



STRATECON
INC.

The Economic Consequences of the Proposed Flow Objective for the Lower San Joaquin River in Merced, San Joaquin and Stanislaus Counties

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SWRCB Hearing on Draft Substitute Environmental Document

Modesto, CA

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Stratecon versus SWRCB Methods

- Groundwater pumping and lost surface water supplies
- Volatility of impacts
- Impacts on well elevations
- Downstream Linkages from the farm sector

Groundwater pumping and lost surface water supplies

- SWRCB: groundwater pumping increases to fully offset lost surface water supplies until groundwater pumping capacity exhausted with no consideration of implementation of the Sustainable Groundwater Management Act (“SMGA”)
- Stratecon: groundwater pumping increases to offset half of lost surface water supplies until groundwater capacity exhausted before SGMA implementation
 - Reflects almost quarter of century of evidence from Westlands Water District’s response to the variability in reduced surface water supplies
 - Increased groundwater pumping not sustainable after SMGA implementation

Volatility of Impacts

- Study area faces variable hydrologic conditions
- SWRCB: examines each water year separately and focuses on the average over all hydrologic conditions
- Stratecon: volatility of impacts has consequences
 - Reliability of surface water supplies
 - Sustainability of groundwater pumping before and after SMGA implementation

Impacts on Well Elevations

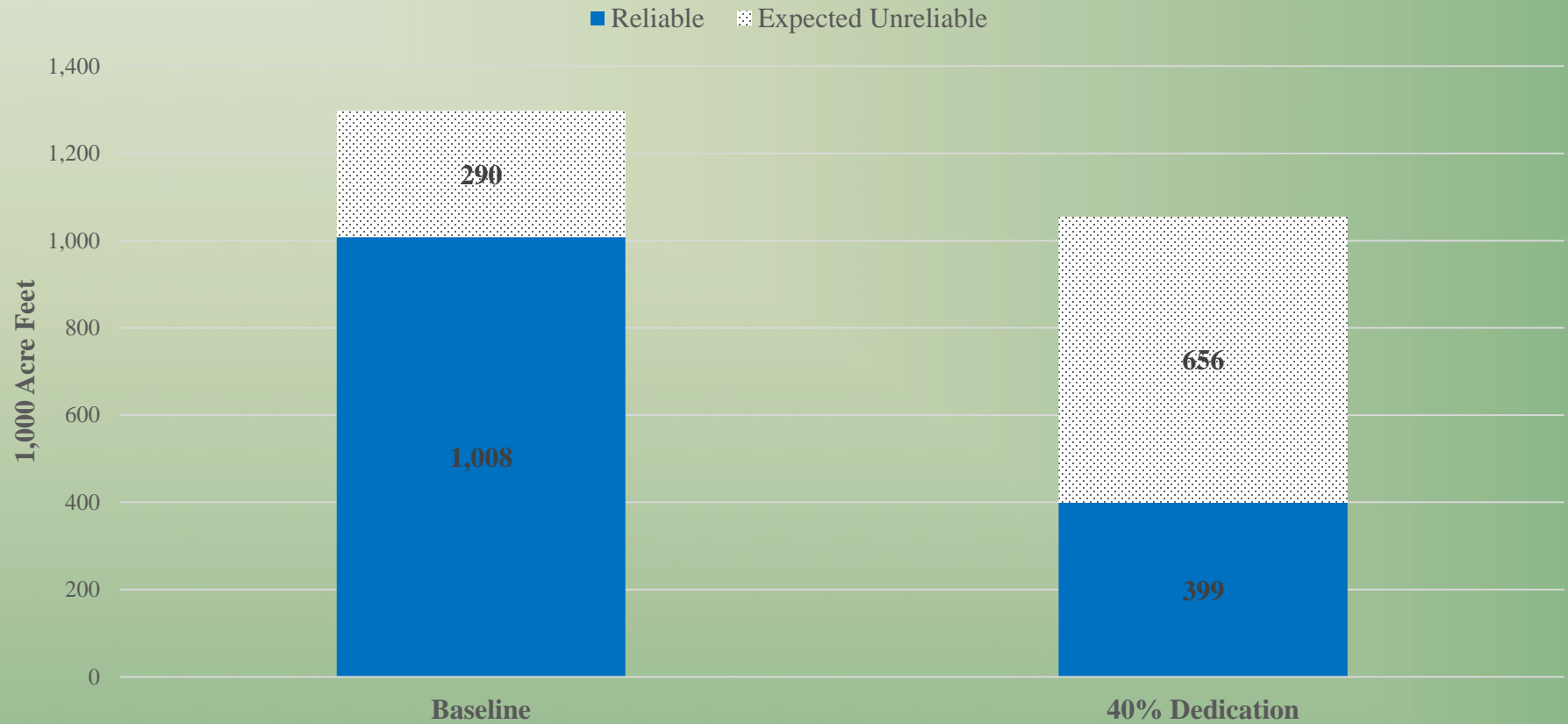
- SWRCB acknowledges that proposed flow objective will have significant and unavoidable adverse impacts on groundwater resources
- SWRCB: no quantification of impacts
- Stratecon: quantifies impact on groundwater elevations based on evidence from the impact of variability in surface water supplies available to Central San Joaquin Water Conservation District on groundwater elevations in San Joaquin County
 - Lower well elevations increase pumping costs for all water users

Downstream Linkeages from farm sector

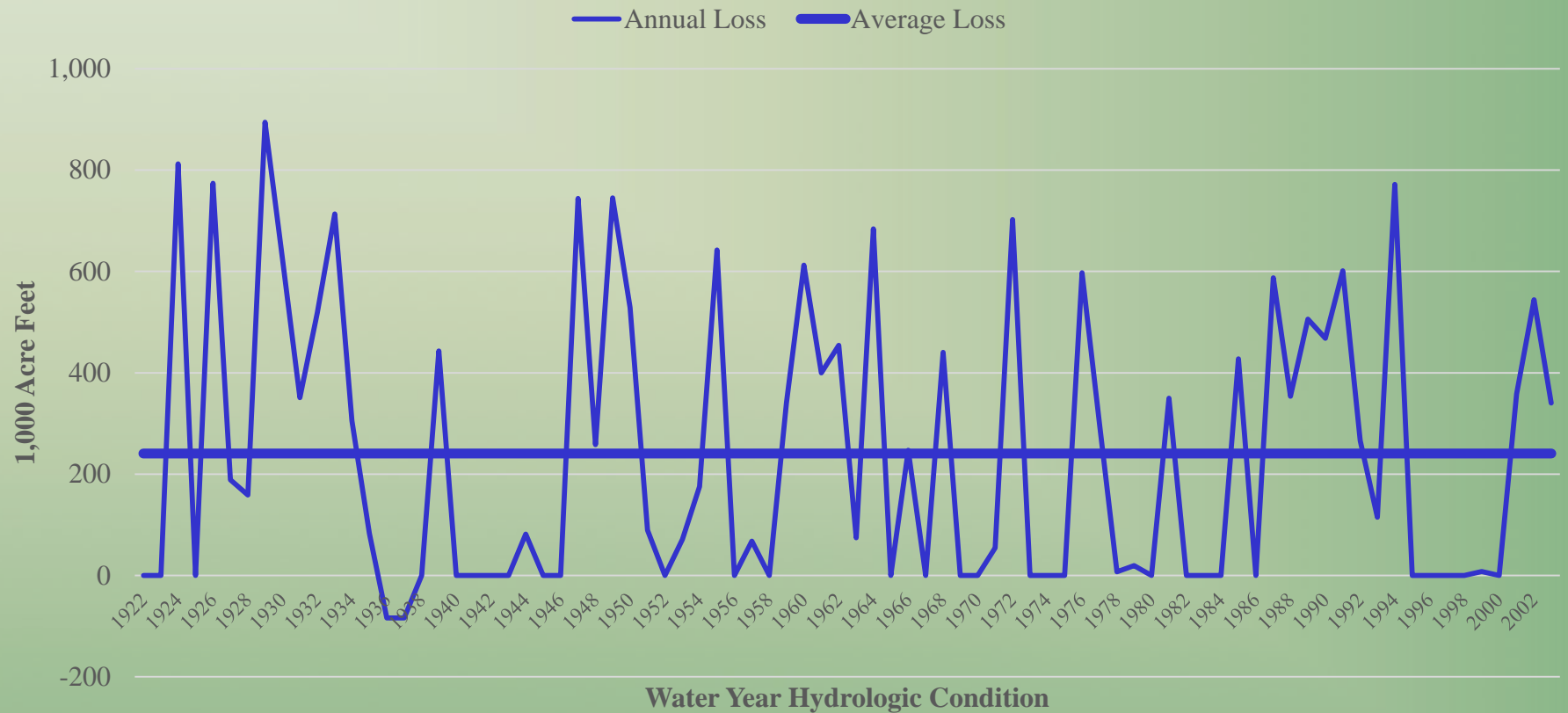
- Significant economic activity in dairy, livestock, food processing
- SWRCB: not considered
- Stratecon: considered

Surface Water Supply Reliability

Annual Reliable and (Expected) Unreliable Surface Water



Annual Loss of Surface Water Supplies Are Volatile

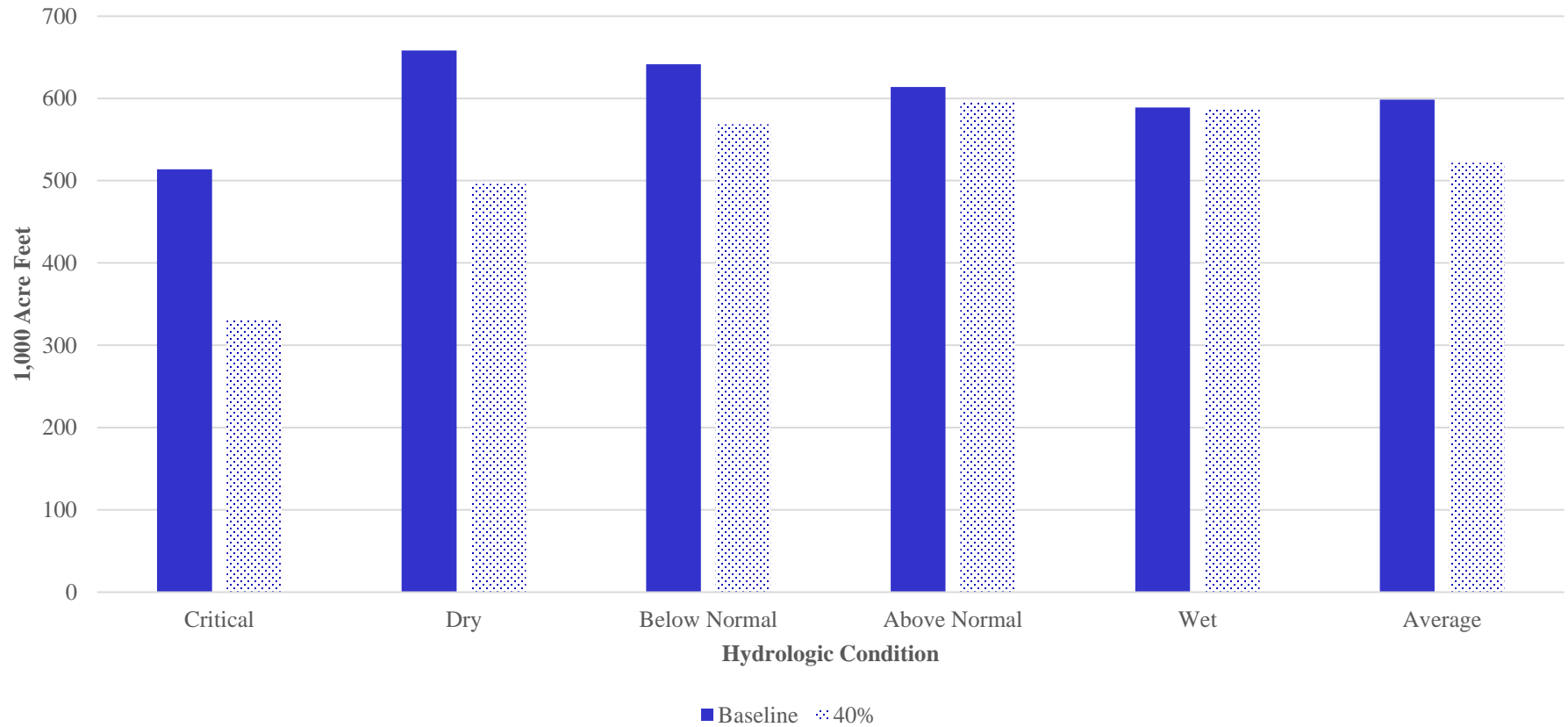


Groundwater Sustainability

All Sub-basins experiencing declining well elevations and are over drafted

Sub basin	Well Level Decline (inches/year)	Well Level Decline (inches/year)	Overdraft (TAF/year)
Eastern San Joaquin	20.0	5.3	88
Modesto	6.0	17.0	11 to 15
Turlock	2.8	20.0	9 to 85
Merced	12.0	27.0	22 to 44
Time Period	1970-2000	2005-2010	

Annual Recharge from Distribution Losses and Deep Percolation in Study Area

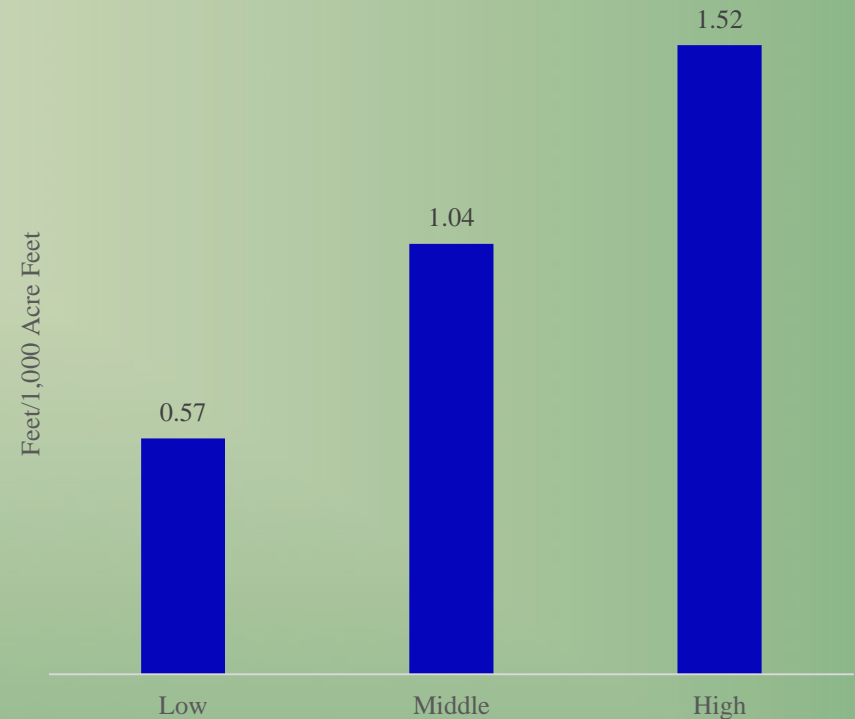


Proposed Flow Objective and Well Elevations

Lessons from New Melones Litigation

- Natural experiment for assessing impact of surface water deliveries on well elevations
- Declining trend in well elevations in Central San Joaquin bottomed out with initiation of surface water deliveries
- Large variability in surface water deliveries explains annual variability in well elevations (see chart)

Impact of Surface Water Deliveries on Central San Joaquin Well Elevations



Reduced Well Elevations from Proposed Flow Objective

<i>District</i>	<i>Critical</i>	<i>Dry</i>	<i>Below Normal</i>	<i>Above Normal</i>	<i>Wet</i>
Central San Joaquin	10 to 20	20 to 45	5 to 10	0 to -2	0 to -4
Stockton East	2 to 5	12-38	-2 to -9	-2 to -5	-1 to -4
S. San Joaquin ID	30 to 80	10 to 30	8 to 18	8 to 15	1 to 3
Oakdale ID	45 to 118	19 to 42	10 to 22	10 to 22	1 to 3
Modesto ID	38 to 92	35 to 90	20 to 45	3 to -10	0 to 1
Turlock ID	32 to 82	30 to 80	15 to 40	3 to 9	none
Merced ID	35 to 80	60 to 140	22 to 60	1 to 3	none

Economic Impact Analysis

ECONOMIC OUTPUT AND EMPLOYMENT

SWRCB QUANTIFIED

+

SWRCB DID NOT QUANTIFY

Increased Groundwater Pumping (Cost)

Just Irrigation Districts with Surface Supplies



Increased Groundwater Depths (Cost)

Irrigation Districts and All Other Regional Water Users

Crop Sector Losses

Just Irrigation District growers



Other Sector Losses (Forward Linkages)

Dairies, Dairy Product Manufacturers, Livestock Producers, etc.)

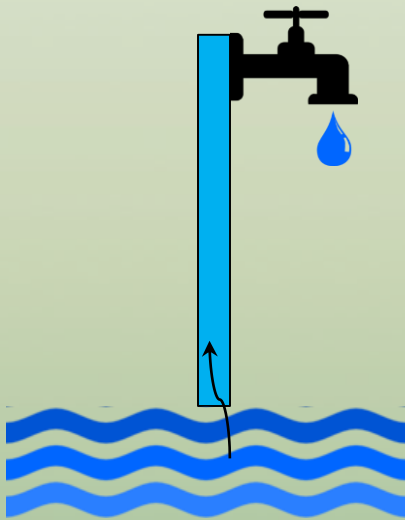
Groundwater Pumping Limited Only by Capacity



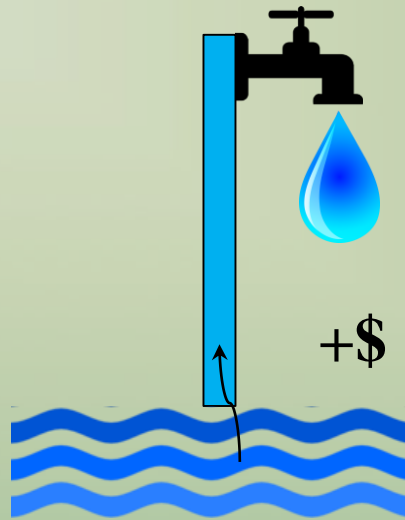
Sustainable Groundwater Management Act ("SGMA")

Increased Groundwater Depths

CURRENT

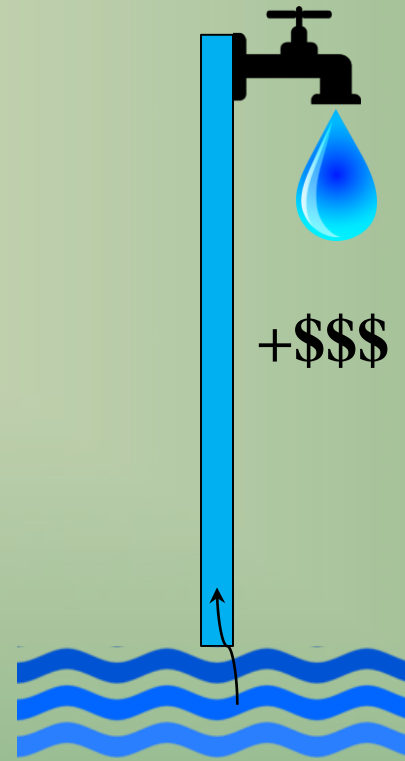


SWRCB



Just Those Reliant on
Surface Water

ACTUAL



All Regional Water Users

Increased Groundwater Depths

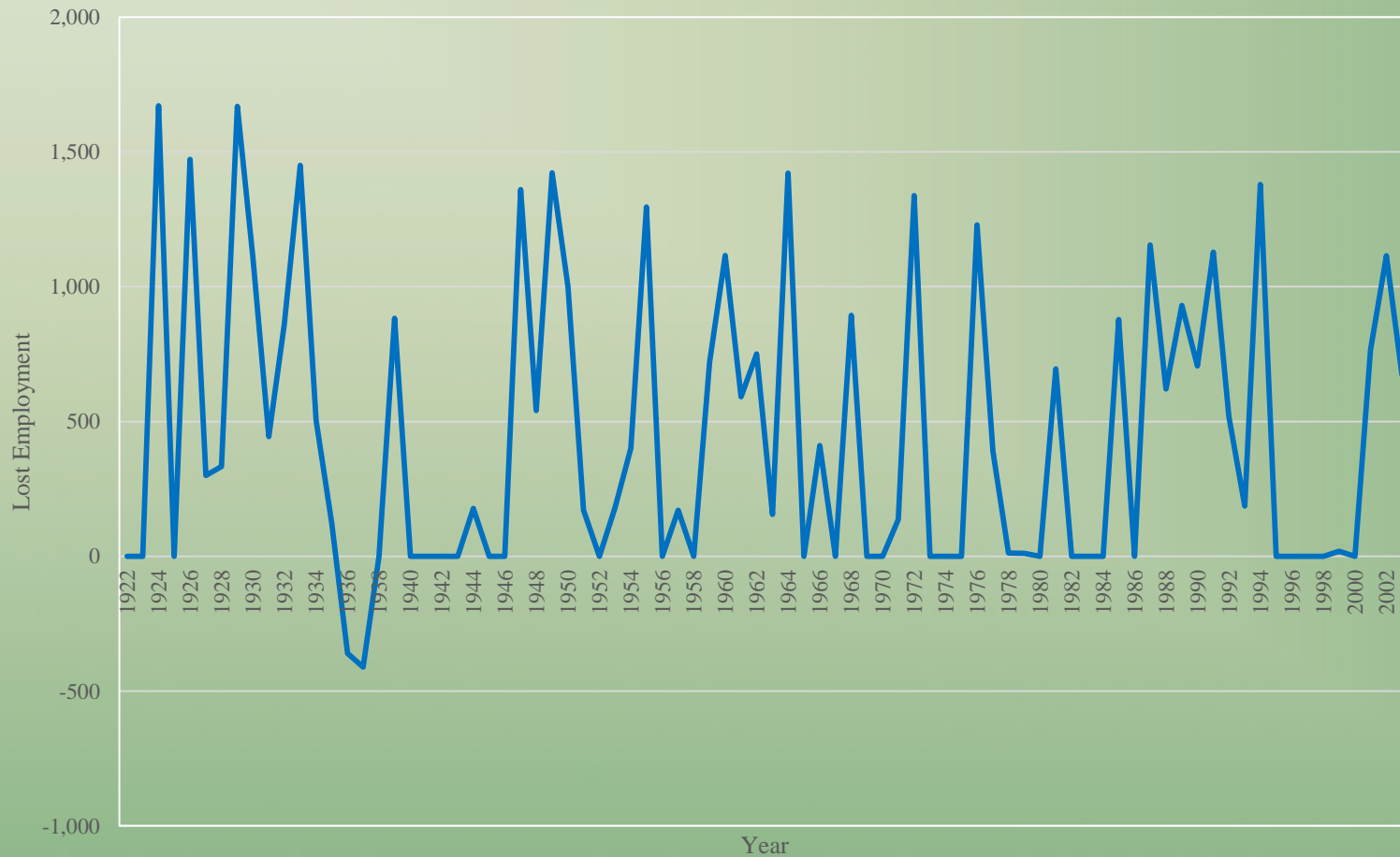
Irrigator Impacts

Increased Groundwater Depths - Farmers

User	Baseline Groundwater Pumping (000's of Acre-Feet)	Irrigated Acres (Acres)
Irrigation Districts	258	512,229
Outside of Irrigation Districts	1,466	531,431

Increased Groundwater Depths - Irrigation

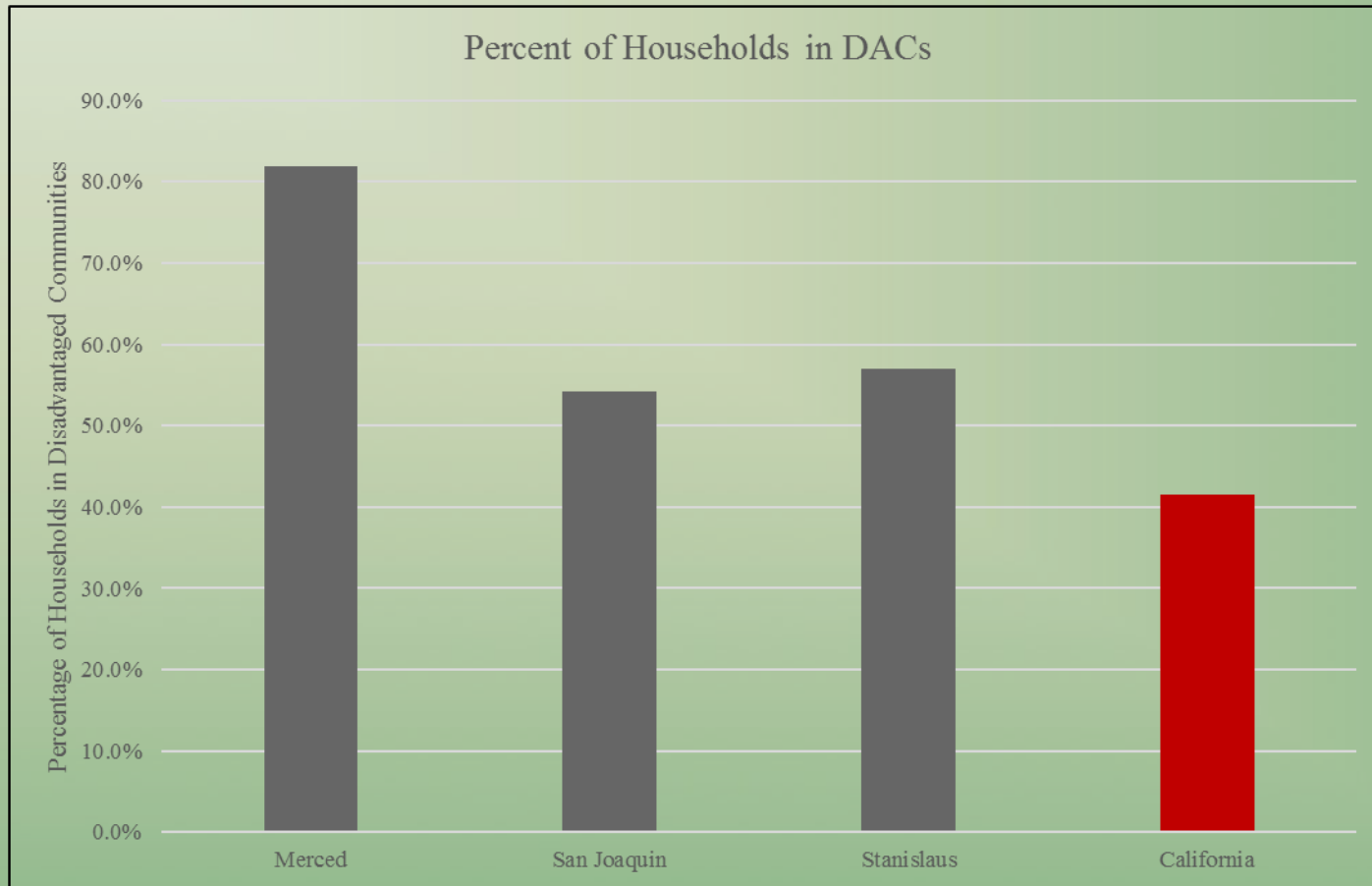
Upper Bound Lost Employment due to Irrigator Pumping Cost Impacts



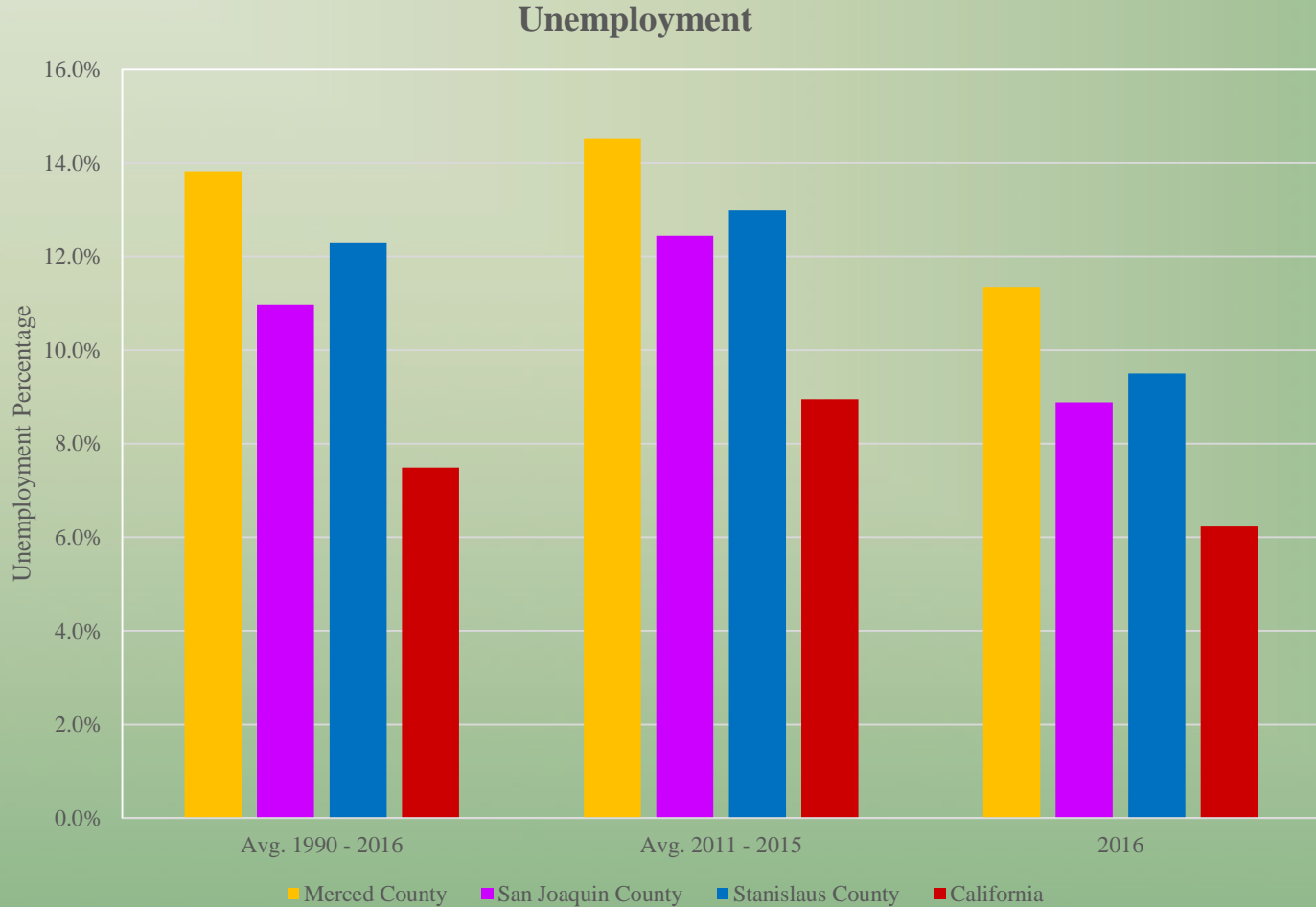
Increased Groundwater Depths

Community Impacts

Increased Groundwater Depths - Communities

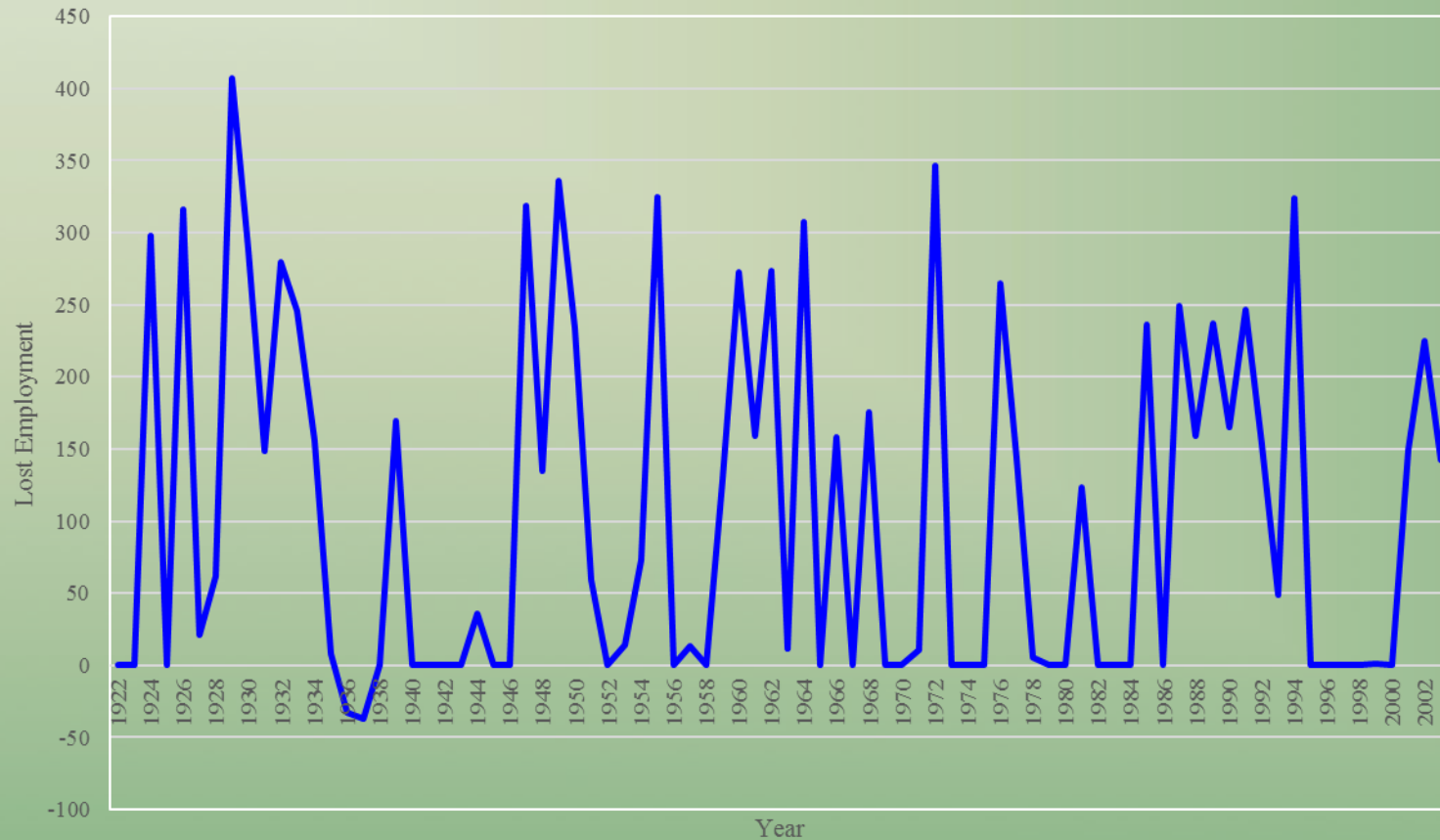


Increased Groundwater Depths - Communities



Increased Groundwater Depths - Communities

Upper Bound Lost Employment due to Community Pumping Cost Impacts

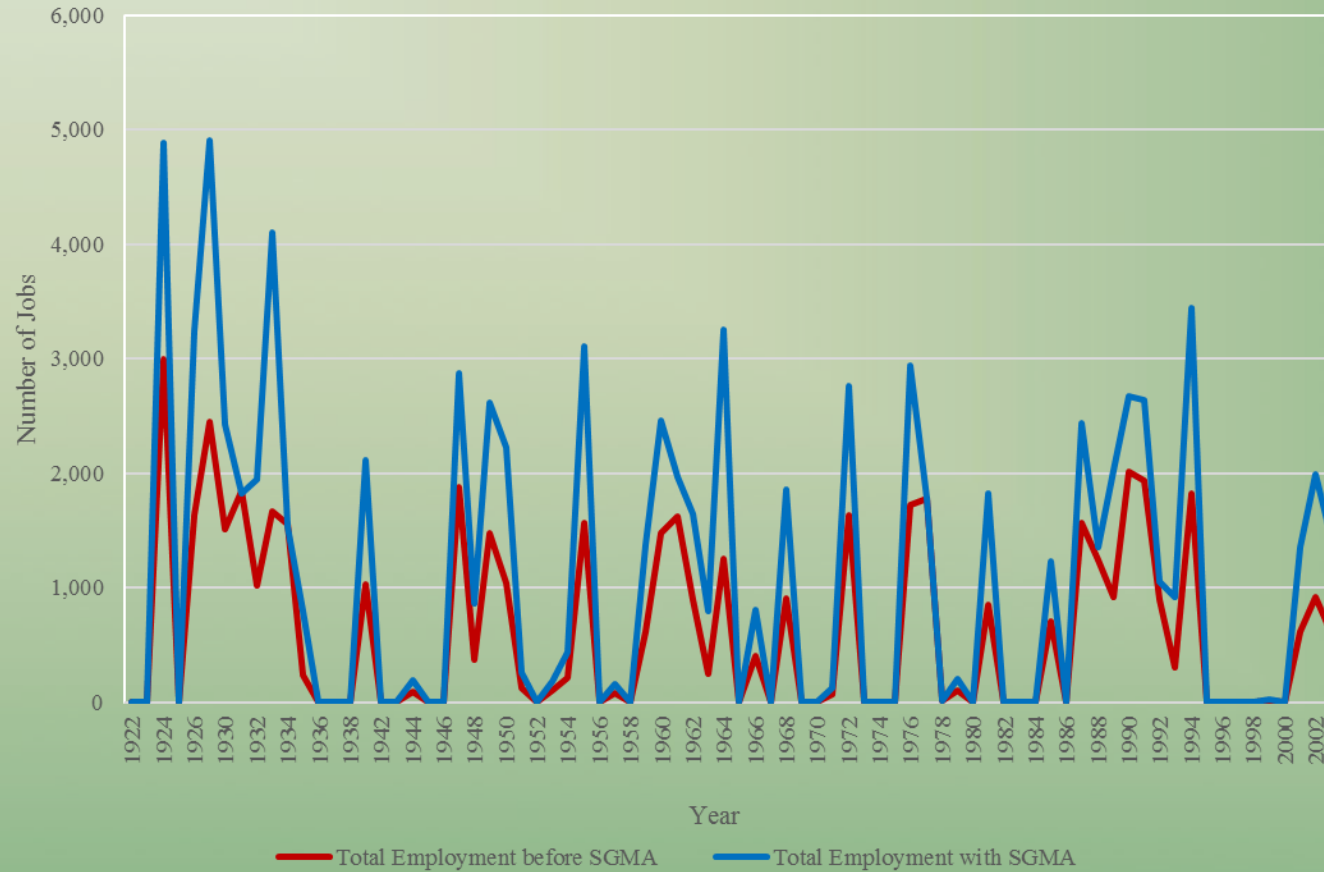


Forward Linkages

Crop Production Impacts

Crop Production Impacts

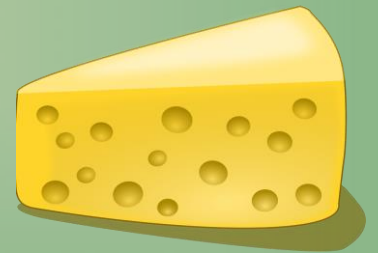
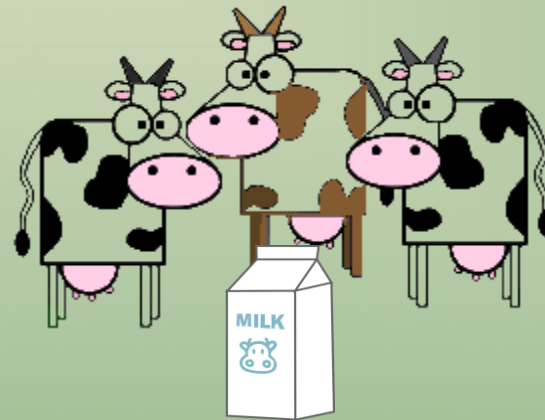
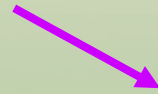
Lost Jobs due to Lost Crop Production



Forward Linkages

Forward Linkage Impacts

Forward Linkages



Forward Linkages

Merced County	
Company	Business Activity
Foster Farms	Poultry Production and Processing
Hilmar Cheese	Cheese Production
Live Oak Farms	Merchant Wholesale of Fresh Fruits and Vegetables
Gallo Cattle	Cheese Production
Liberty Packing Company	Packing and Transport of Farm Products

San Joaquin County	
Company	Business Activity
Leprino Foods Company	Cheese Production
Morada Produce Company	Merchant Wholesale of Fresh Fruits and Vegetables
O - G Packing & Cold Storage	Merchant Wholesale of Fresh Fruits and Vegetables
Pacific Coast Producers	Canning and Food Processing

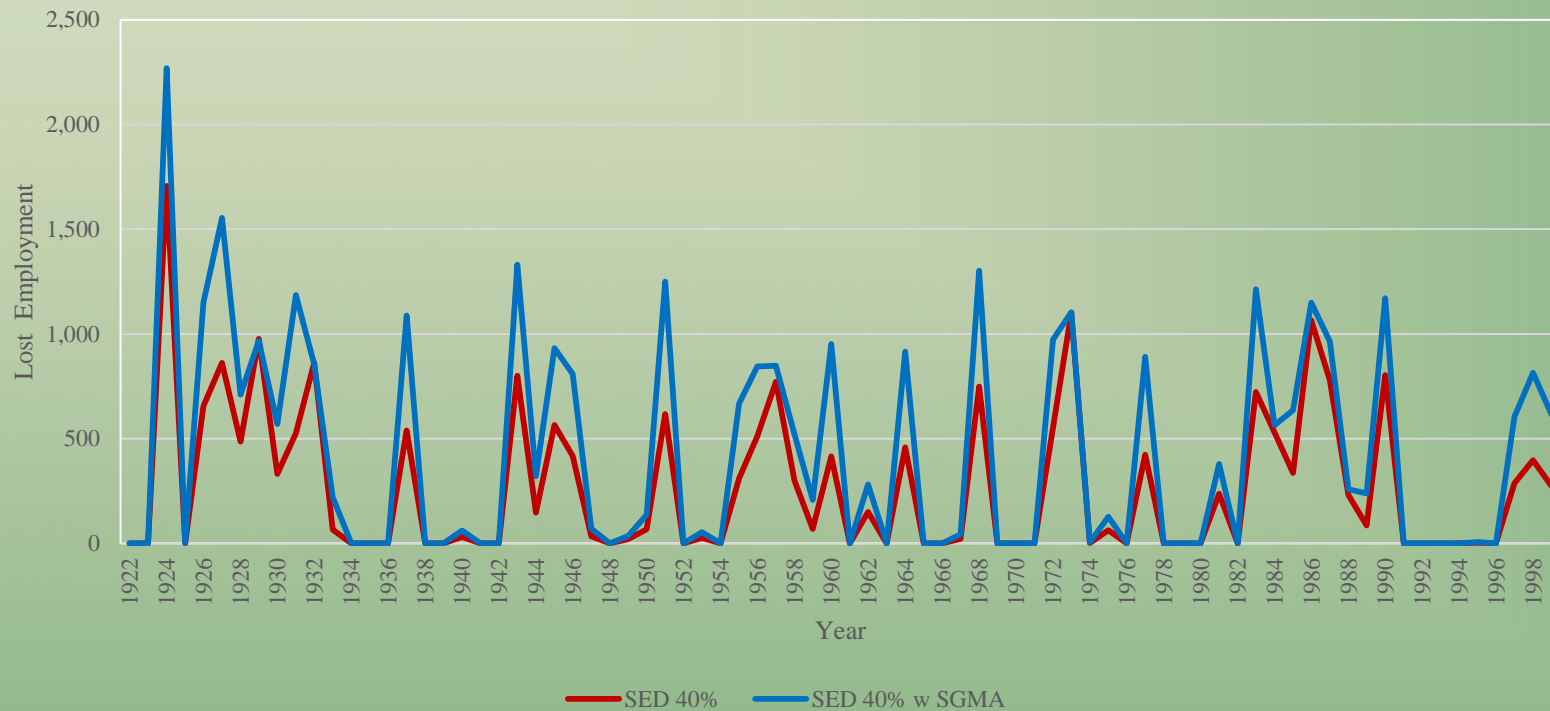
Stanislaus County	
Company	Business Activity
Del Monte Foods	Canning and Food Processing
Con Agra Foods	Canning and Food Processing
Ecco Domani	Wine Production
Foster Farms	Poultry Production and Processing
Frito-Lay	Merchant Wholesale of Nuts, Potato Chips, etc.

Forward Linkages

Dairy Sector

- Relies on locally produced feed (corn silage, hay, etc.)

Lost Employment Associated with Upper Bound Lost Dairy Sector Production



IMPACT SUMMARY

Average During Study Period	Before SGMA			With SGMA		
	Lost Revenues/ Increased Cost (2015\$)	Total Lost Output (2015\$)	Total Lost Jobs	Lost Revenues/ Increased Cost (2015\$)	Total Lost Output (2015\$)	Total Lost Jobs
Impact Category						
Reduced Crop Production Irrigation Districts	\$ 58,110,593	\$ 102,223,488	619	\$ 101,279,043	\$ 178,019,040	1,082
Reduced Dairy & Livestock Sector Production (Upper Bound)	\$ 55,214,118	\$ 99,520,600	341	\$ 83,424,211	\$ 133,263,208	656
Increased Irrigation District Costs (Upper Bound)	\$ 25,310,496	\$ 20,248,397	115	N/A	N/A	N/A
Increased Other Irrigation Costs (Upper Bound)	\$ 73,065,124	\$ 58,452,099	333	N/A	N/A	N/A
Increased Urban Water Costs (Upper Bound)	\$ 23,025,416	\$ 18,420,333	105	N/A	N/A	N/A
Total¹	\$ 234,725,748	\$ 298,864,917	1,513	\$ 184,703,254	\$ 311,282,247	1,738

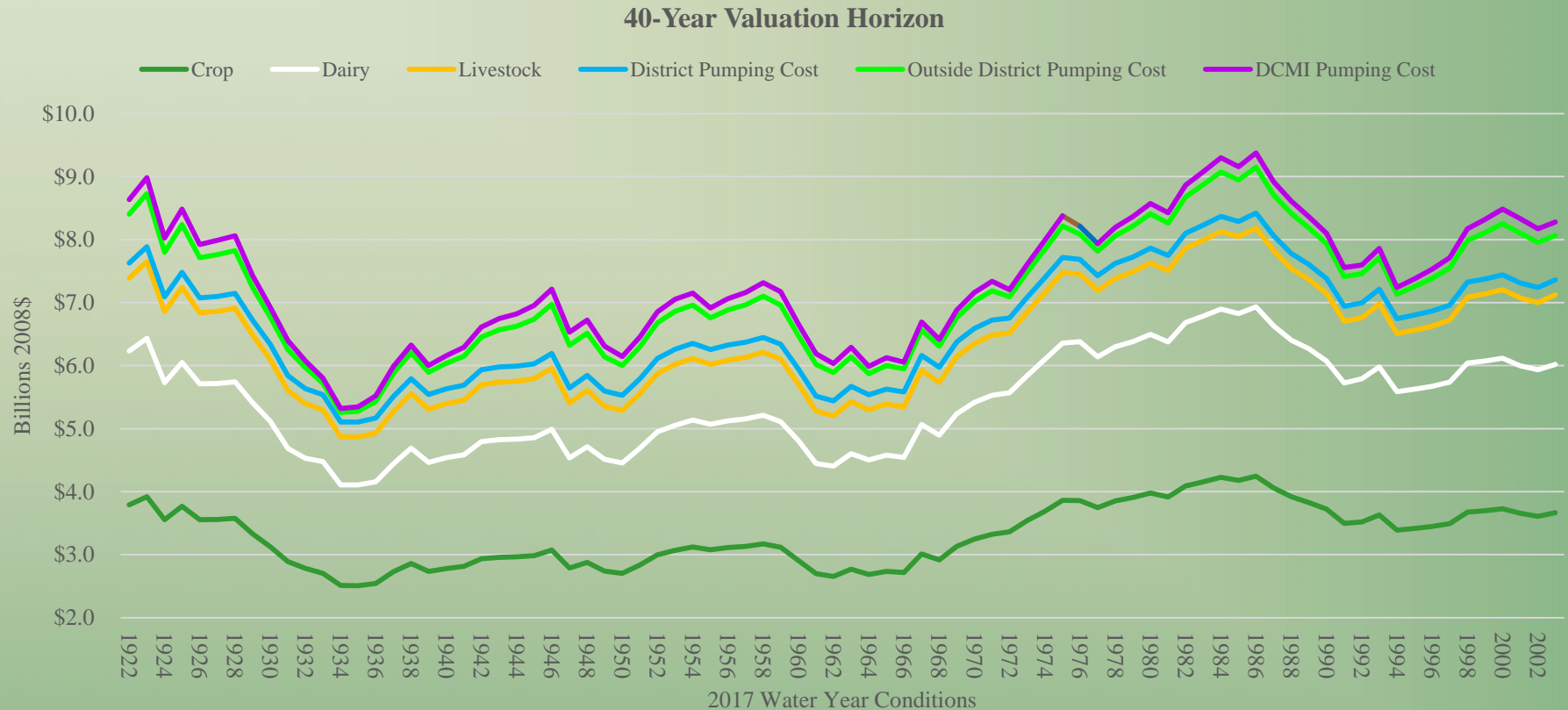
Peak Year of Impacts	Before SGMA			With SGMA		
	Lost Revenues/ Increased Cost (2015\$)	Total Lost Output (2015\$)	Total Lost Jobs	Lost Revenues/ Increased Cost (2015\$)	Total Lost Output (2015\$)	Total Lost Jobs
Impact Category						
Reduced Crop Production Irrigation Districts	\$ 263,306,378	\$ 463,359,118	2,997	\$ 455,275,842	\$ 798,140,076	4,909
Reduced Dairy & Livestock Sector Production (Upper Bound)	\$ 312,704,416	\$ 553,587,317	1,555	\$ 405,980,251	\$ 716,178,153	3,117
Increased Irrigation District Costs (Upper Bound)	\$ 101,513,377	\$ 81,210,701	462	N/A	N/A	N/A
Increased Other Irrigation Costs (Upper Bound)	\$ 270,177,684	\$ 216,142,147	1,230	N/A	N/A	N/A
Increased Urban Water Costs (Upper Bound)	\$ 89,462,327	\$ 71,569,861	407	N/A	N/A	N/A
Total¹	\$ 997,813,713	\$ 1,427,478,702	6,652	\$ 827,217,094	\$ 1,451,218,110	7,817

Future Economic Impacts

Drivers of Future Economic Impacts

- Timing of SED Implementation (2018)
- Timing of SGMA Implementation
 - Start: 2020 (all sub basins high priority)
 - Implementation Period: 2020-2039 (20 years)
- Future Hydrologic Conditions (Monte Carlo study using Sequential Index Method)

Present Value of Lost Economic Output by 2017 Water Condition



Composition of Expected Present Value of Lost Economic Output

<i>Component</i>	<i>Billions</i>	<i>Share</i>
Crop Output	\$3.31	44.0%
Dairy	\$2.12	28.9%
Livestock	\$0.98	13.4%
Increased Pumping Costs		
Inside Irrigation Districts	\$0.24	3.2%
Outside Irrigation Districts	\$0.53	7.2%
DCMI	\$0.17	2.3%
Total	\$7.34	100.0%

Conclusion

- Reliable water supplies is a critical foundation for a community's economic sustainability and growth
- SWRCB's assessment is narrow in scope and completely fails to account for the supply reliability, sustainability and volatility challenges that will confront the counties
- SED implementation will transform the local investment environment from one of relative historical stability to extreme swings in annual conditions
- The deterioration in the economic incentives for investment and employment will herald a retrenchment in local economies
- The consequences of this deterioration are not quantified in the Stratecon study