Update on Delta Inflow/Outflow Evaluations

BDCP Conveyance/HOTT Meeting
May 28, 2009

Part I.

Approaches Evaluated for Achieving Delta Flows

Background of BDCP Ops Effort

- December 19, 2008, issued Overview Document
  - Left the issue of Delta outflow unresolved;
  - Recognized that appropriate targets for Delta outflow have been vigorously debated;
  - Used D-1641 for DRERIP purposes;
  - Committed to evaluate a range of targets.

Delta Flow Complexities

- Changes to Delta flow affect to varying degrees:
  - Upstream coldwater management
  - Outflow and X2 location
  - Water supply reliability
- Tradeoffs are unavoidable
- Delta flow can be achieved through changes in:
  - Outflow
  - Inflow
  - Reservoir Releases

BDCP Approaches for Delta Flow

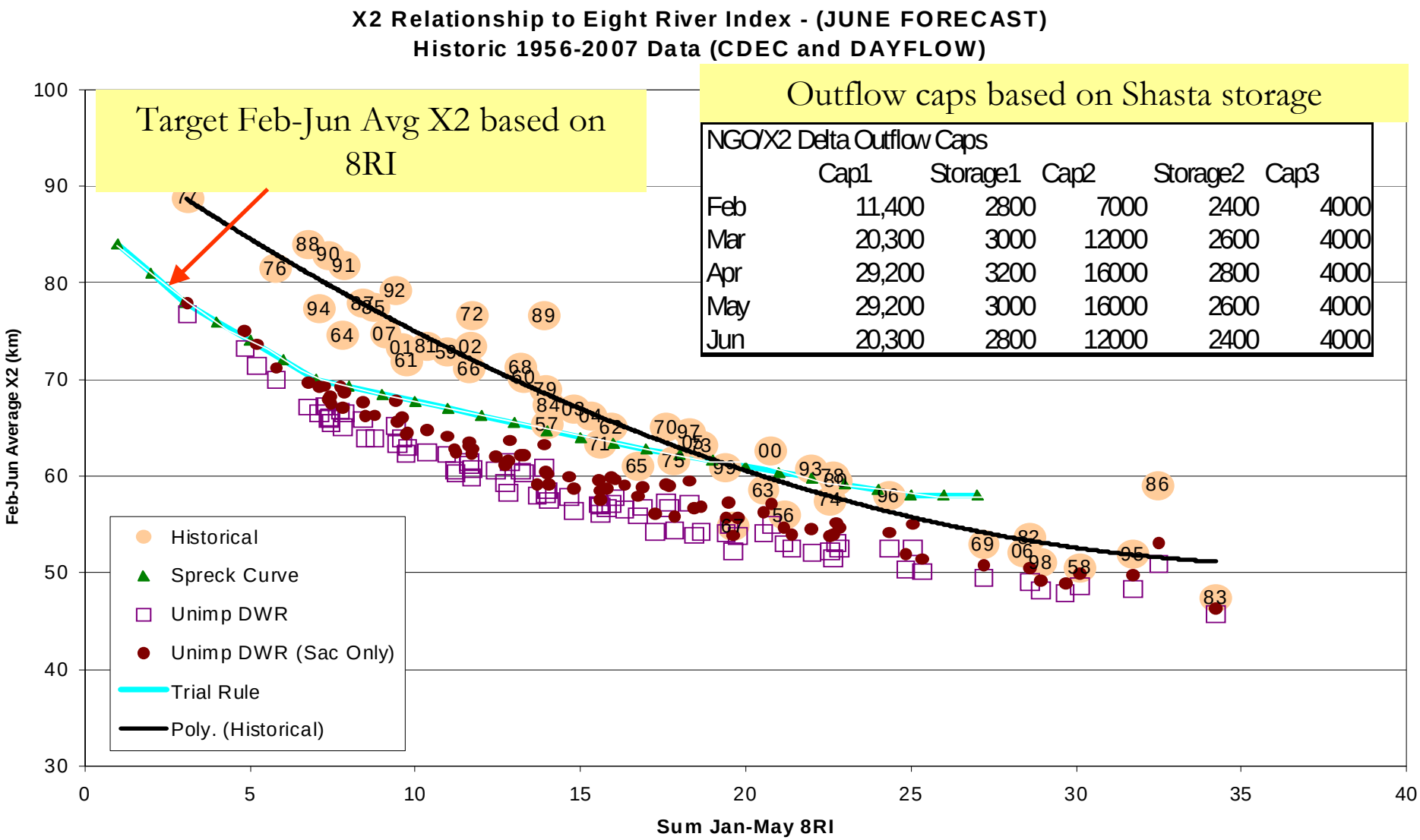
- Explore a range of inflow/outflow approaches for consideration in BDCP planning

- Consider improved, **simplified** methods for providing Delta inflows/outflows that better **balance** competing needs

Two Main Approaches Explored for Spring Flows

- Delta Outflow/X2
  - Focuses on achieving Feb-Jun average X2 based on seasonal hydrologic index for Sacramento and San Joaquin Valleys
  - Management point is Delta outflow
  - Distribution of upstream flows is product of coordinated SWP and CVP operations
- Proportionate Reservoir Release (PRR)
  - Focuses on tributary and Delta hydrologic synchrony to achieve biologically-based seasonal targets for floodplain and secondary channel inundation
  - Management point is at Keswick, Thermalito, and Nimbus
  - Outflow is product of PRR values, plus Hood Bypass and OMR requirements

Delta Outflow/X2 Approach (Modified NGO X2)



Proportionate Reservoir Release Approach

Seasonal instream flow targets as percentage of reservoir inflow

		Jan	Feb	Mar	Apr	May	Jun
Keswick	✓	0	0.2	0.4	0.6	0.6	0.4
Thermalito	✓	0	0.2	0.4	0.6	0.6	0.4
Nimbus	✓	0	0.2	0.4	0.6	0.6	0.4
Verona		0.6	0.6	0.6	0.5	0	0
Shasta Storage trigger for Low%		0	2600	2600	2800	2200	2200
Freeport		Low % 0	0.3	0.3	0.3	0.3	0.3
		High % 0	0.5	0.5	0.5	0.5	0.5
Delta Outflow*		0	0.4	0.4	0.4	0.4	0.4

*Delta Outflow is set to a percent of forecasted unimpaired SACR flows plus 100% of SJR

Minimum flow caps based on storage

Reservoir Bypass Flow Caps (Shasta)

	Cap1	Storage1	Cap2	Storage2	Cap3
Feb	10,000	2800	6,625	2400	3250
Mar	10,000	3000	6,625	2600	3250
Apr	10,000	3200	6,625	2800	3250
May	10,000	3000	6,625	2600	3250
Jun	10,000	2800	6,625	2400	3250

Reservoir Bypass Flow Caps (Oroville)

	Cap1	Storage1	Cap2	Storage2	Cap3
Feb	4,000	2000	2,375	1300	750
Mar	4,000	2200	2,375	1500	750
Apr	4,000	2400	2,375	1700	750
May	4,000	2200	2,375	1500	750
Jun	4,000	2000	2,375	1300	750

Reservoir Bypass Flow Caps (Folsom)

	Cap1	Storage1	Cap2	Storage2	Cap3
Feb	3,000	350	1,900	250	800
Mar	3,000	400	1,900	300	800
Apr	3,000	450	1,900	350	800
May	3,000	400	1,900	300	800
Jun	3,000	350	1,900	250	800

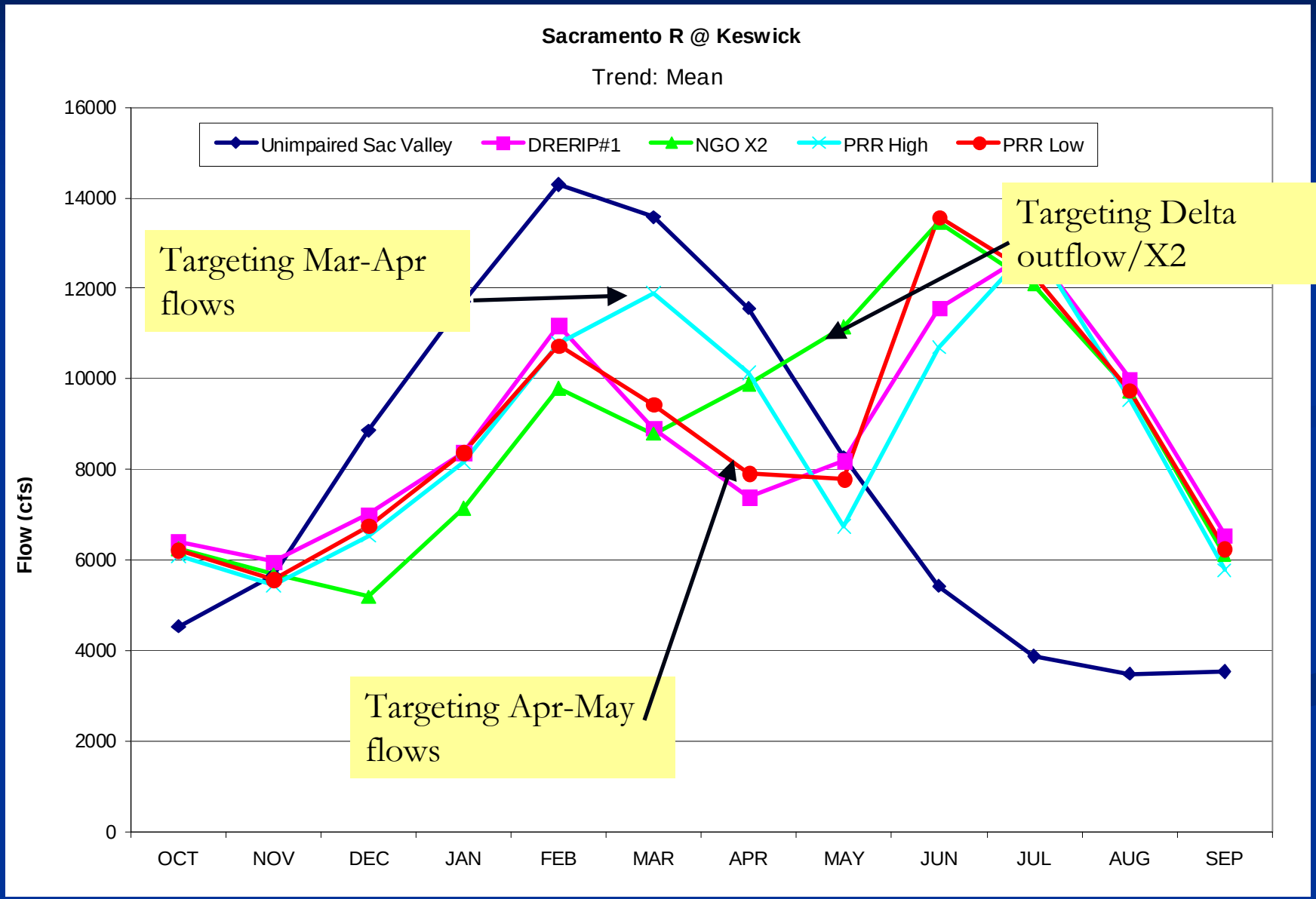
Preliminary Biological Flow Thresholds

Location	Biological Justification	Frequency	Threshold	Timing	Duration
Sacramento River (Keswick)	Seasonal inundation of off-stream channels and habitat to support rearing and outmigration	Once per year (as able)	8,500 - 12,500 cfs	February – April	7 - 30+ days
Sacramento River (Verona)	Yolo Bypass floodplain inundation (3,000 to 6,000 cfs) through modified Fremont Weir	Once every two years (as able)	> 35,000 cfs	February - April	30+ days
Feather River (Mouth)	Seasonal inundation of off-stream channels and habitat to support rearing and outmigration	Once per year (as able)	> 8,000 cfs	February – April	7 – 30+ days

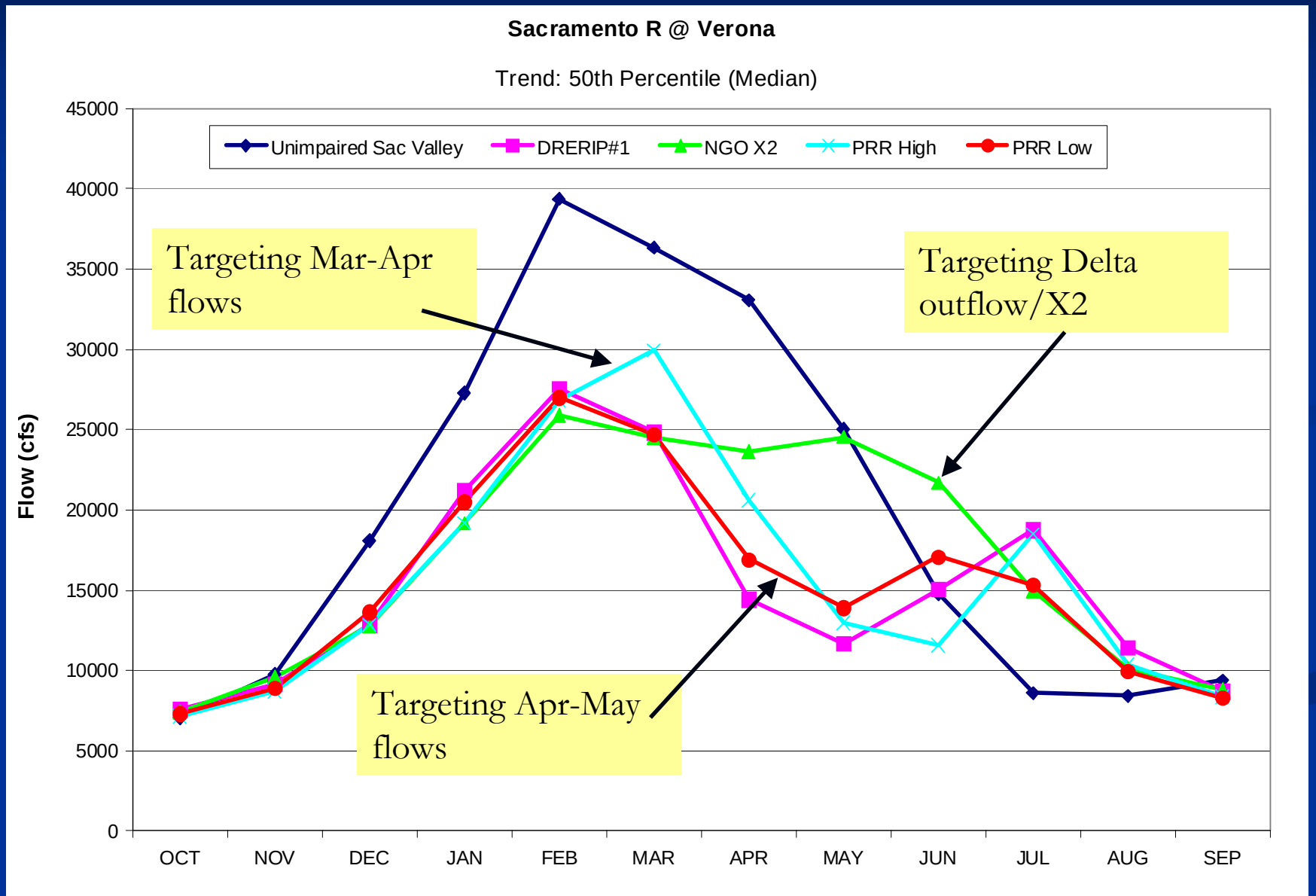
PRR Approach: Primary Modeling Objectives

- Improve synchrony during months most askew from unimpaired flow patterns (Feb-Jun)
- Provide instream flows when thresholds most likely to achieved (i.e. would 75% of unimpaired have achieved the threshold?)
- Limit releases to those justifiable by biological thresholds to limit impacts to coldwater pool and export water supply

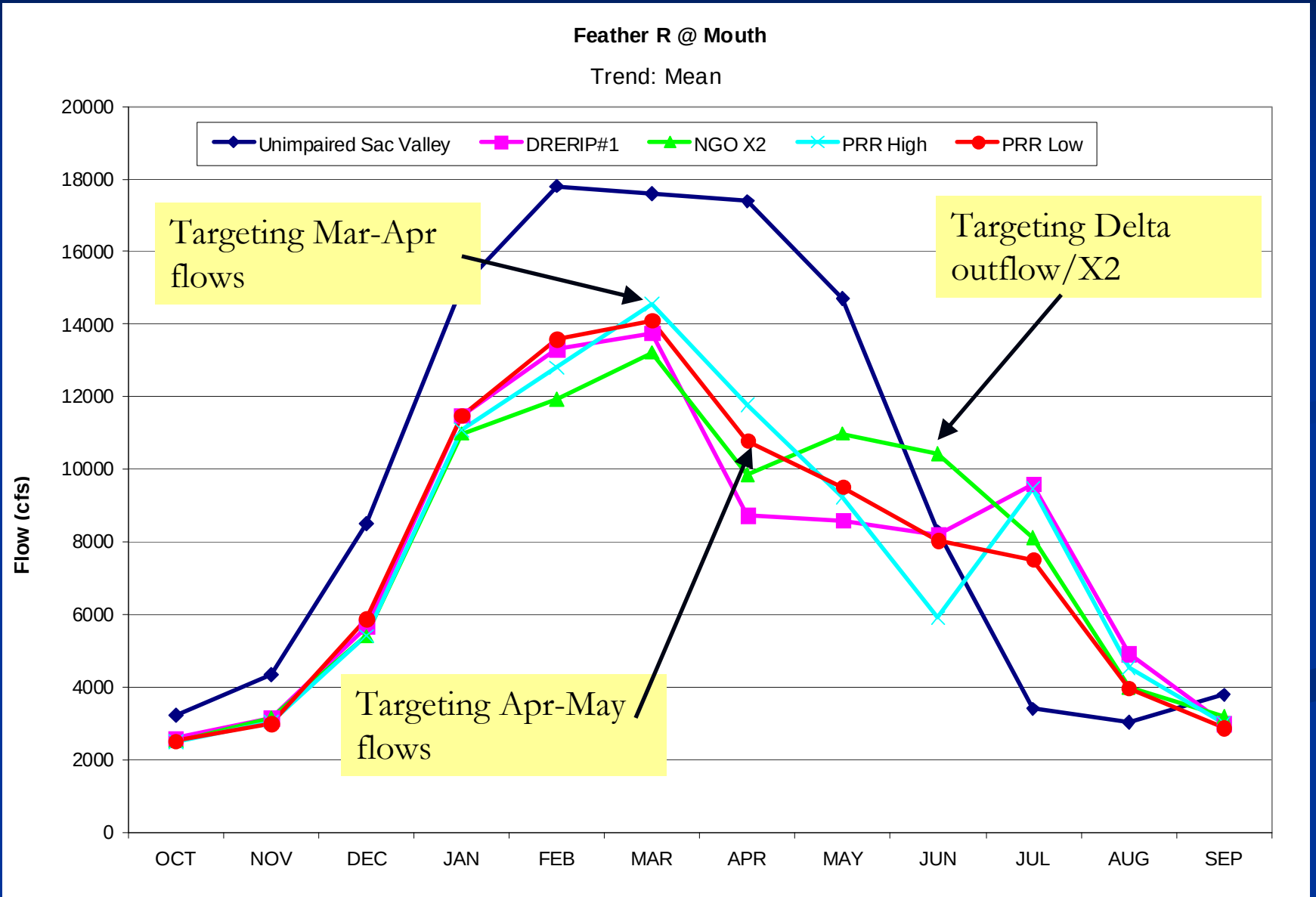
PRR Approach Could Improve Synchrony



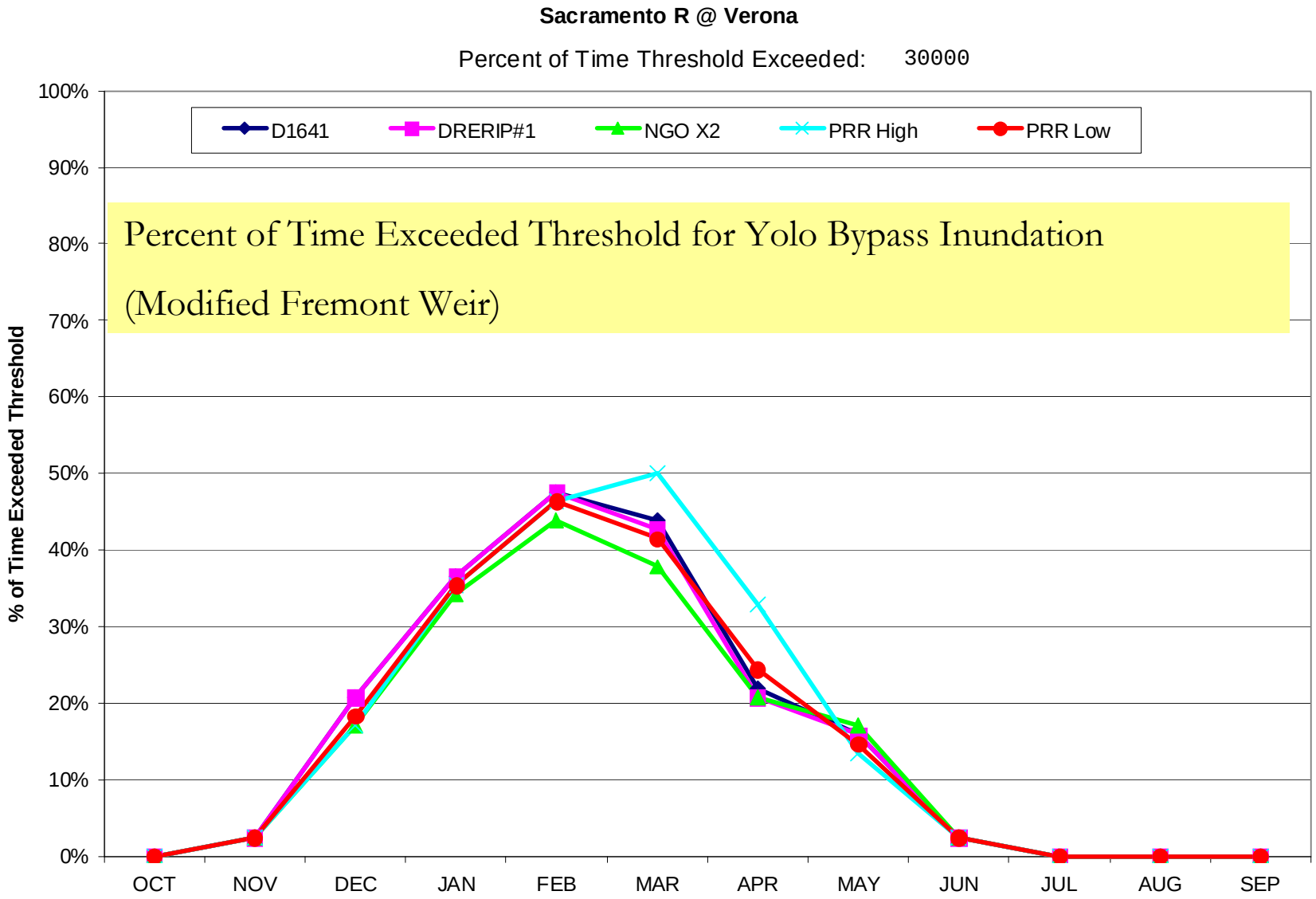
PRR Approach Could Improve Synchrony



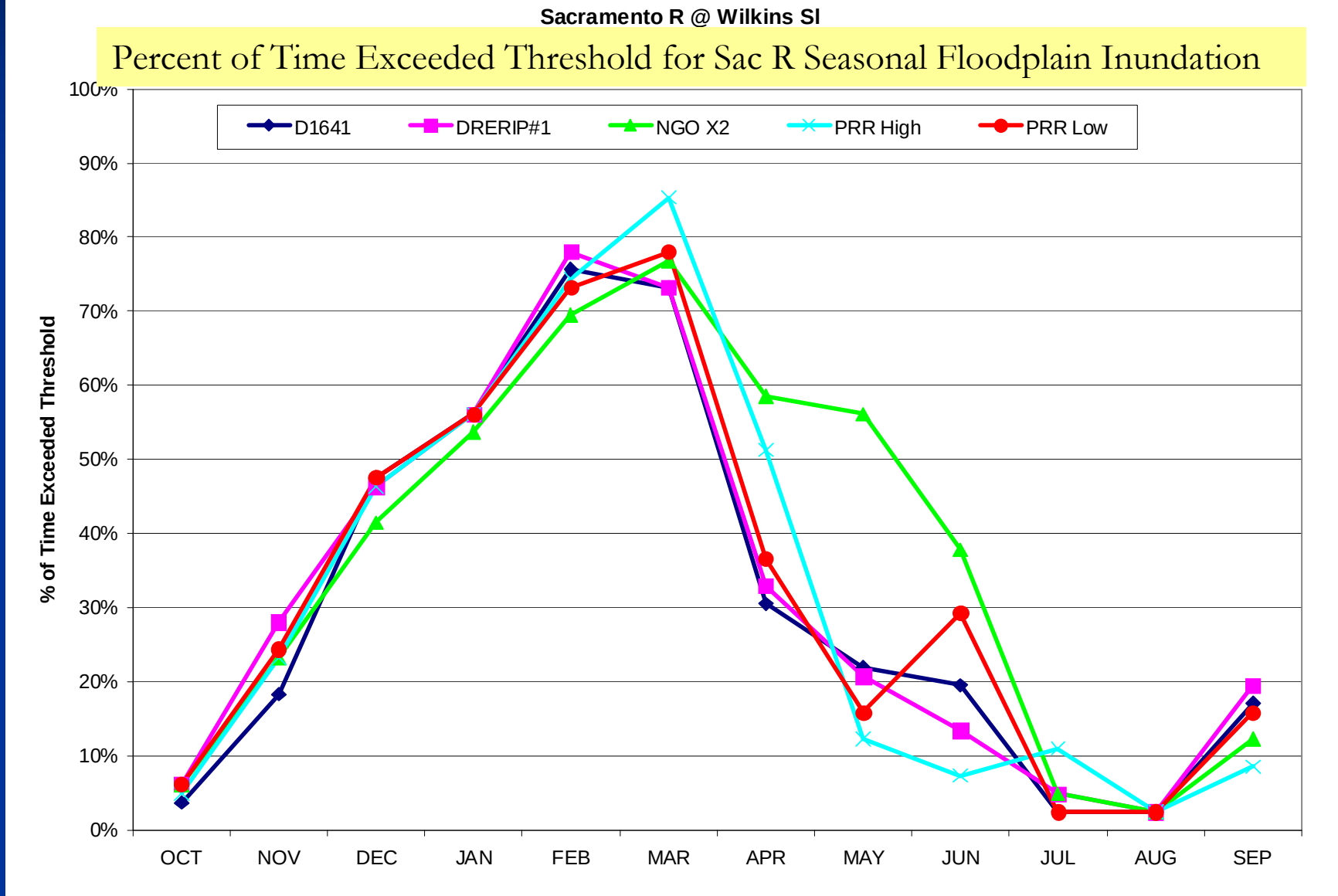
PRR Approach Could Improve Synchrony



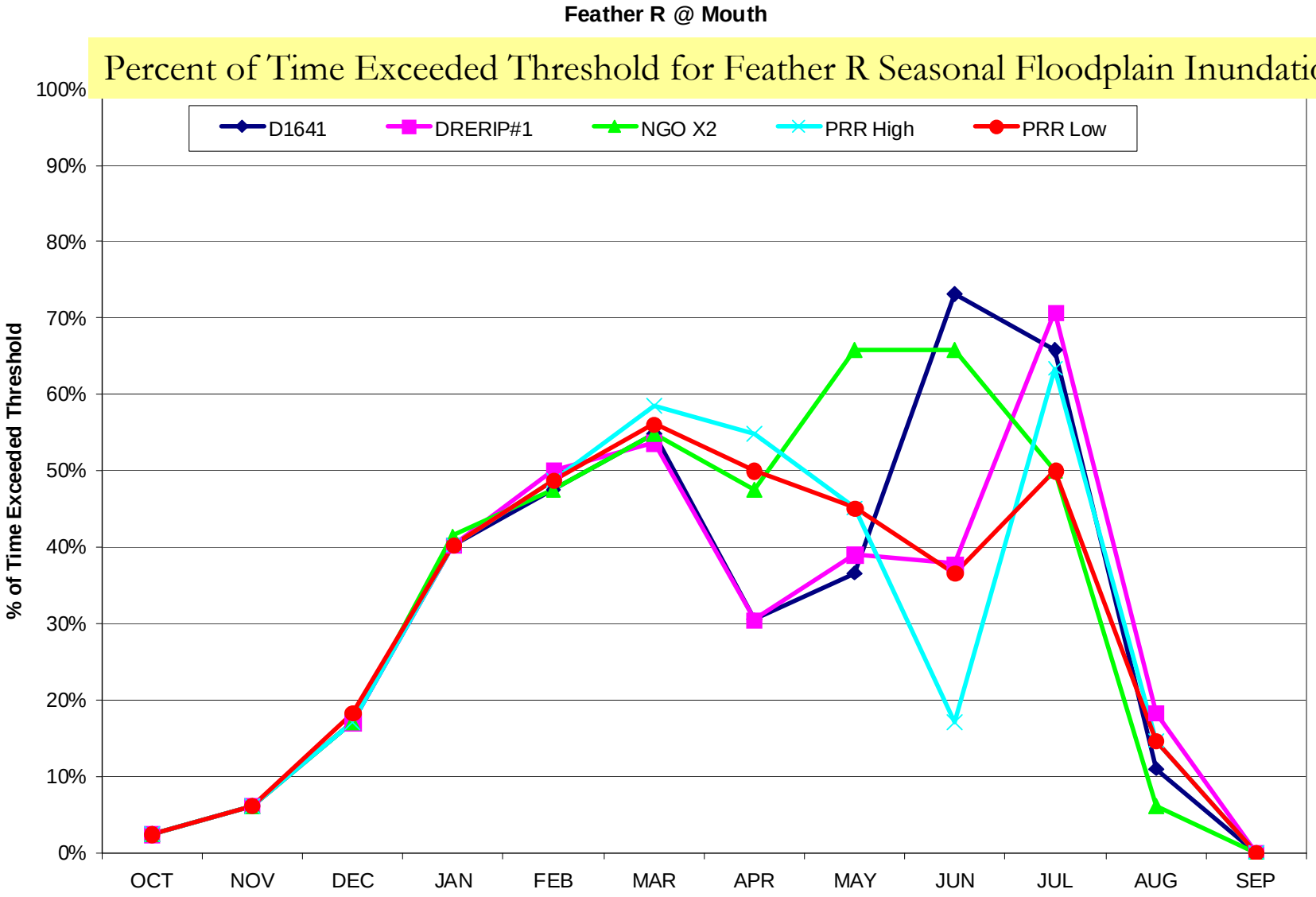
Potential Yolo Bypass Inundation Frequencies



Potential Sac River Seasonal Floodplain Inundation Frequency



Potential Feather River Seasonal Floodplain Inundation



Next Steps

- PRR scenarios need revision to better identify and target upstream biological objectives
- Delta outflow/X2 scenario could be hybridized with the PRR approach to better synchronize upstream flows
- Need to limit major conflicts with upstream temperature control (species vs species trade-off)

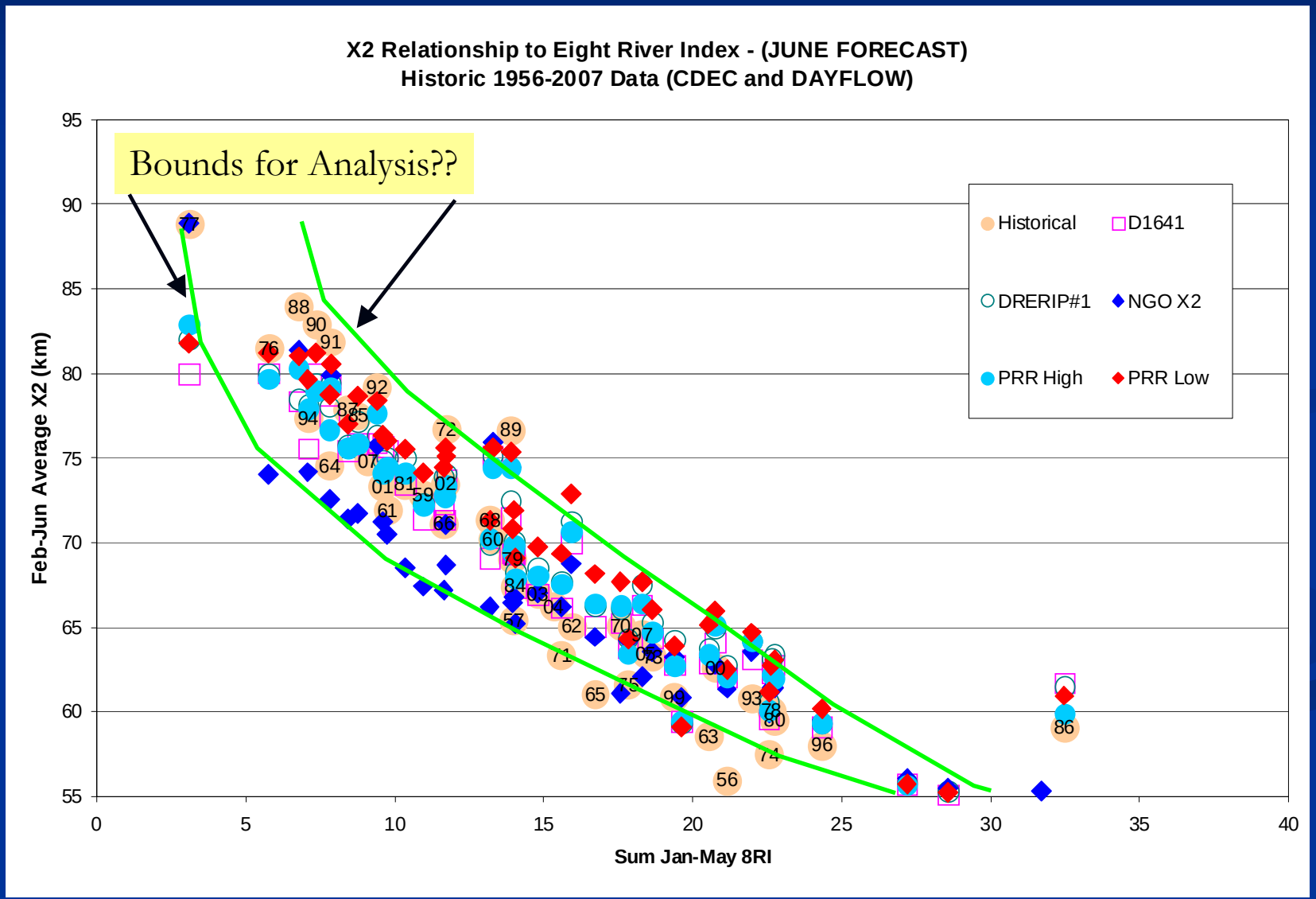
Part II.

Potential Approach for Evaluating Range of Delta Outflows

Bookend Approach to Evaluate Range of Delta Outflows

- Consider relatively HIGH and LOW
  - Hood Bypass flows requirements
  - Old and Middle River flow requirements
- Consider two methods for spring releases
  - NGO X2 approach
  - Proportionate Reservoir Release (PRR) approach

Can Rules be Derived to Describe a Range of Outflow?



Current Scenario Assumptions

- Hood Bypass

  Utilized BDCP Option #1 for all scenarios except D1641

- South of Delta

  Utilized BDCP OMR constraints:

  -3,500 cfs Dec – Jun

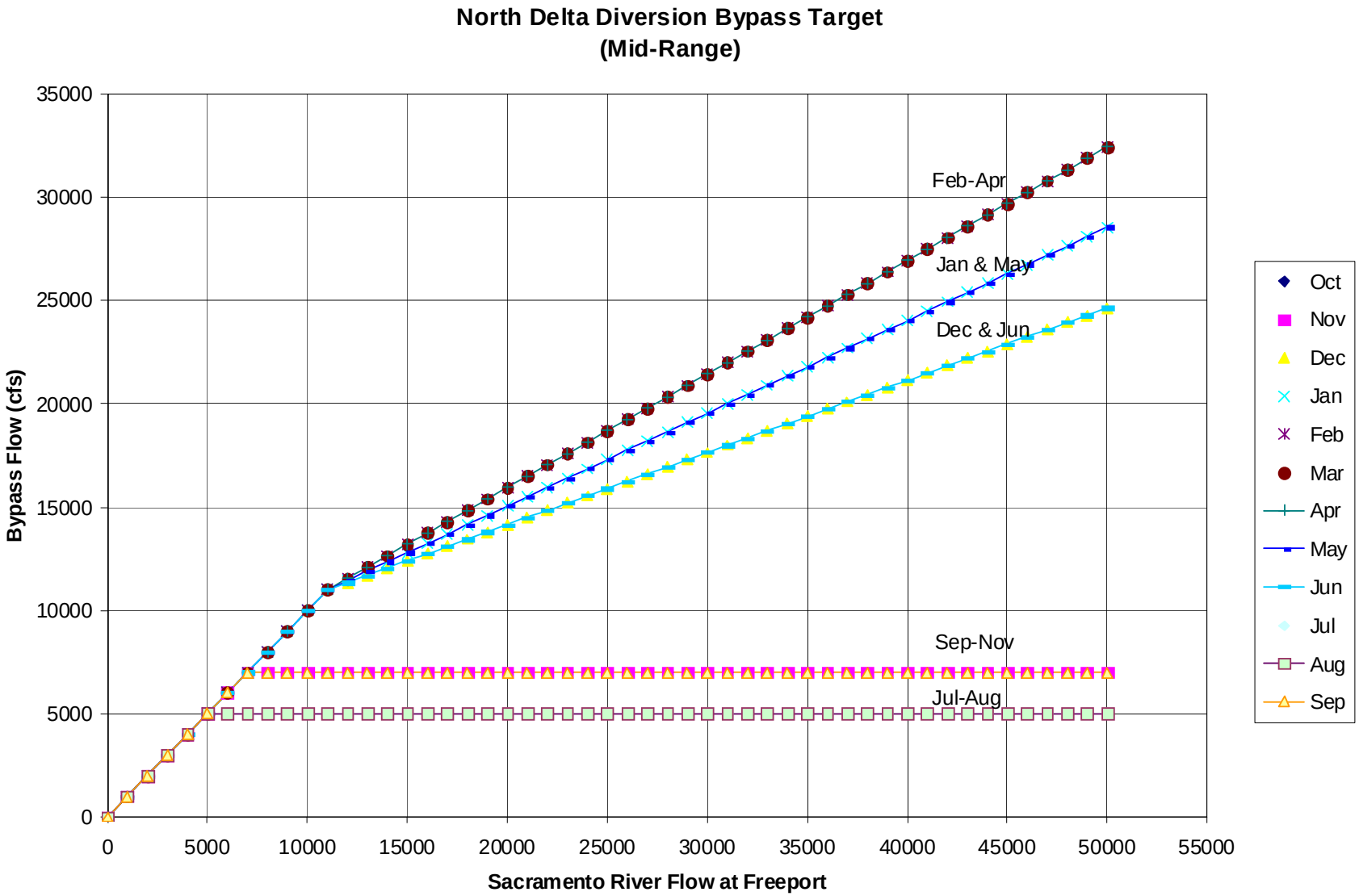
  -5,000 cfs Jul – Nov

- San Joaquin River Inflow

  Fully impaired current condition

- All other current standards assumed to exist.

BDCP Option #1 Hood Bypass Assumption

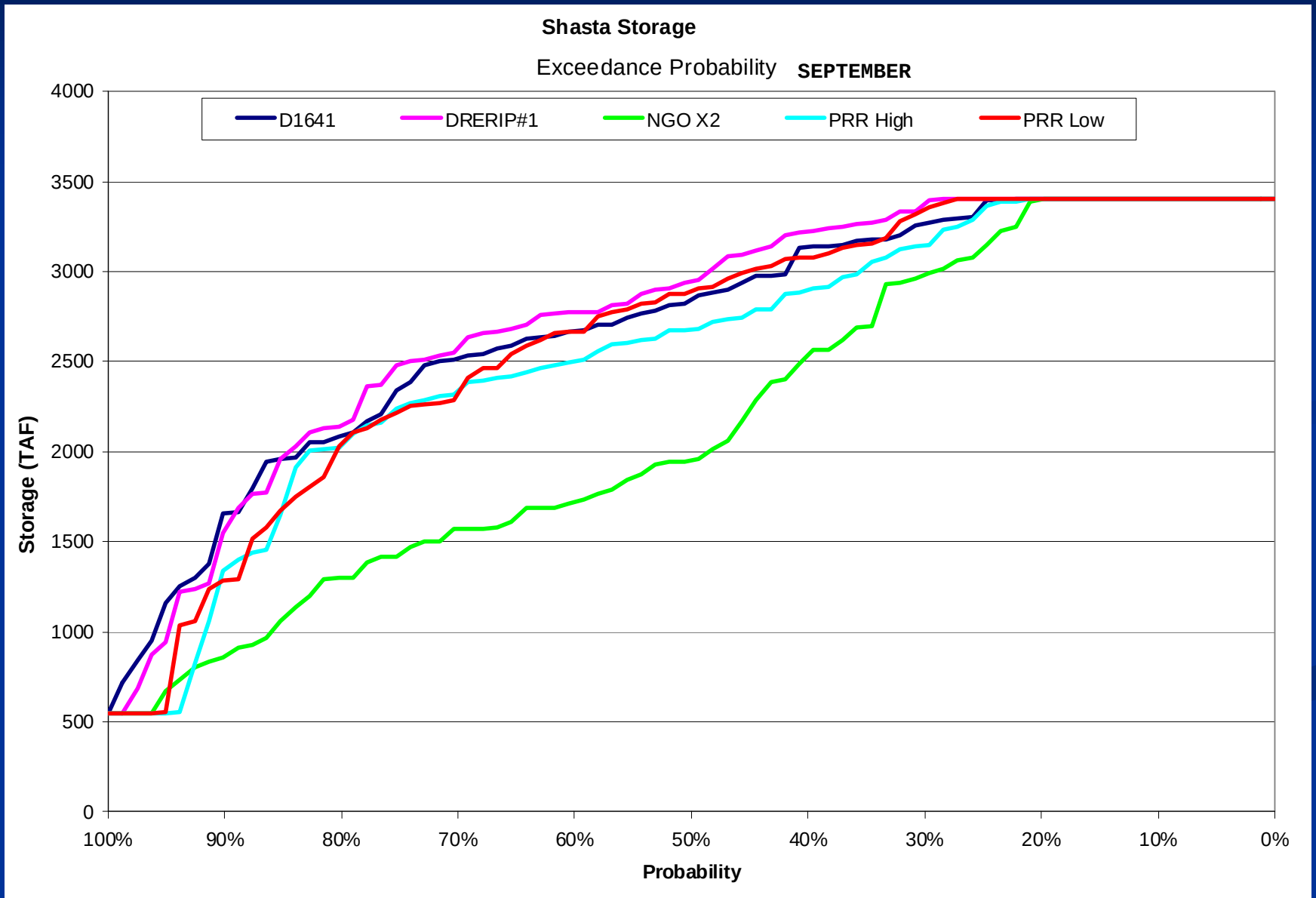


Assumptions for Scenarios

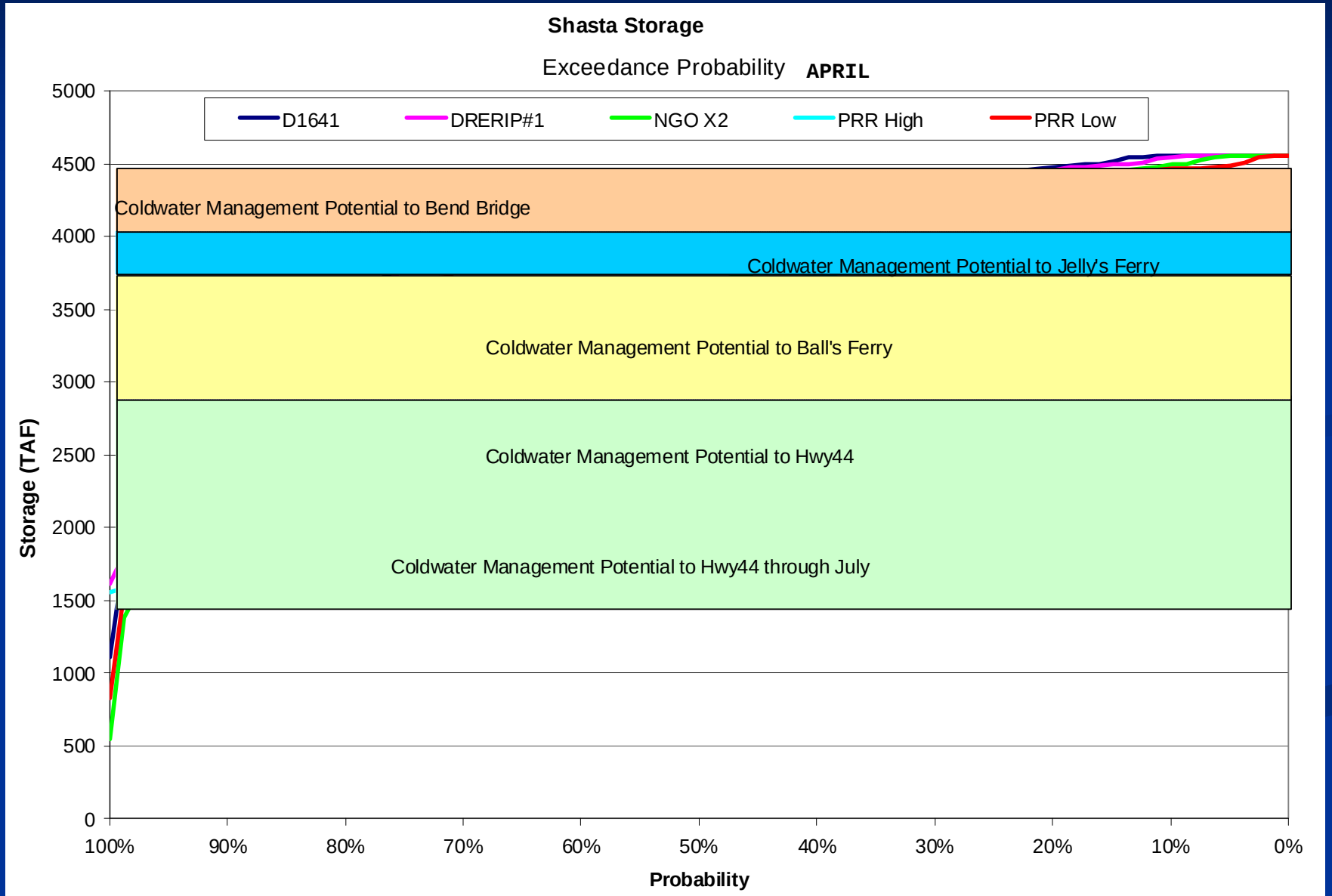
- Scenario 1: D-1641 with existing facilities
- Scenario 2: BDCP DRERIP #1
- Scenario 3: NGO X2 proposal
- Scenario 4: PRR#1 + HIGH Hood & OMR req.
  - PRR: 40%, 100%, 100%, 60%, 40% of inflow (Feb-Jun, respectively)
  - Hood Bypass: 13,500 cfs Dec-Jun; 7,000 cfs Jul-Nov (percentage criteria same as DRERIP scenario)
  - OMR: -2,000 cfs Dec-Jun; -5000 cfs Jul-Nov
- Scenario 5: PRR#2 + LOW Hood & OMR req.
  - PRR: 20%, 40%, 60%, 60%, 40% of inflow (Feb-Jun, respectively)
  - Hood Bypass: 5,000 cfs during all months (percentage criteria same as DRERIP scenario)
  - OMR: -3,500 cfs Dec-Feb; -5000 cfs Mar-Jun; no requirement Jul-Nov

Initial Exploratory Modeling Results

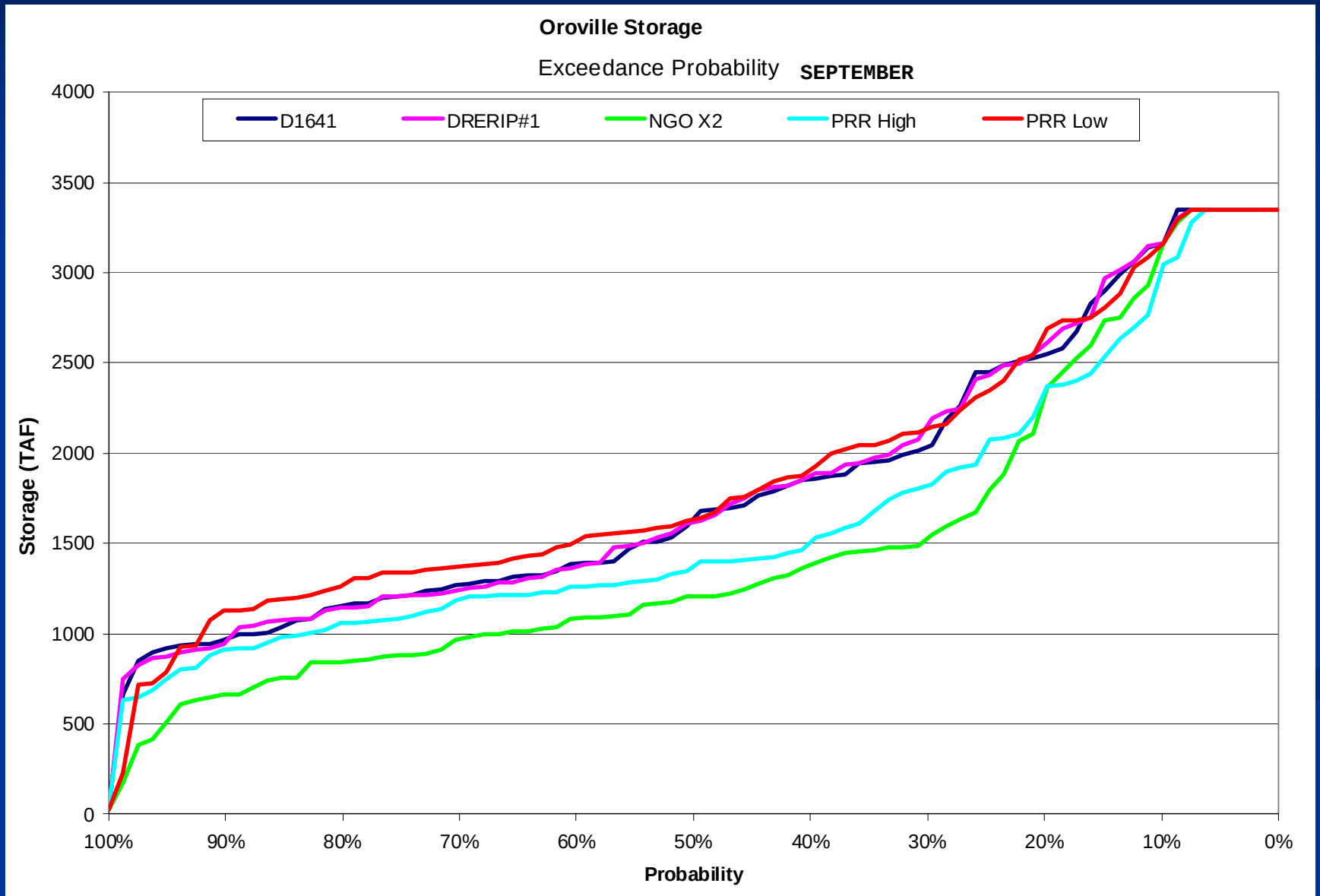
Shasta Carryover Storage



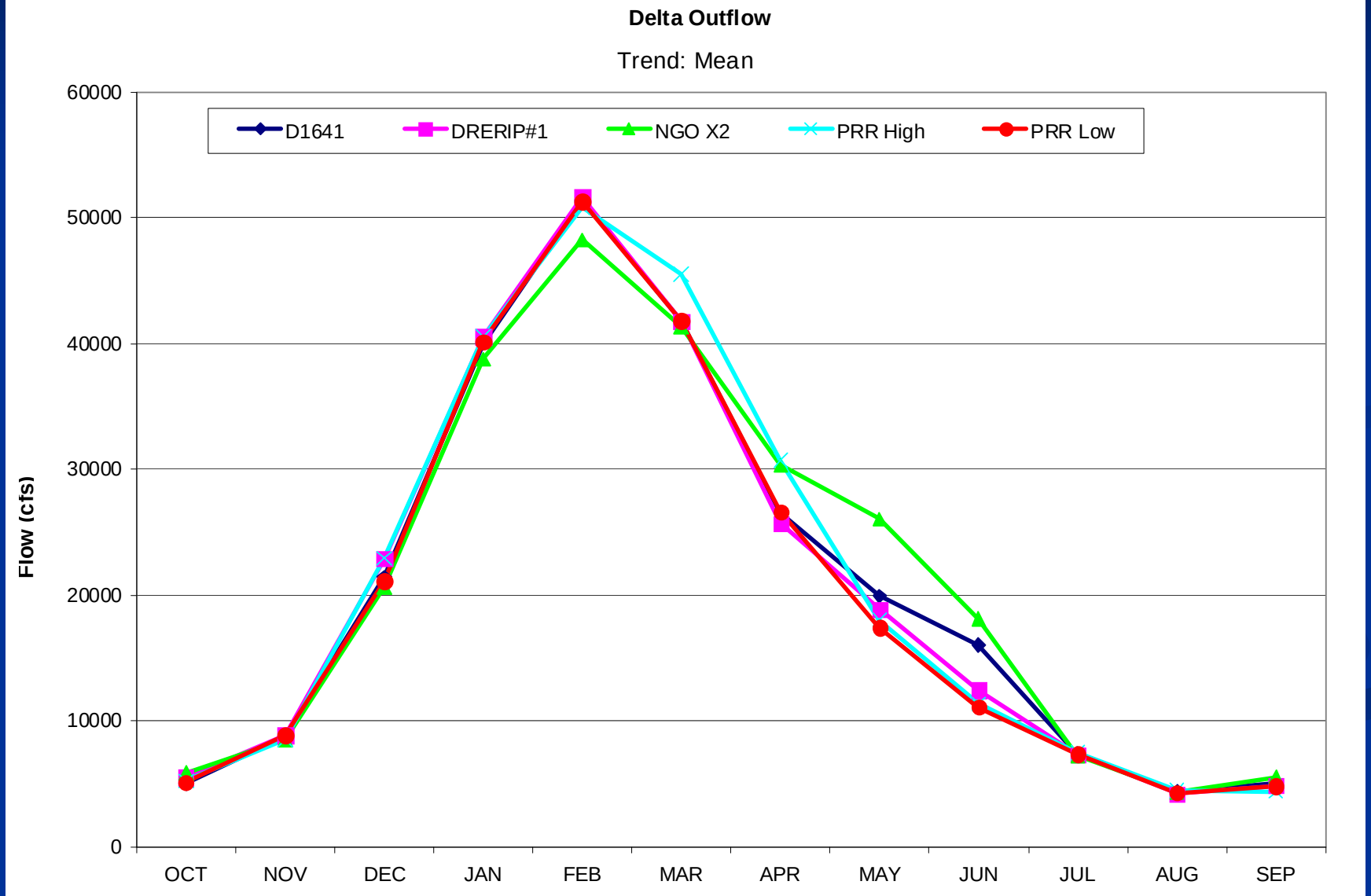
Shasta Coldwater Management Potential



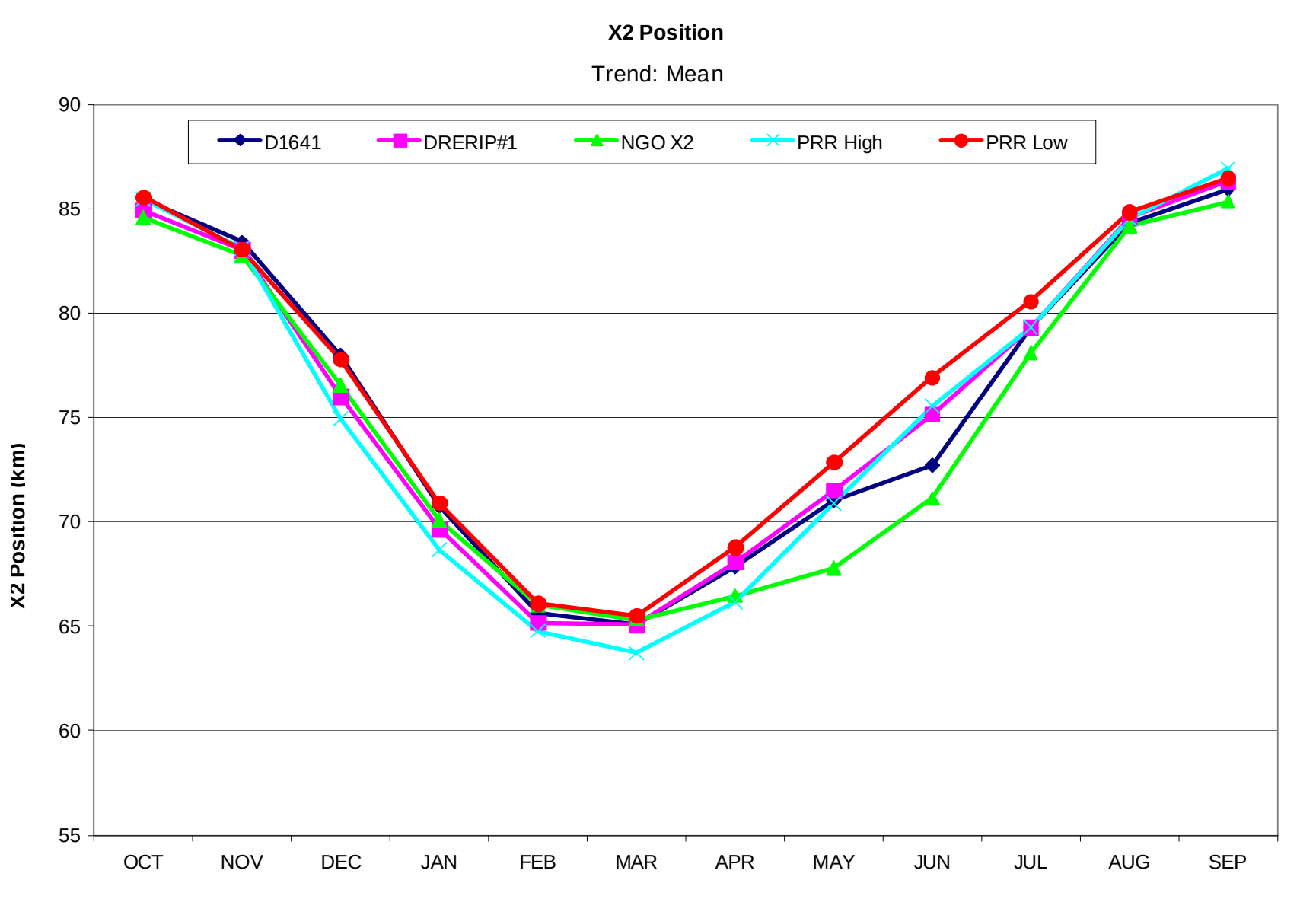
Oroville Carryover Storage



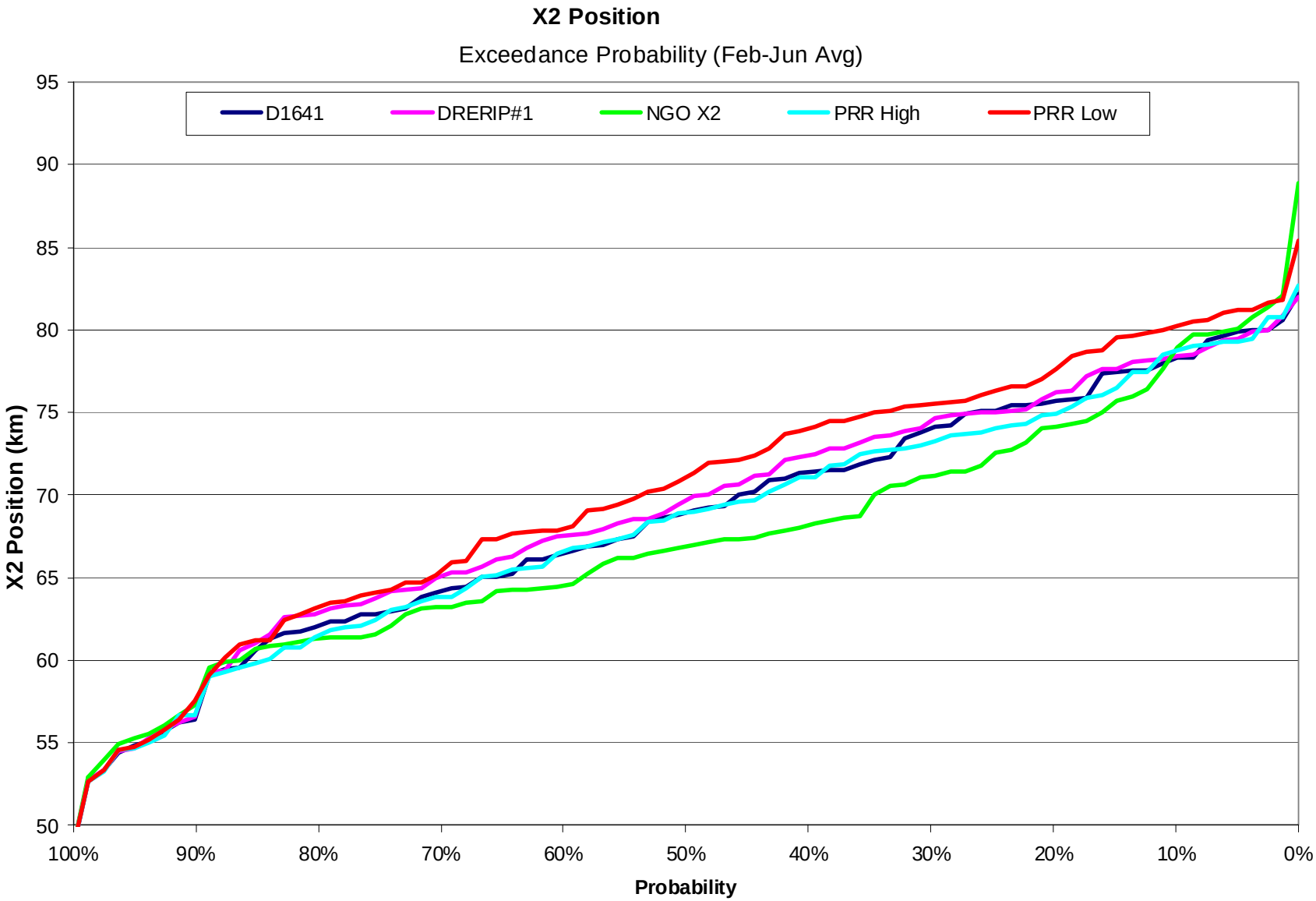
Delta Outflow



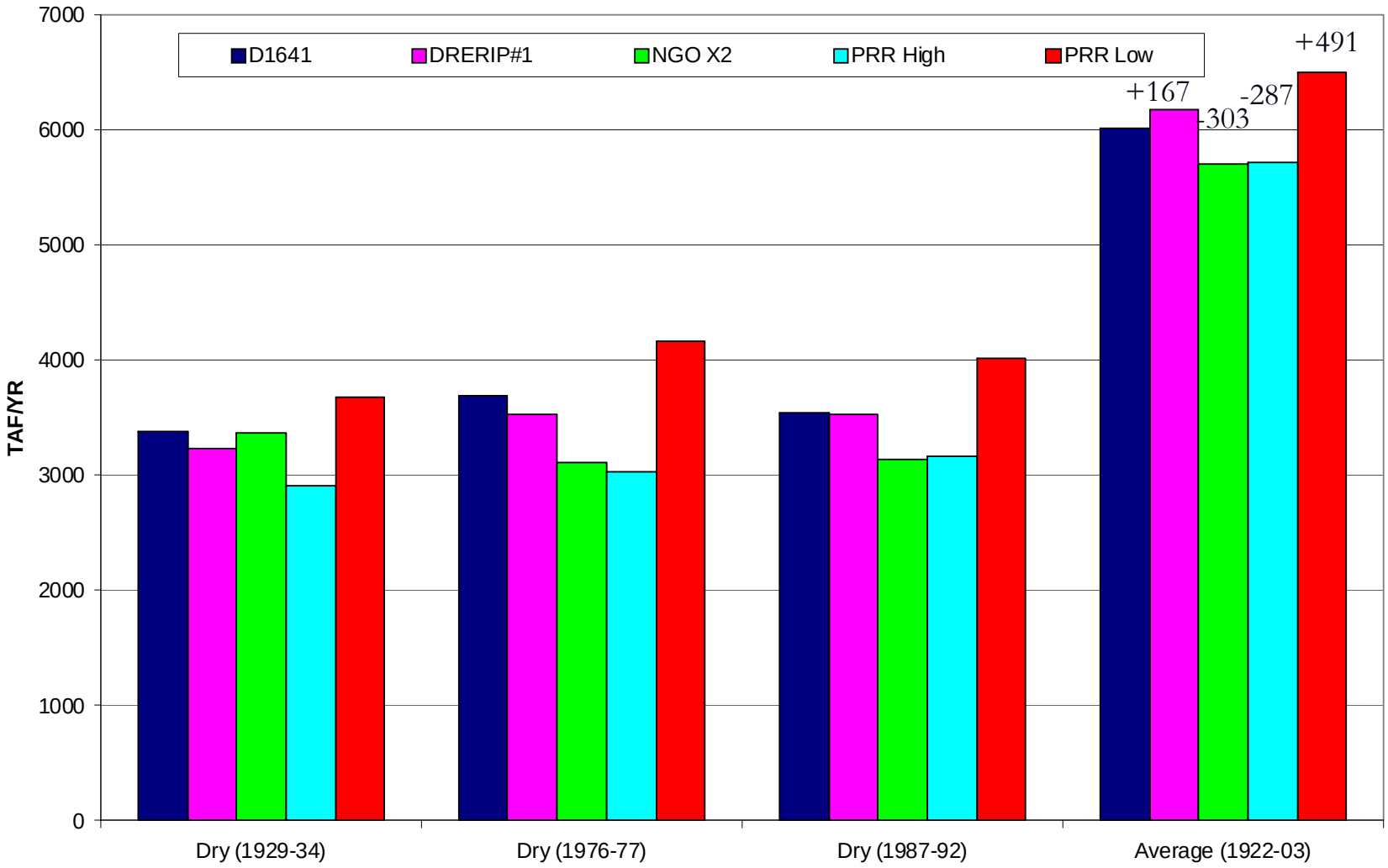
Monthly X2 Changes



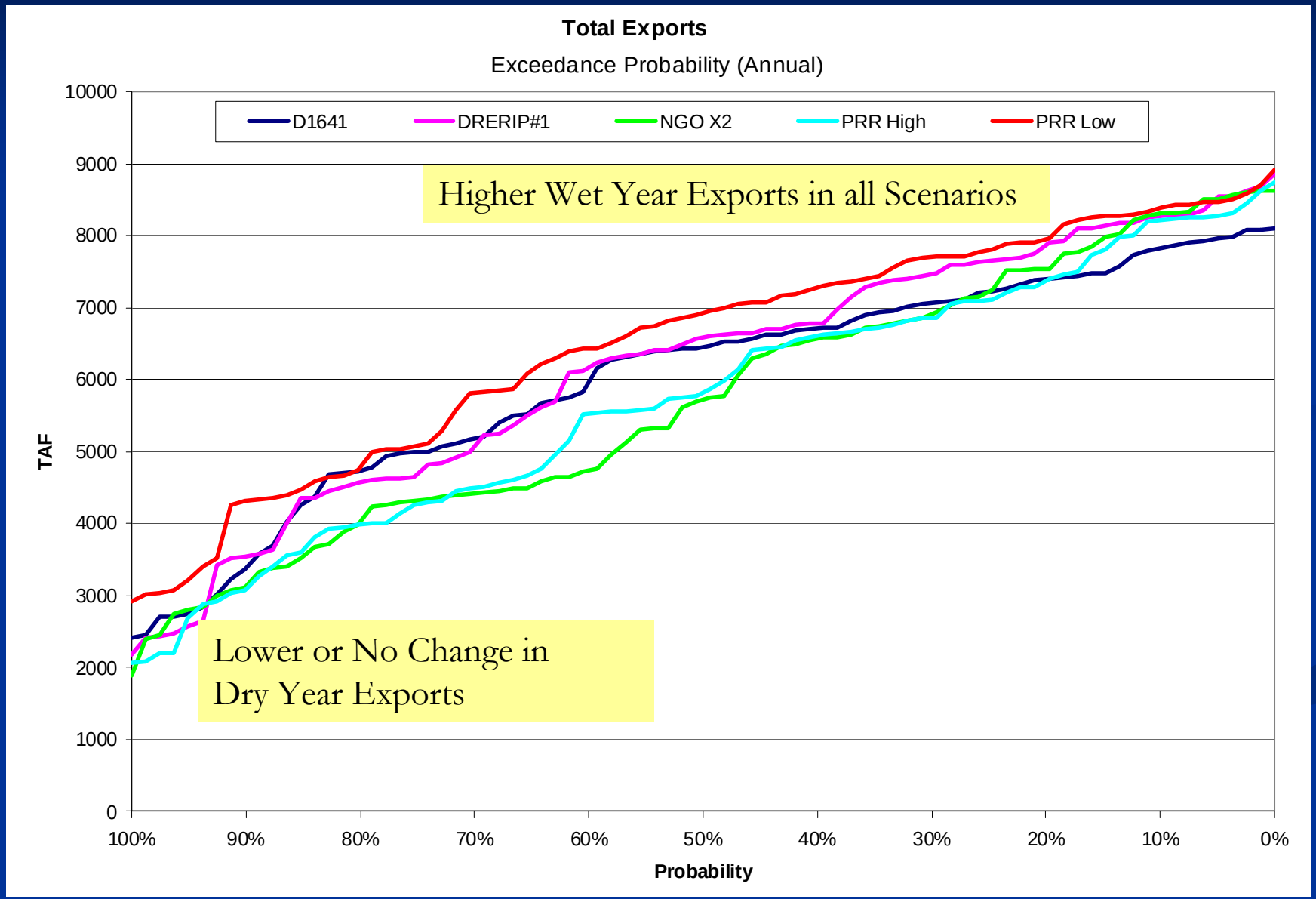
Feb-Jun Average X2 Position



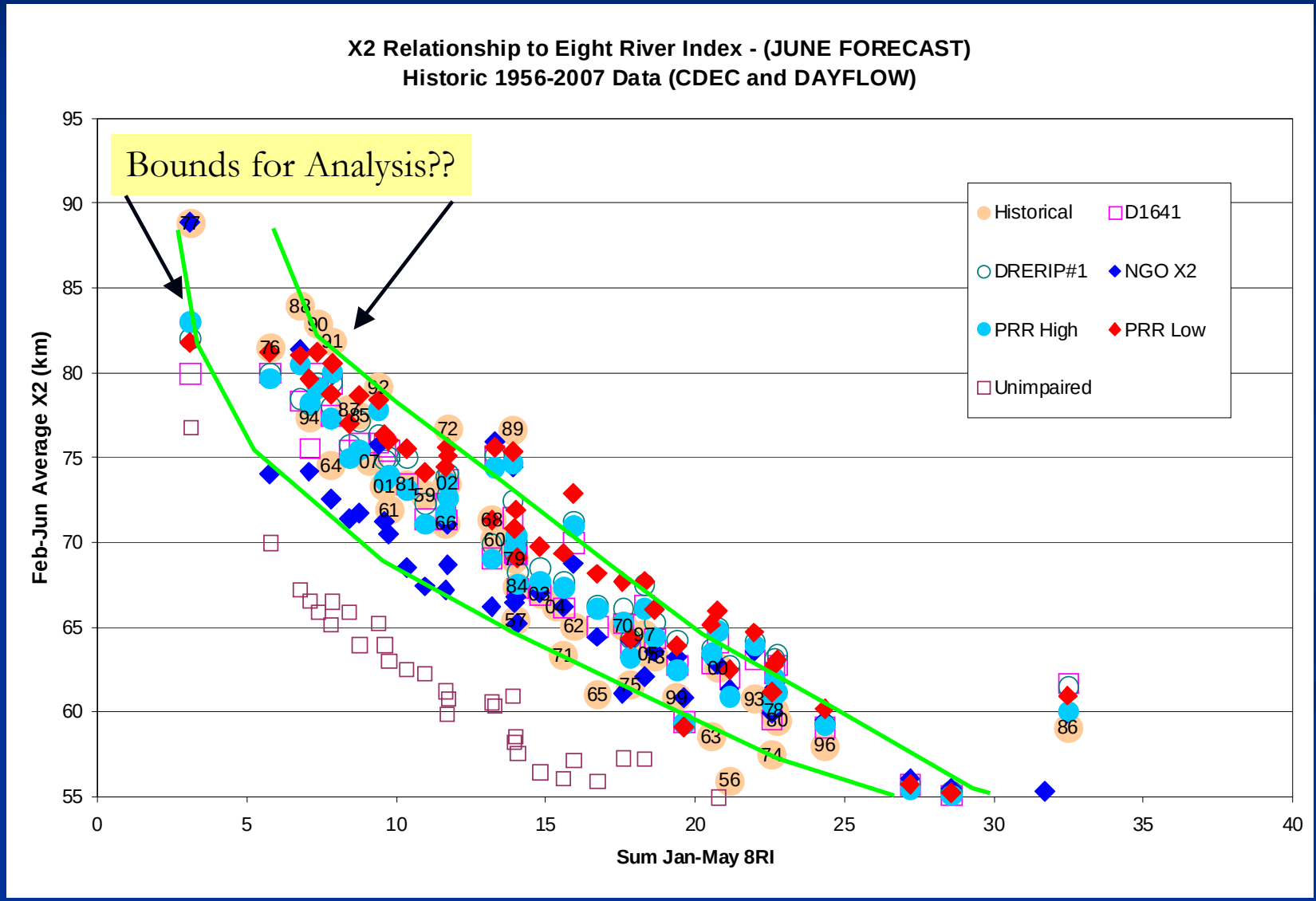
Project Annual Average Exports



Water Supply Reliability



Can Rules be Derived to Describe the Outflow Range?



Next Steps

- PRR scenarios need revision to better target upstream biological objectives
- If a range outflow is desired, then an X2 (or Outflow) vs 8-RI rule can be derived to describe the range
- Mechanism for achieving Delta flows will be necessary to describe impacts, both positive and negative