

RECLAMATION

Managing Water in the West

Yakima River Basin Winter Flow Plan

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November 2004
Water Year 2005



U.S. Department of the Interior
Bureau of Reclamation

Yakima Basin Winter Flow and Water Supply

Method for Setting Winter Flows

RECLAMATION

Background

- **Yakima Project**
 - **Irrigation**
 - **Fish and Wildlife**
 - **Flood control**
 - **Hydropower**

Background

- **Fall Spring Chinook**
 - **Spawn in September**
 - **Fall flows are naturally lowest**
 - **Winter flows are higher**
 - **Risk to eggs are not high**

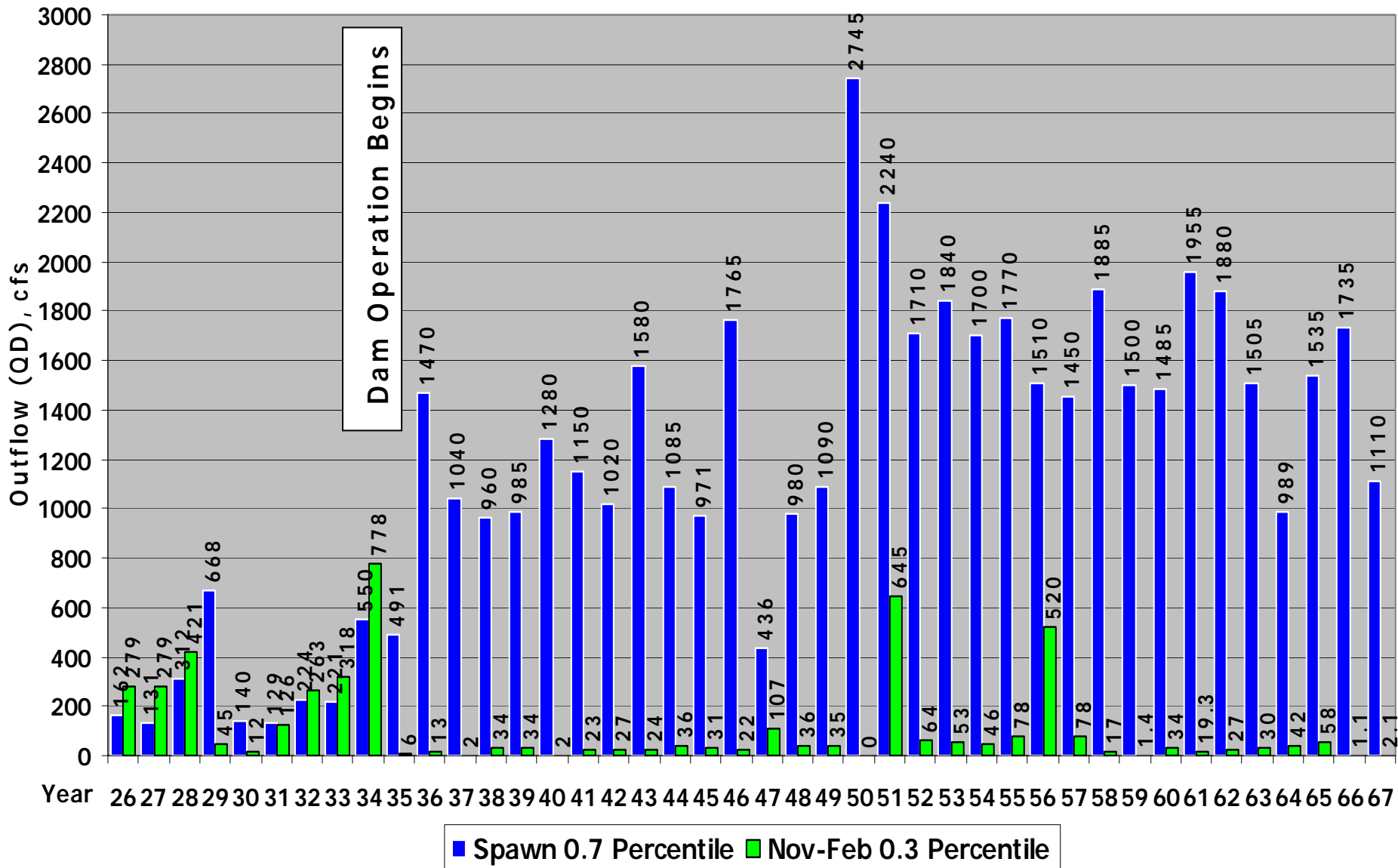


RECLAMATION

Background

- **Irrigation controlled flows**
 - High flows during spawning
 - Lower flows during incubation
 - Fish redds are at great risk

Cle Elum River below Cle Elum Dam



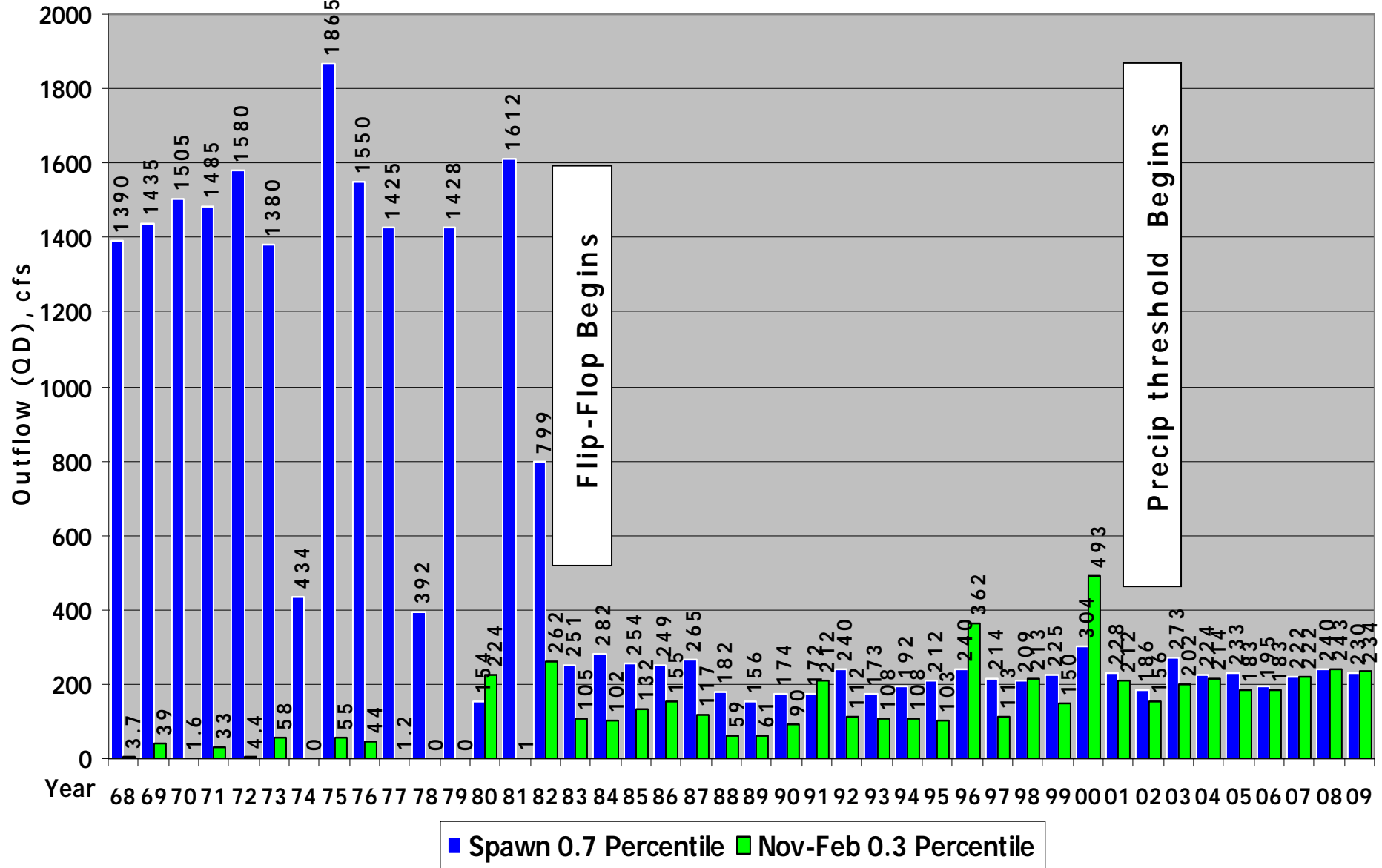
Background

- **Solution number 1**

–Flip-flop

- **Reduce fall flows below Cle Elum Reservoir**
 - A very productive and sensitive reach
- **Increase fall flows below Rimrock Reservoir**
 - Not a highly productive reach
- **Keep most redds covered over winter**

Cle Elum River below Cle ELum Dam



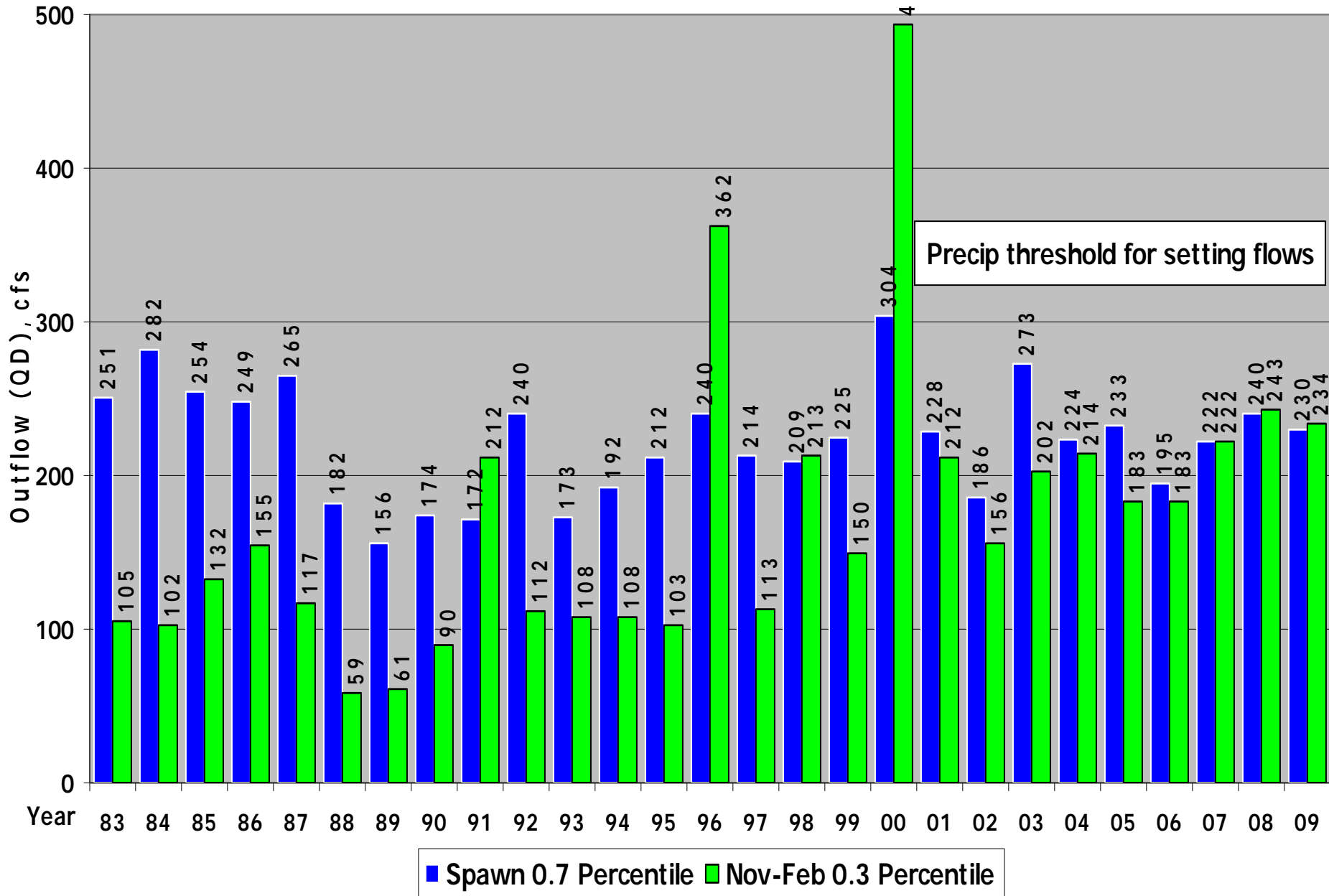
Precipitation Threshold

- **Solution number 2 (20 years later)**
 - **It's more than keeping redds wet**
 - **Habitat**
 - **Hyporheic zone**
 - **Hold spawning flows through winter**
 - **Use any “extra” water to increase winter flows**

Precipitation Threshold

- **Solution number 2 (cont.)**
 - **Use any “extra” water to increase winter flows**
 - **Low risk to irrigation water supply**

Cle Elum River below Cle Elum Dam



Objective

Use water better

- **Is Extra Water Available?**
 - Can we expect to be spilling in the Spring?
 - Will supply meet or exceed 100 % of demand?
 - What is reliability to meet 100% *supply*
- **Use extra water for winter flows**

HOW?

- **Predict next seasons supply in Nov and Dec?**
- **What do we know?**

What We Know

- **November 1 reservoir storage (carryover)**
- **Rain and snow fall in the winter and spring**
- **Storage and flow come from rain and snow**
- **Storage and flow meet demands ...or not**

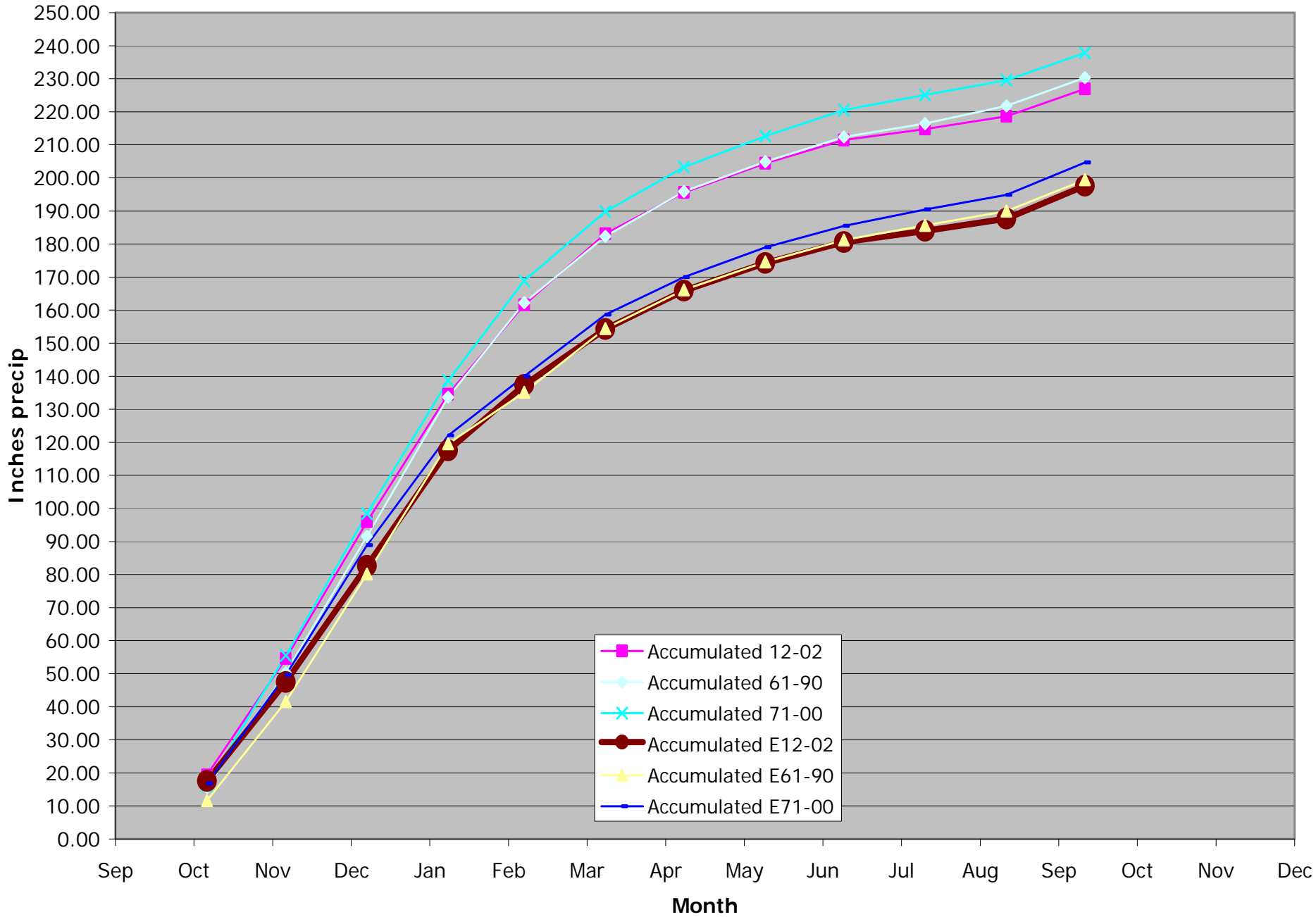
Uncertainties

- How much rain and snow will fall?
- How will the rain and snow run off?

Assumptions

- **Future normal precipitation**
- **ENSO influences NW precipitation**
- **ENSO positive ~ less precip**

Yakima 5 Res Precip



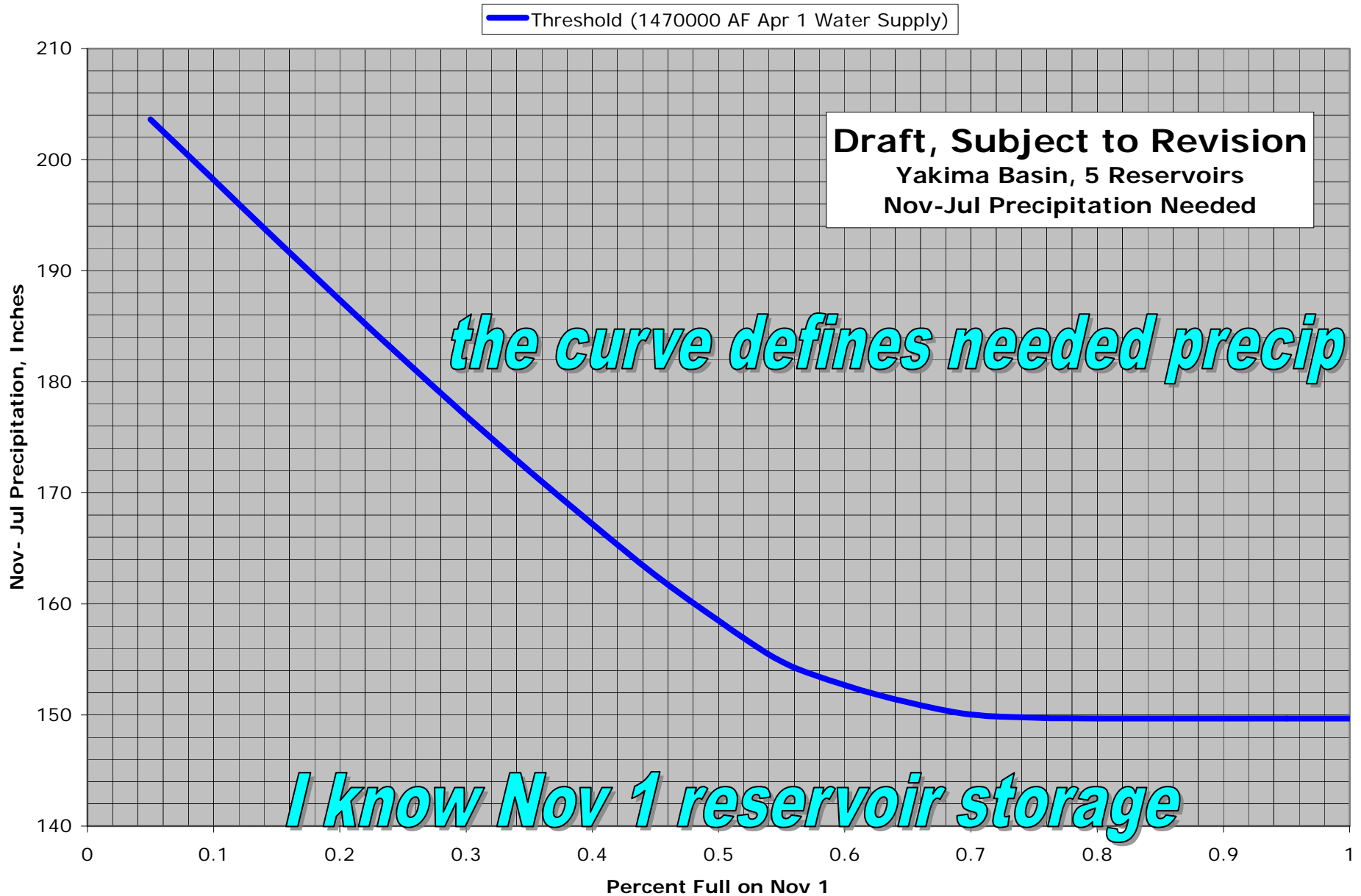
More Assumptions

- **April Supply will meet demand ... or not**
- **April Supply comes from Reservoir storage and Runoff.**

Things to determine

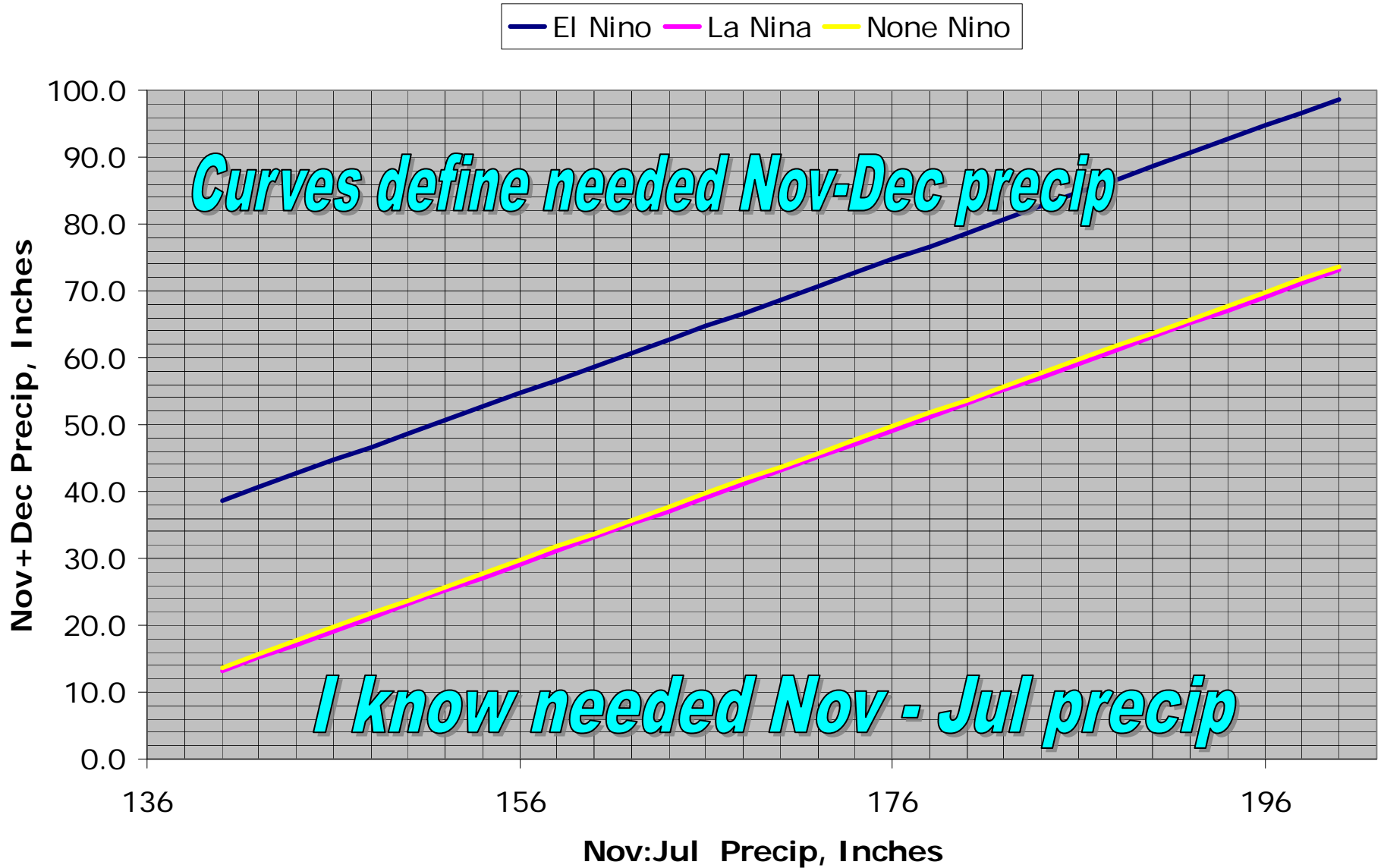
- What April supply is not enough – what is the failure threshold.
- What amount of precip will produce the Apr threshold supply

Select Envelope Curves



Draft – Prototype Precipitation Guide

Yakima Basin 5 Reservoir Sites, Fall vs Subsequent Precip



Yakima Basin Precip Threshold Worksheet

For Setting Winter Flows

Enter the November 1st System Storage					Averages--->	75.88	
Enter the appropriate CPC ENSO condition.					Distribution--->	1	
	Sys Storage	Fraction full	Nov-Jul Precip Needed		ENSO condition this	Jan-Jul Avg Precip	Precip Need
Full	1065400						Nov+Dec
1-Nov	111000	0.104	197.7	El Nino, 1	1	101.3386	96.4
1-Nov	111000	0.104	197.7	La Nina, -1	-1	126.8594	70.9
1-Nov	111000	0.104	197.7	None, 0	0	126.2794	71.4
1-Nov	111000	0.104	197.7	El Nino, 1	1	101.3386	96.4
1-Nov	111000	0.104	197.7	All	2	118.8092	78.9

Note

- El Nino years call for more Nov-Dec precip than La Nina or ENSO Neutral years
- Fisheries now care about carryover storage
- Heavy fall irrigation is scrutinized.

Performance

- **No shortage but still indicated a cut**
 - November – 7 indicated (9%)
 - December – 9 indicated (12%)
- **Should have indicated a cut but didn't**
 - November – 8 indicated (11%)
 - December – 4 indicated (5%)
- **Wrong action**
 - Total – 19 out of 76 (25%)
 - 2002-2009 – 1 out of 8 (12.5%)

Yakima Basin Winter Flow Plan

Process based on:

- Risk analysis derived Precipitation Threshold tool
- Existing conditions
 - Sys AF,
 - ENSO episode,
 - PC
- Biological factors

Decisions made semi-monthly

Coordinate with SOAC & others

Decision support to set flow targets

- Precipitation threshold
- Prevailing conditions

Hydrologic Decision Support Input Factors

Primary indicators

- ENSO episode
- November 1st System Storage
- Precipitation thresholds
- Water supply forecast (after Jan 1)

Other factors used for “close calls”

- Recent weather and streamflow patterns/trends
- Short range forecasts
- Snowpack
- Unconditioned precip averages (all years)

Yakima Basin Winter Flows

- The precipitation threshold is for use during November – December as a decision support tool for the Yakima Field Office Manager and can be used along with other pertinent factors (i.e. forecasts, fish conditions, etc.). The threshold's derivation explicitly takes into account reservoir storage and precipitation and implicitly takes into account base flows. Basin conditions after January 1 will be evaluated based on the traditional Yakima Basin runoff forecast.
- The sum of the precipitation at the 5 reservoir sites for the following periods, in water year 2005, to be met in order to maintain winter flows equal to spawning flows at key Yakima River indicator sites.
- | <u>Period</u> | <u>Precip Threshold</u> | <u>Precip received</u> | <u>Action</u> |
|---------------|-------------------------|------------------------|----------------|
| Nov 1-15 | <u>11 inches</u> | 6.84 inches | Cle to 200 cfs |
| Nov 1-30 | <u>33 inches</u> | | |
| Nov 1-Dec 15 | <u>56 inches</u> | | |
| Nov 1-Dec 31 | <u>79.5 inches</u> | | |
- **Normal Precipitation**
 - November 34.7 inches
 - December 41.2 inches
 - Nov-Dec 75.9 inches.
- **Surveys for redds and side channel connections:**
 - Cle at 206 cfs on Nov 16, 2004.
 - Easw not yet surveyed
- **Spawning flows:** Cle flow was 225 cfs, Easw flow was 220 cfs, Yrcw 100 cfs
- **Current targets:** Cle flow was 200 cfs, Easw flow was 215 cfs, Yrcw 100 cfs (set November 16).

Summary

Want

- Fewer winter flow target reductions
- Little impact/risk to irrigation

Use

- November 1st Reservoir Storage
- ENSO (El Nino) precipitation curves

Use as a decision support tool along with other input

- Field surveys
- Short term forecasts
- Political climate