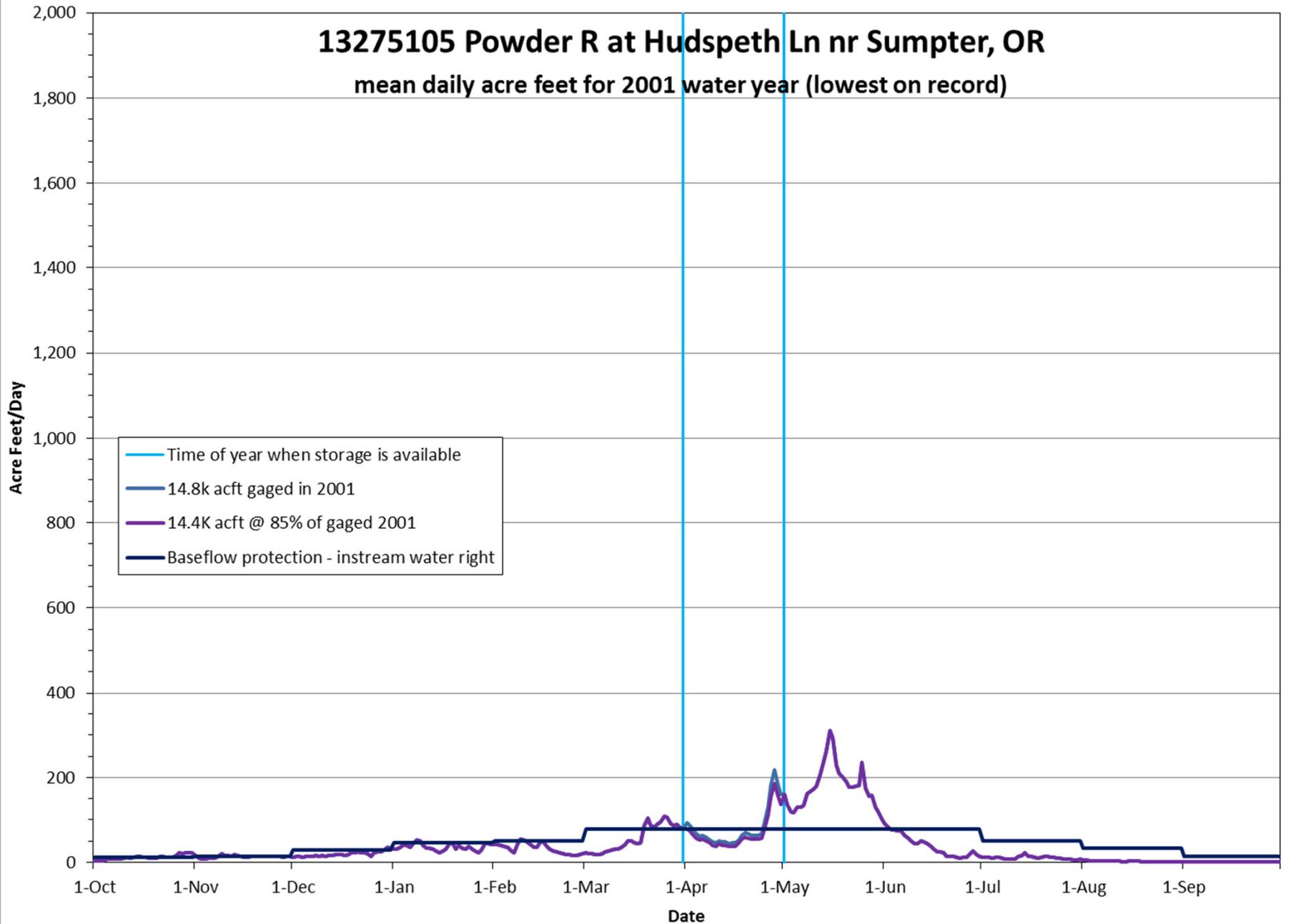
# 13275105 Powder R at Hudspeth Ln nr Sumpter, OR

mean daily acre feet for 2001 water year (lowest on record)



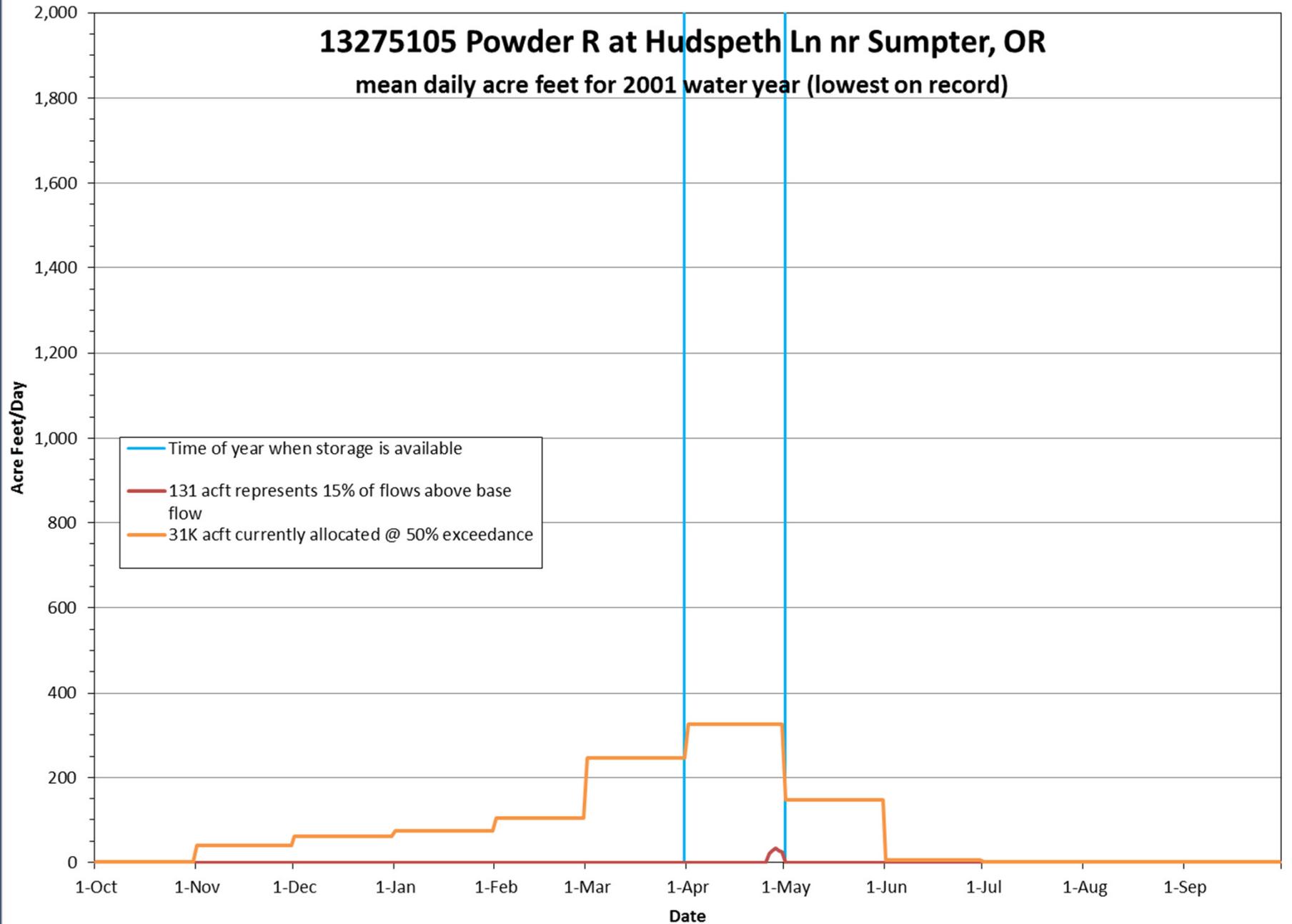
# 13275105 Powder R at Hudspeth Ln nr Sumpter, OR

mean daily acre feet for 2001 water year (lowest on record)



# 13275105 Powder R at Hudspeth Ln nr Sumpter, OR

mean daily acre feet for 2001 water year (lowest on record)

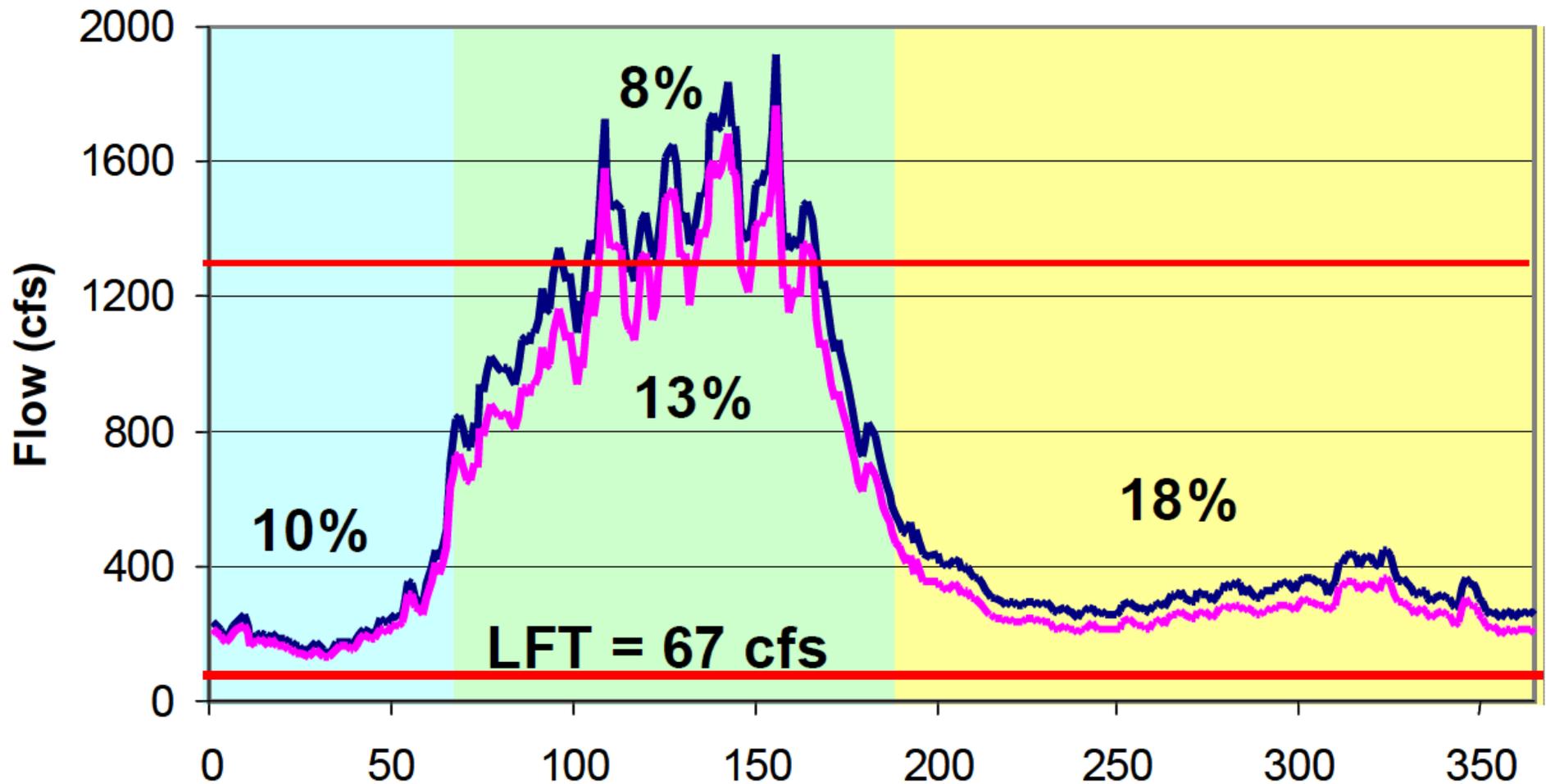


# Thank You

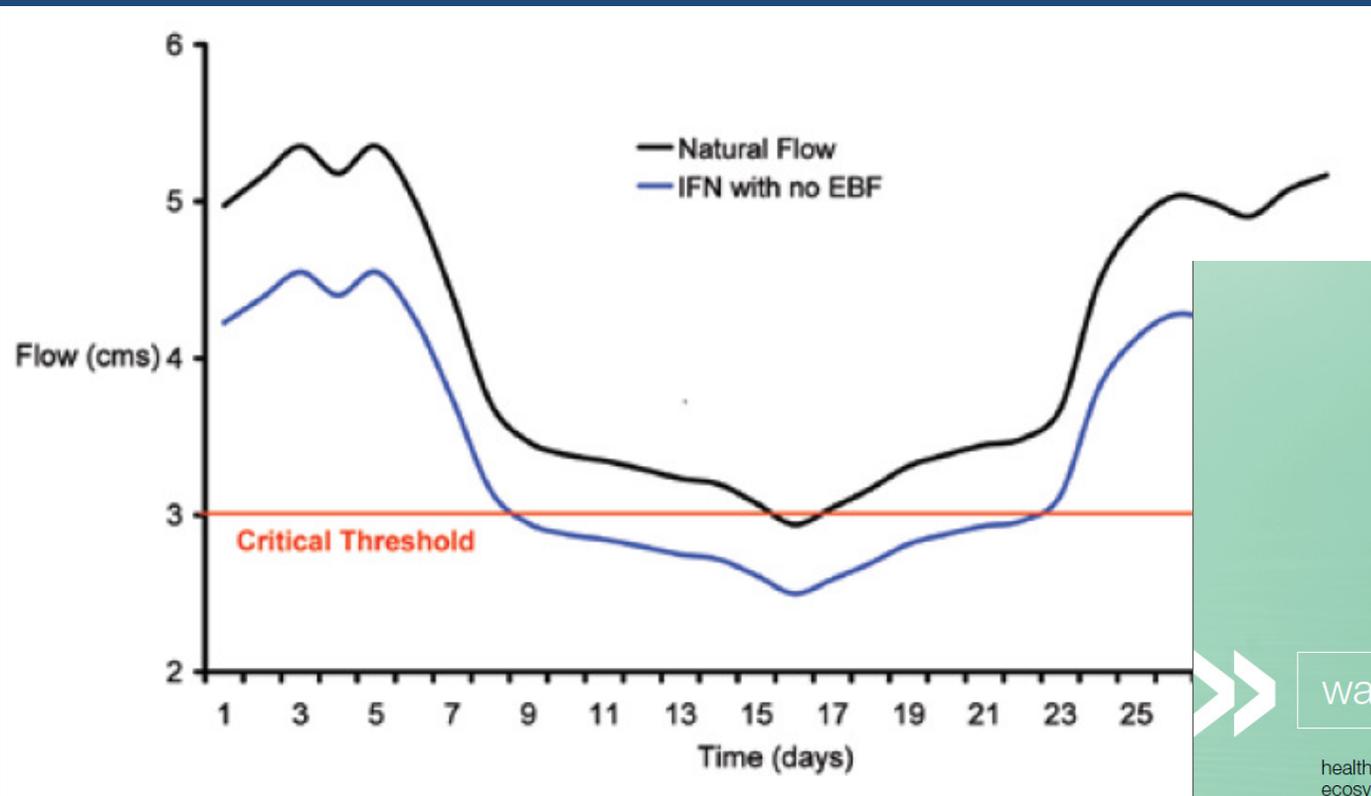




# Florida: Peace River Example



# Alberta: “A Desktop Method”



water for life

healthy aquatic  
ecosystems

» A Desk-top Method for Establishing Environmental  
Flows in Alberta Rivers and Streams

Government  
of Alberta