An Assessment of CVP-SWP System Performance Under Alternative Delta Regulations, Infrastructure and Climate Change Scenarios Using CalSim II

California Water and Environmental Modeling Forum

Feb. 22, 2010

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Water Resources Challenges Identified

- Delta Health
- Climate Change
- Drought

Water Resources Management Responses

- New Delta Conveyance
- New Storage
  - Surface Storage
  - Groundwater Banking

Five Base Scenarios

1. D1641
2. Wanger Restrictions
3. BDCP
4. North-of-the-Delta Offstream Storage (NODOS)
5. SOD Groundwater Bank

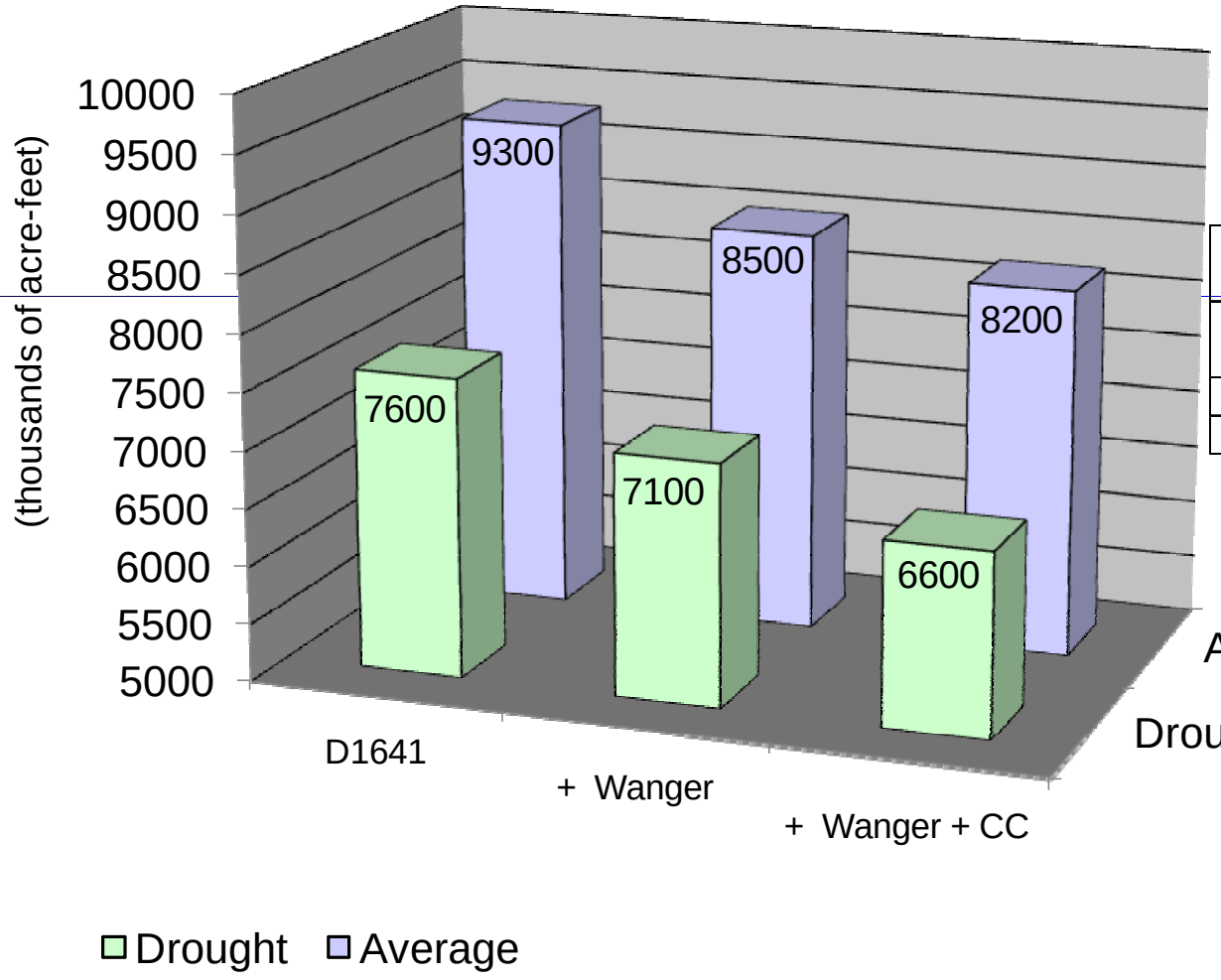
Five Scenarios With Climate Change

- Future Scenarios with one representative climate change scenario (with 1 foot Sea Level Rise) created from each base scenario (except for D1641 base study)
- One Future Scenario with CAT selected 12 climate change scenarios

General Study Assumptions

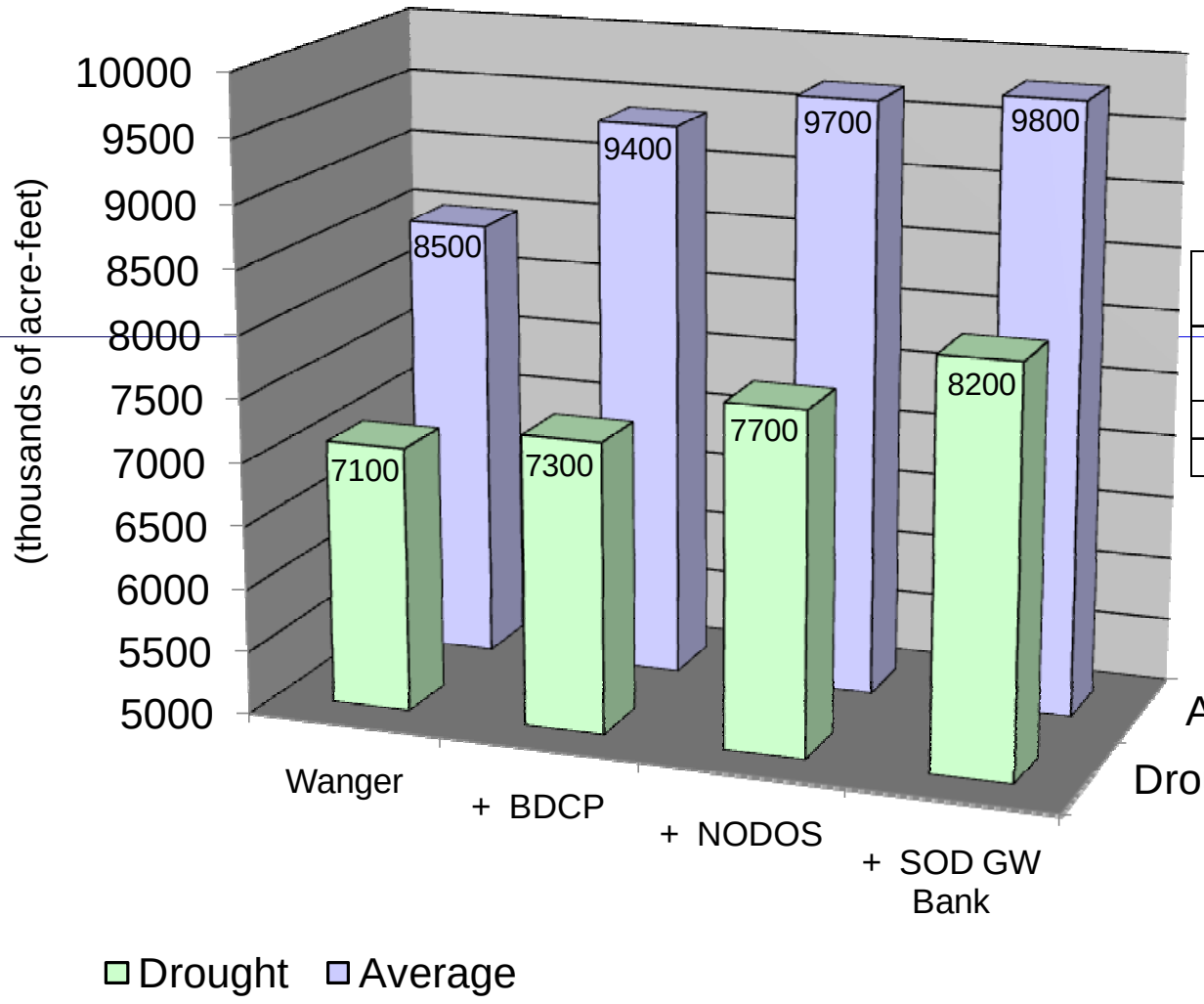
- 2030 Level Of Development (Sac and SJ Valley Land Use and Demands Fixed)
- D1641 Regulations and Operations Criteria
- Present COA Maintained
- CVPIA 3406 (b)(2) Discretionary Actions Modeled
- CVP Demands Per Contract
- SWP demands – Full Table A and Article 21 (to extent possible)

Total CVP & SWP Deliveries (NOD and SOD)



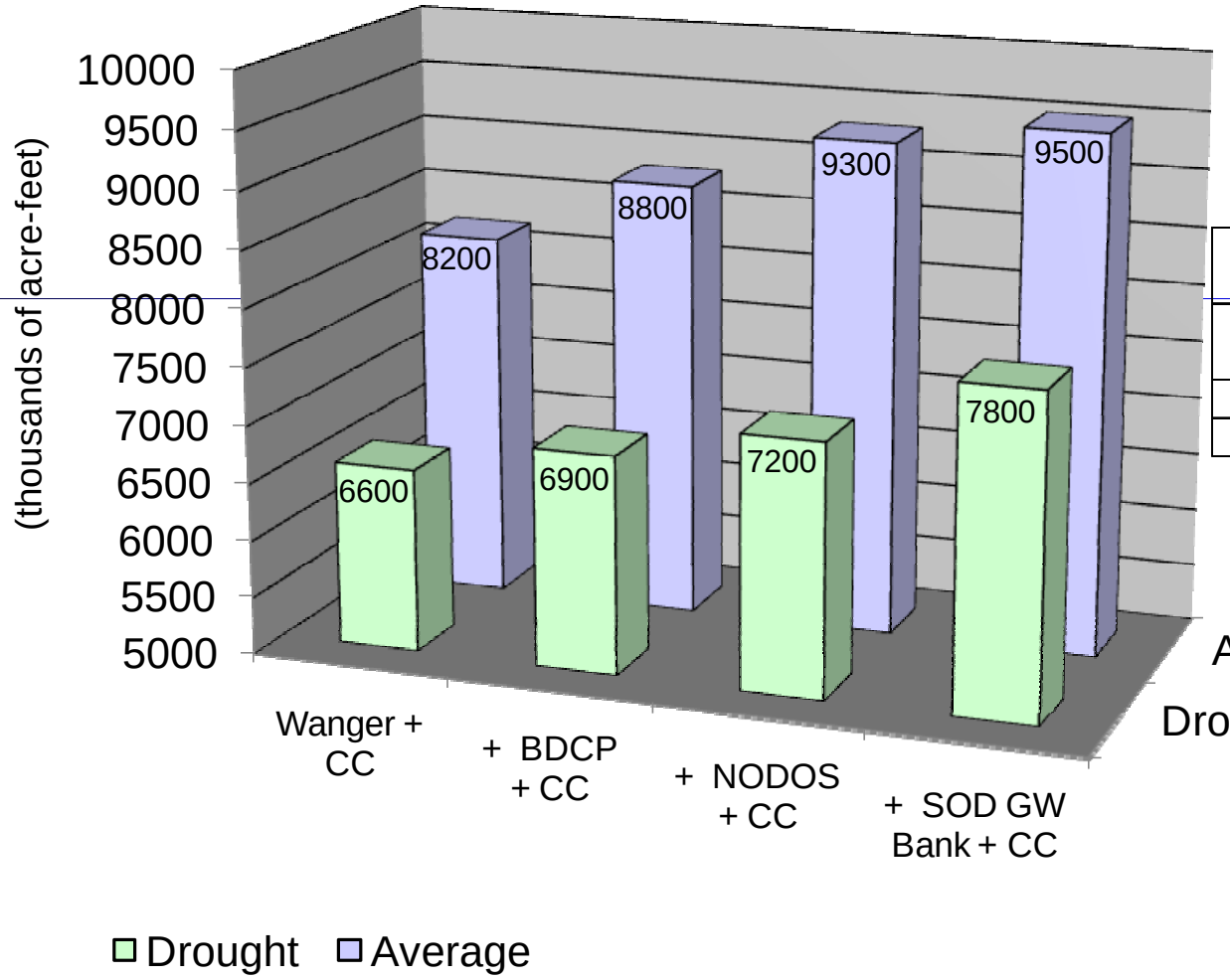
Changes from D1641			
Period	Wanger	CC	Wanger + CC
Average	-800	-300	-1100
Drought	-500	-500	-1000

Total CVP & SWP Deliveries (NOD and SOD) With New Facilities



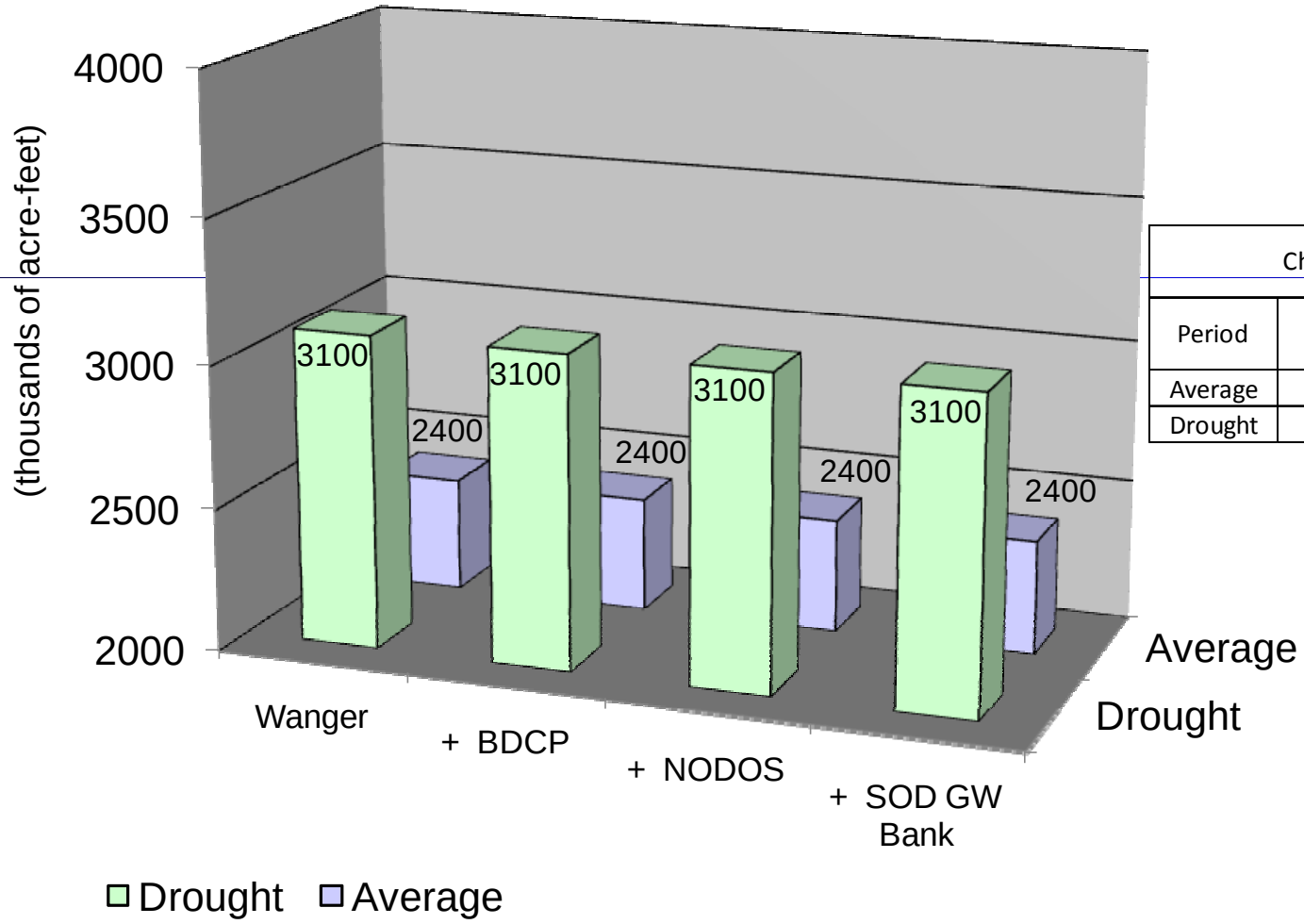
Changes from Wanger			
Period	BDCP	NODOS	SOD GW Bank
Average	900	1200	1300
Drought	200	600	1100

Total CVP & SWP Deliveries (NOD and SOD) With New Facilities and Climate Change



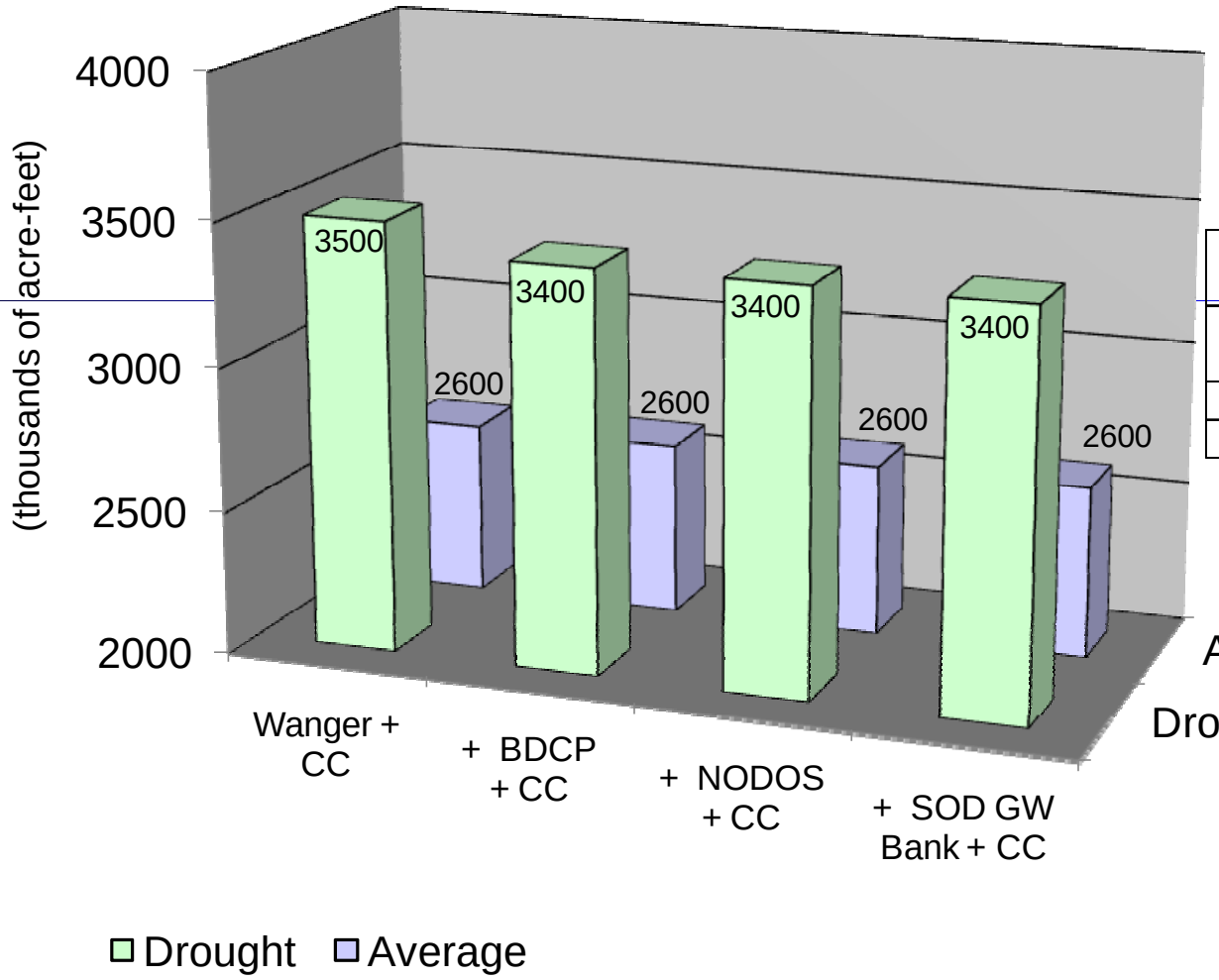
Changes from Wanger + CC			
Period	BDCP + CC	NODOS + CC	SOD GW Bank + CC
Average	600	1100	1300
Drought	300	600	1200

Sacramento Basin Groundwater Pumping Without Climate Change



Changes from Wanger			
Period	BDCP	NODOS	SOD GW Bank
Average	0	0	0
Drought	0	0	0

Sacramento Basin Groundwater Pumping With Climate Change

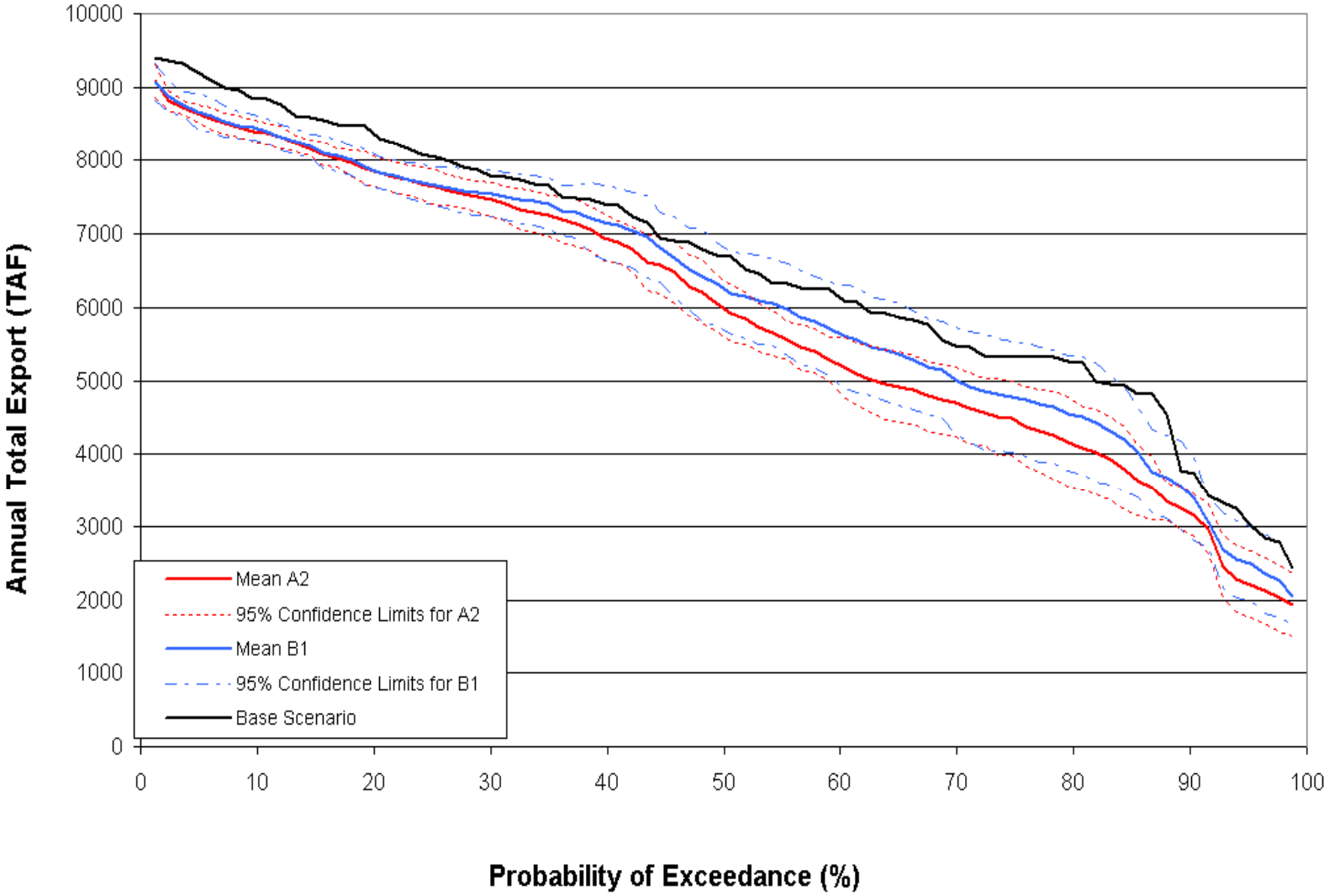


Changes from Wanger + CC			
Period	BDCP + CC	NODOS + CC	SOD GW Bank + CC
Average	0	0	0
Drought	-100	-100	-100

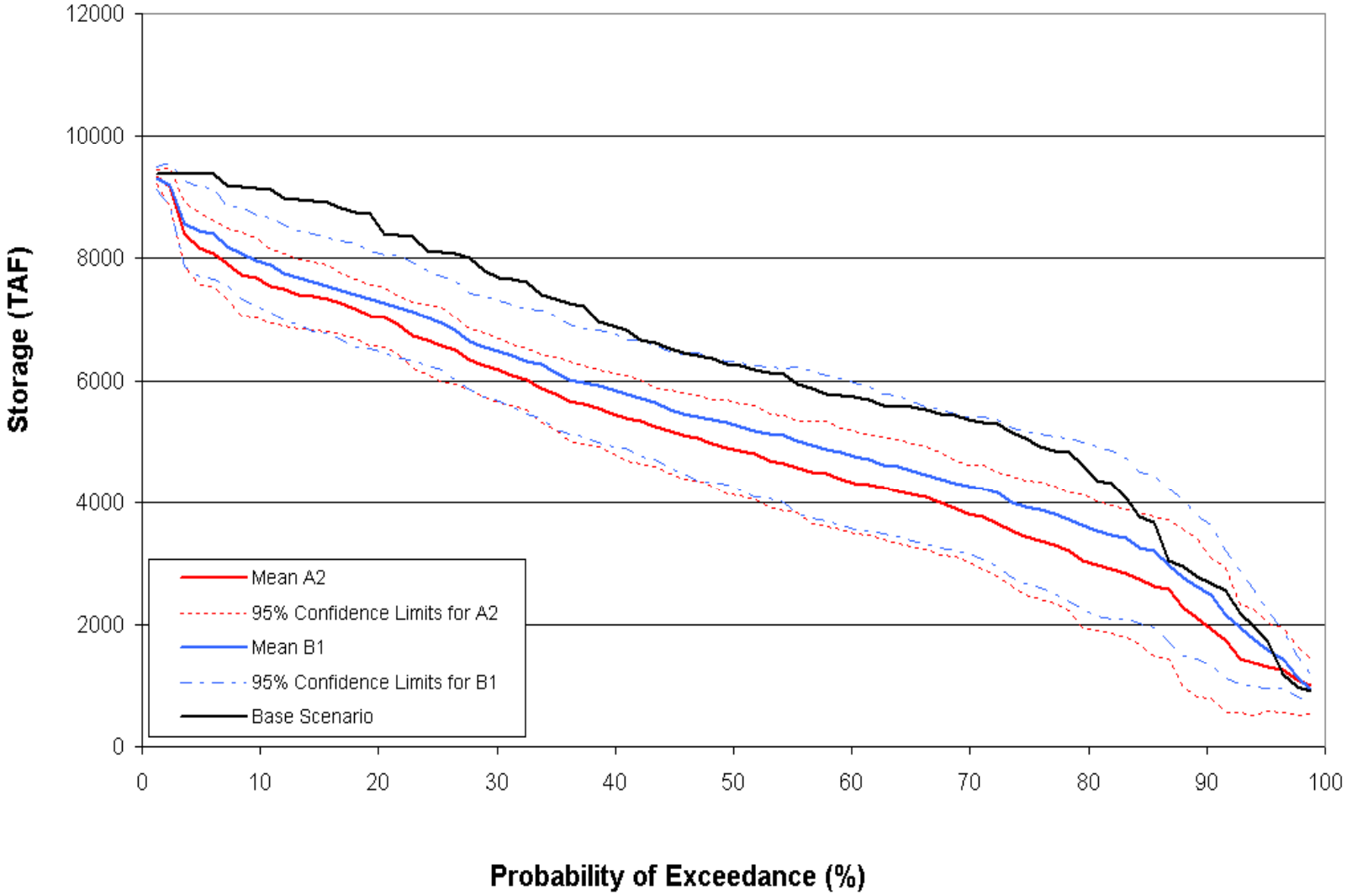
Numbers of Dead Storage Months for North-of-Delta Reservoirs from Climate Change

Scenario	Trinity	Shasta	Oroville	Folsom	Total
D1641	3	6	0	6	15
(+) Wanger with CC	9	24	21	25	79
(+) BDCP with CC	12	21	10	39	82
(+) NODOS with CC	15	24	17	42	98
(+) SOD GW Bank with CC	17	27	23	46	113

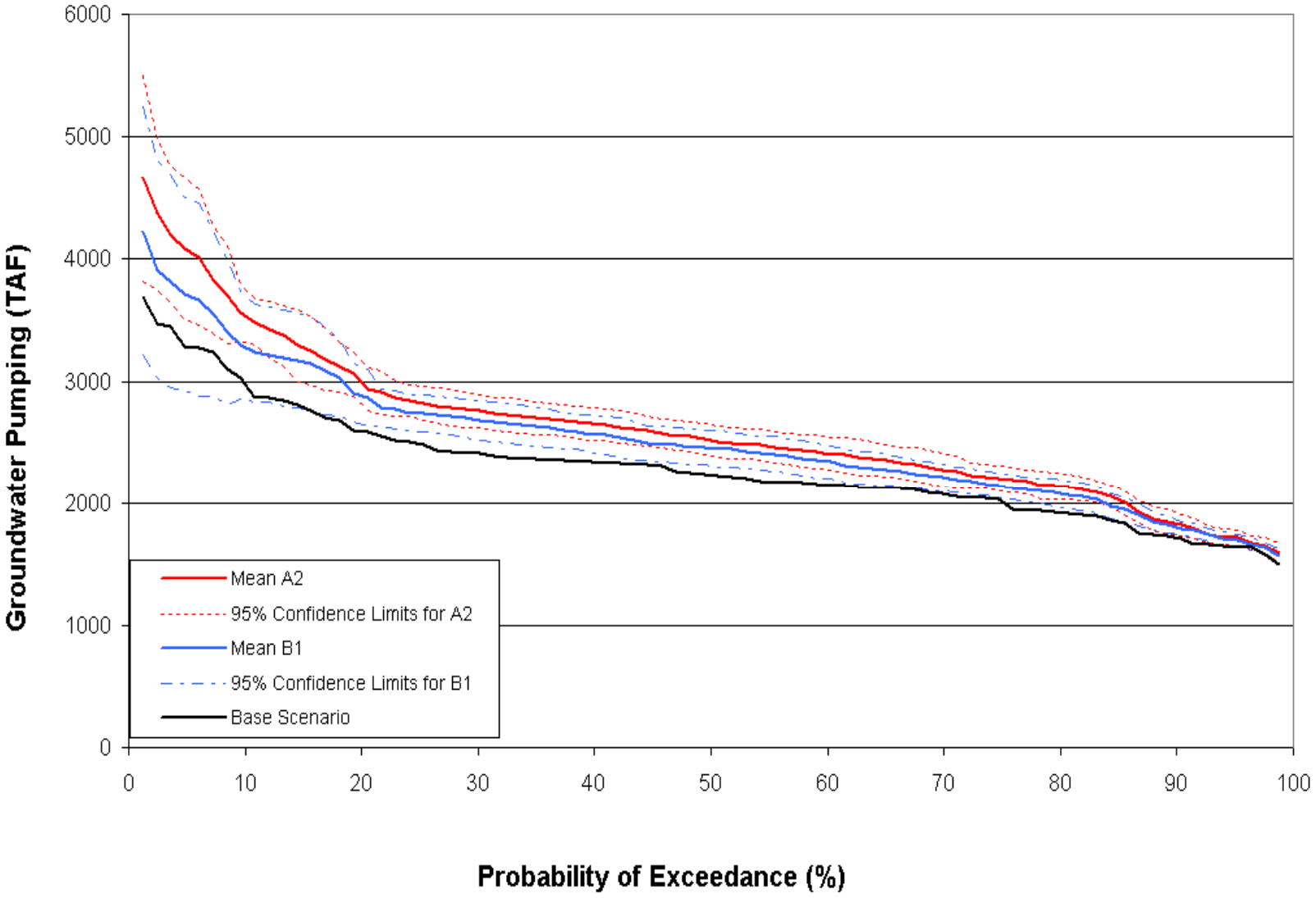
BDCP Scenario with New Storage (NODOS and SOD GW Bank)
Annual Delta Export Exceedance Curves for Mid-Century



BDCP Scenario with New Storage (NODOS and SOD GW Bank)
Mean NOD Carryover Storage Exceedance Curves for Mid-Century



BDCP Scenario with New Storage (NODOS and SOD GW Bank)
Annual GW Pumping Exceedance Curves for Mid-Century



Sensitivity Analysis on Climate Change Impacts for BDCP Scenario (No Project exports from storage withdrawals)

	Sacramento Basin GW Pumping		Total Exports		Delta Outflow	
Scenario	Long Term	Dry & Critical	Long Term	Dry & Critical	Long Term	Dry & Critical
BDCP No CC	2399	2862	6040	4277	14679	6121
BDCP With CC (EXP1 = 0)	2578	3038	5117	3596	16211	6828

EXP1 = 0 implies no storage release made for exports

Sensitivity Analysis on Climate Change Impacts for BDCP Scenario (No Project exports from storage withdrawals) (continued)

Number of Months at Dead Storage

Scenario	Trinity	Shasta	Folsom	Oroville
BDCP No CC	2	7	11	0
BDCP With CC (EXP1 = 0)	6	14	17	0

EXP1 = 0 implies no storage release made for exports

Summary Observations

- New conveyance and new storage provide reliability benefits under most future scenarios.
- New conveyance performs best under average non-climate changed conditions.
- New storage provides the greatest supply reliability benefits under drought or climate-changed conditions.

Observations (continued)

- New groundwater storage performs similarly, with even greater drought year performance. New groundwater storage performs best during both climate-changed and drought conditions.
- A range of IRWM implementations do not appear to significantly affect Delta operations or deliveries.
- Results appear to be unsustainable. The relative frequency of dead storage conditions in upstream reservoirs indicate that significantly modified operations will be required with climate-changed conditions.

Recommendations

- ***We recommend that DWR develop a reoperation strategy for the CVP and SWP that includes modified operations scenarios to mitigate the effects of dead storage during climate change conditions prior to release of any studies (either these or BDCP) that include climate change.***
- ***We recommend that economic modeling and results be completed and included with prepared information.***