Exhibit RTD-31
Testimony of Michael Machado

Outline

- Relationship of the Delta Economic Sustainability Plan (DESP) to Change Petition
- Delta Agricultural Economic Background
- Method of Modeling Crop Patterns in the Delta
- Impacts of Salinity Changes in South Delta
- Independent Review of the DESP Study
- Direct Answers to Petition Hearing Prompts

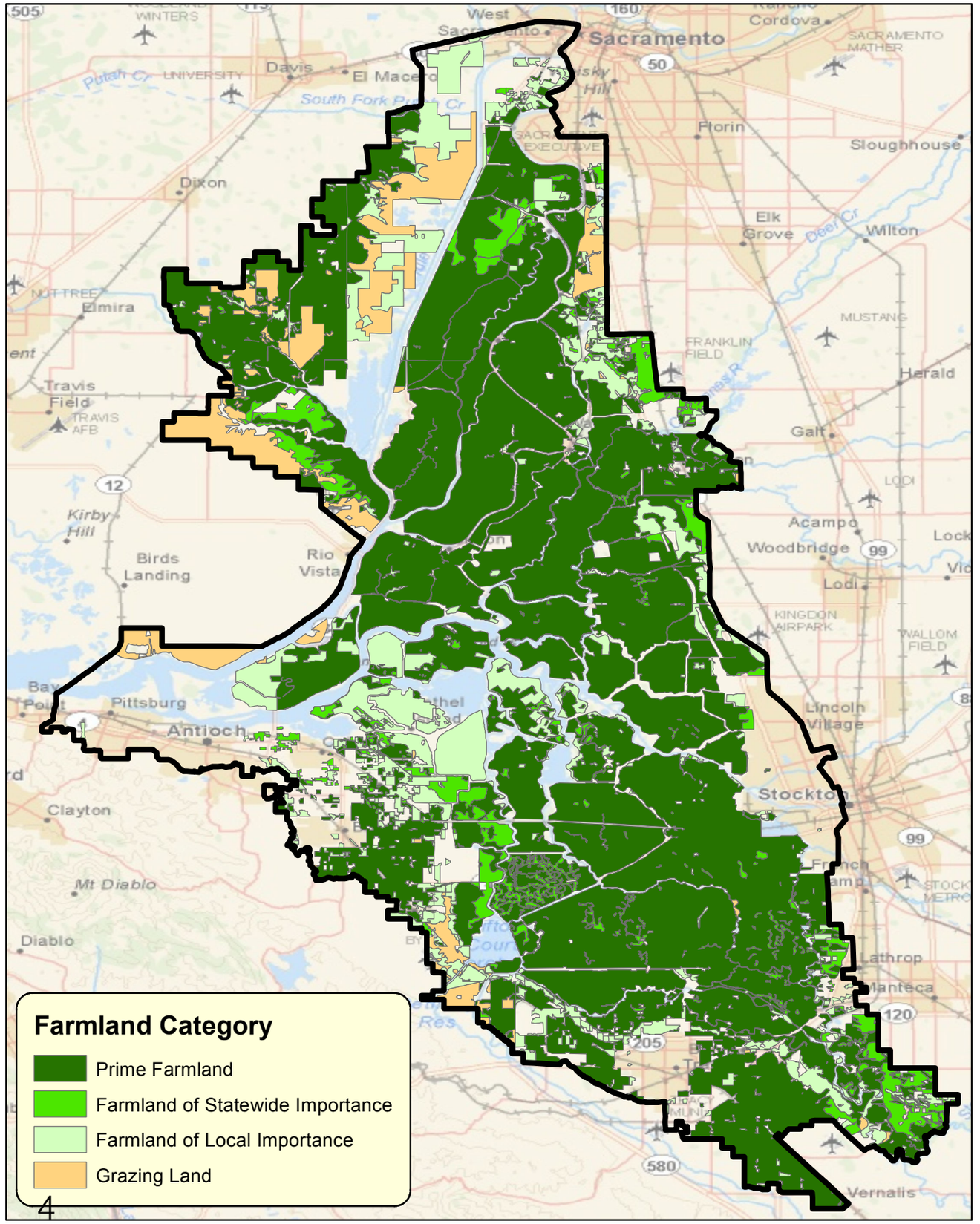
Relationship of the Delta Economic Sustainability Plan (DESP) to Change Petition

- Nearly all Delta water right holders are farmers irrigating crops and recreation and tourism businesses.
- DESP studied economic impact of changes to water quality—a broad measure of injury to Delta water right holders.
- Salinity conditions feed back through economic and irrigation decisions farmers make.
- DESP goals included modeling effects of water policy proposals on Delta agriculture.

Ag Economy

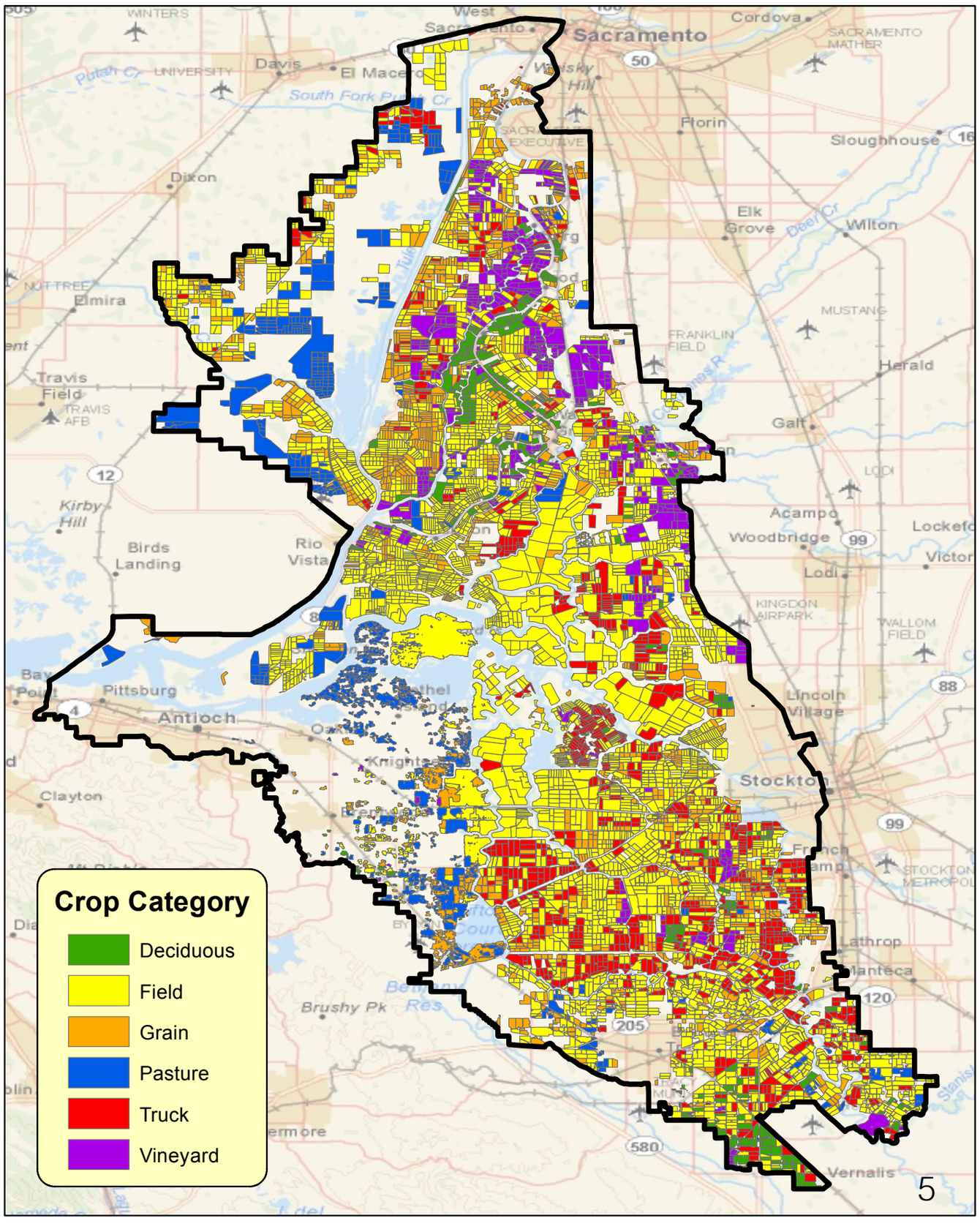
- 80% of Delta farmland categorized as prime farmland.
- Total 2010 423,727 cropped acres, not including 38,000 acres of grazing land.

FMMP Delta Farmland Coverage



Ag Economy

Delta Agricultural Field Borders, 2010



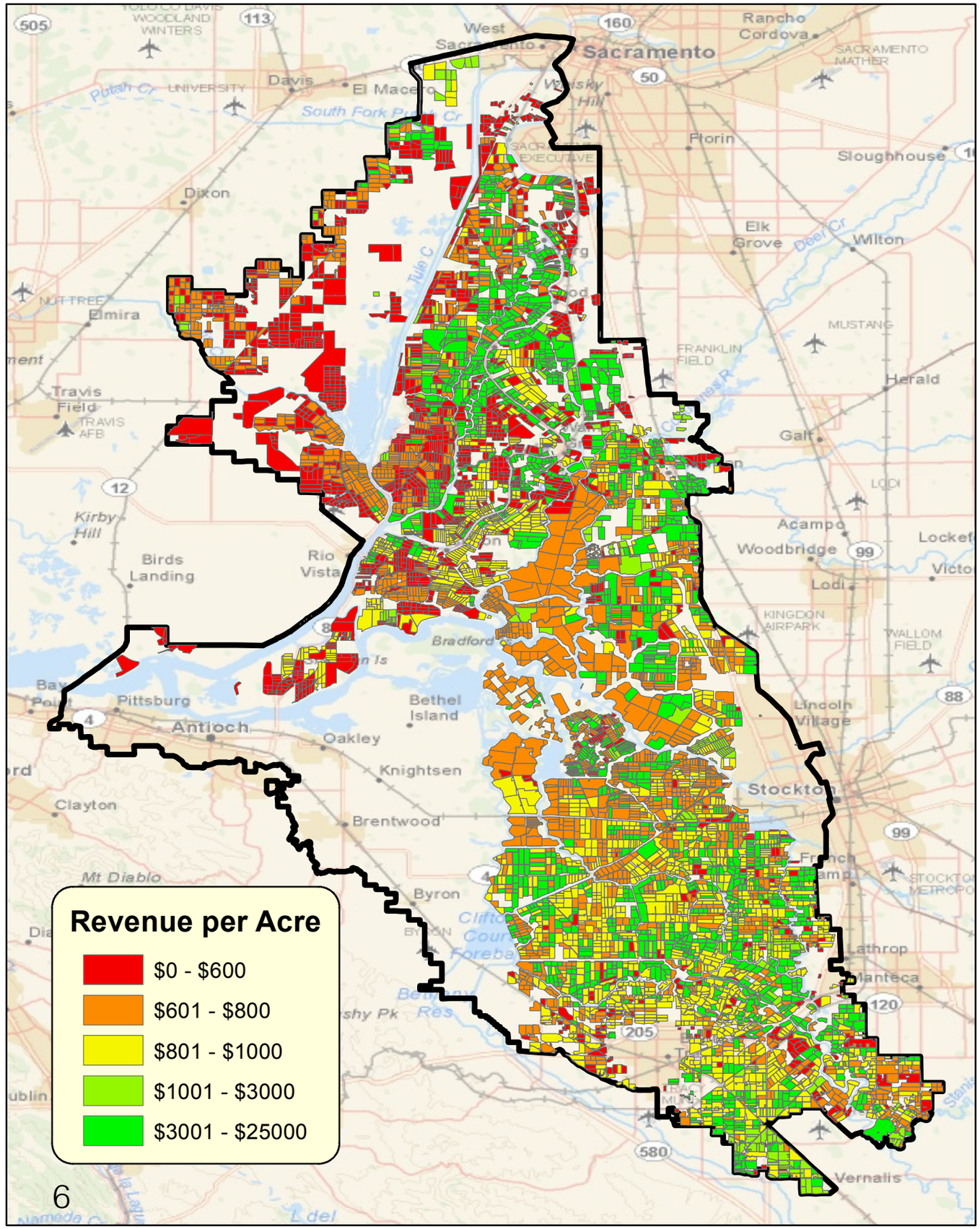
- Top acreage crops: corn, alfalfa, processing tomatoes, wheat, wine grapes.
- Top value crops: processing tomatoes, wine grapes, corn, alfalfa, and asparagus.

Ag Economy

- Highest revenue-per-acre crops: truck crops, deciduous crops.

- Animal production $93 million in 2010.

Delta Crop Value, 2009



Ag Economy

- Delta agricultural revenues $702.4 million from 2009 acreage.
- Four crops support significant value-added linkages to the region and the state.
  - Alfalfa
  - Corn
  - Processing tomatoes
  - Wine grapes

2009 Economic Effects
(not including food processing)

Delta region
- 4,132 jobs
- $146.7 million in labor income
- $361.7 million in total value added
- $816 million in total output

California
- 12,900 jobs
- $485.7 million in labor income
- $819.2 million in total value added
- $1.64 billion in total output

2009 Economic Effects (including food processing)

Delta region

- 13,179 jobs
- $594 million in labor income
- $1.059 billion in total value added
- $2.647 billion in total output

California

- 25,125 jobs
- $1.252 billion in labor income
- $2.135 billion in total value added
- $5.372 billion in total output

Ag Economy

Direct, indirect, and induced output and jobs employ:

- On-farm workers cultivating and harvesting crops
- Workers as varied as machinists repairing and making agricultural equipment and vehicles
- Seasonally-hired food processing workers in plants throughout the Delta region
- Truck drivers hauling raw crops and finished products to market
- Others

Method

- Farmers choose to plant crops based on numerous factors.
    - Anticipated market demand for a crop
    - Access to transportation routes for efficient market access
    - Soil conditions
    - Underlying land value, potential for conversion from ag land use to urban
    - Irrigation water availability and
    - Irrigation water quality

Method

- Geographic pattern of crops in the Legal Delta in 2010 reflects many of these factors.
- Delta farmers monitor salinity levels closely and some incur costs in chemicals and drainage systems to deal with current salinity levels.

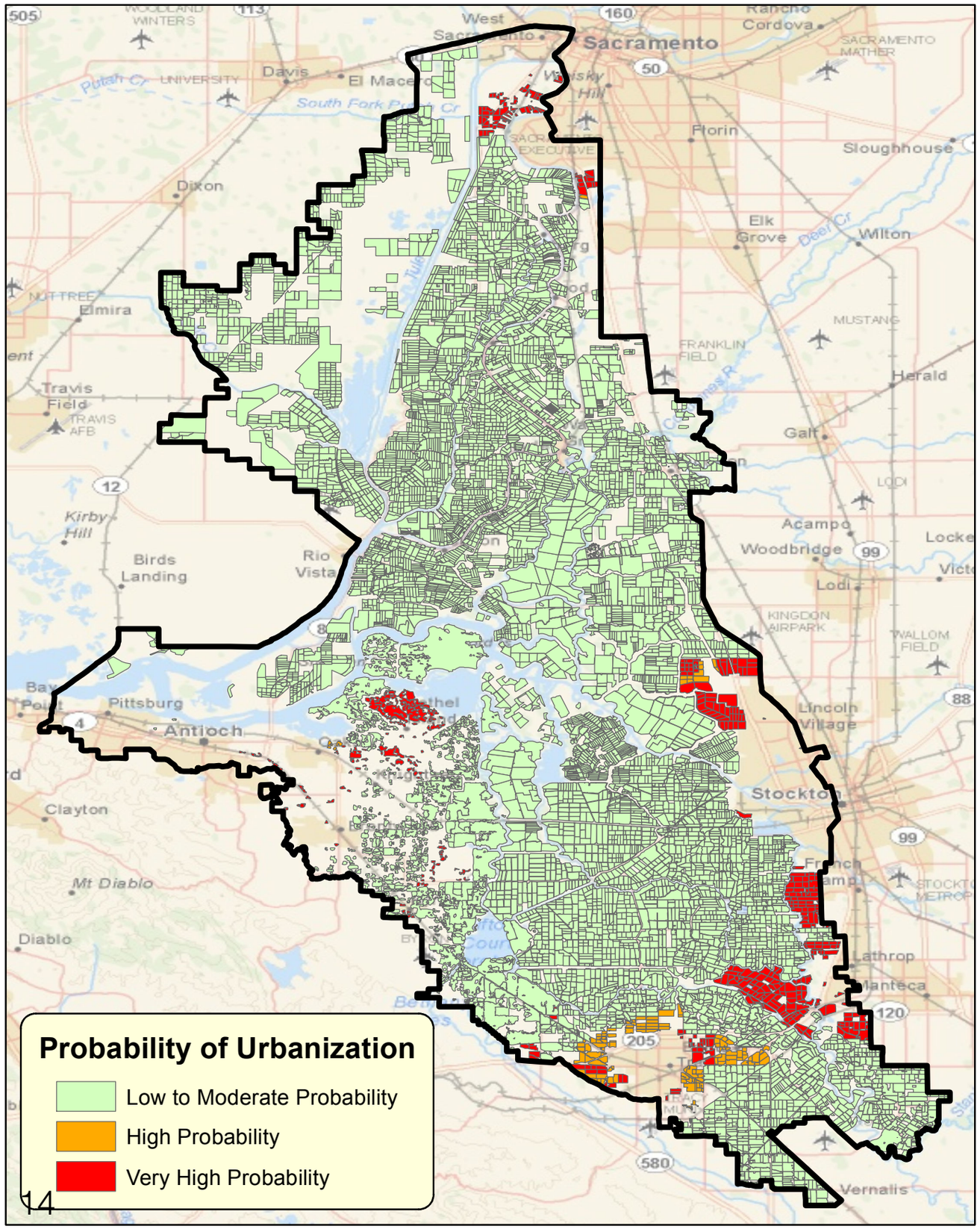
Method

- Multinomial logit (MNL) model used to estimate farmers' crop choices in DESP.
- MNL models used previously to study irrigation technology choices and crop management practices.

Method

- Used MNL model in DESP to estimate effect of urbanization potential on Delta crop patterns.
- Urbanization potential identified of 26,625 acres in western and southeastern peripheries of the Legal Delta.

Crop Fields with High or Very High Probability of Urbanization



Method

- Urbanization opportunities for agricultural entrepreneurs.
    - Can stimulate planting and cultivation of high value crops in the Delta's future.
    - MNL model in DESP estimated $111 million in total gross agricultural revenue, assuming current crop acreage and average crop class revenue from 2009 prices.
    - Potential $43 million decrease in Delta crop revenue from urbanized lands.
    - Net positive future crop value growth estimated at $68 million.

Salinity Impacts

- MNL model found salinity to have a statistically significant impact on crop choice in the Delta.

- Conditions generally fresher in north Delta.

- Higher average electrical conditions in south Delta.

- Averaging salinity data masks spikes in the data when the average may be lower.

Salinity Impacts

- Differences in salinity conditions due to:
    - Ambient differences in water quality.
    - Presence of reverse flows along Old and Middle Rivers due to SWP/CVP export pumping.
    - Flow conditions in Sacramento and San Joaquin Rivers.
    - Climatic and hydrological conditions generally.

Salinity Impacts

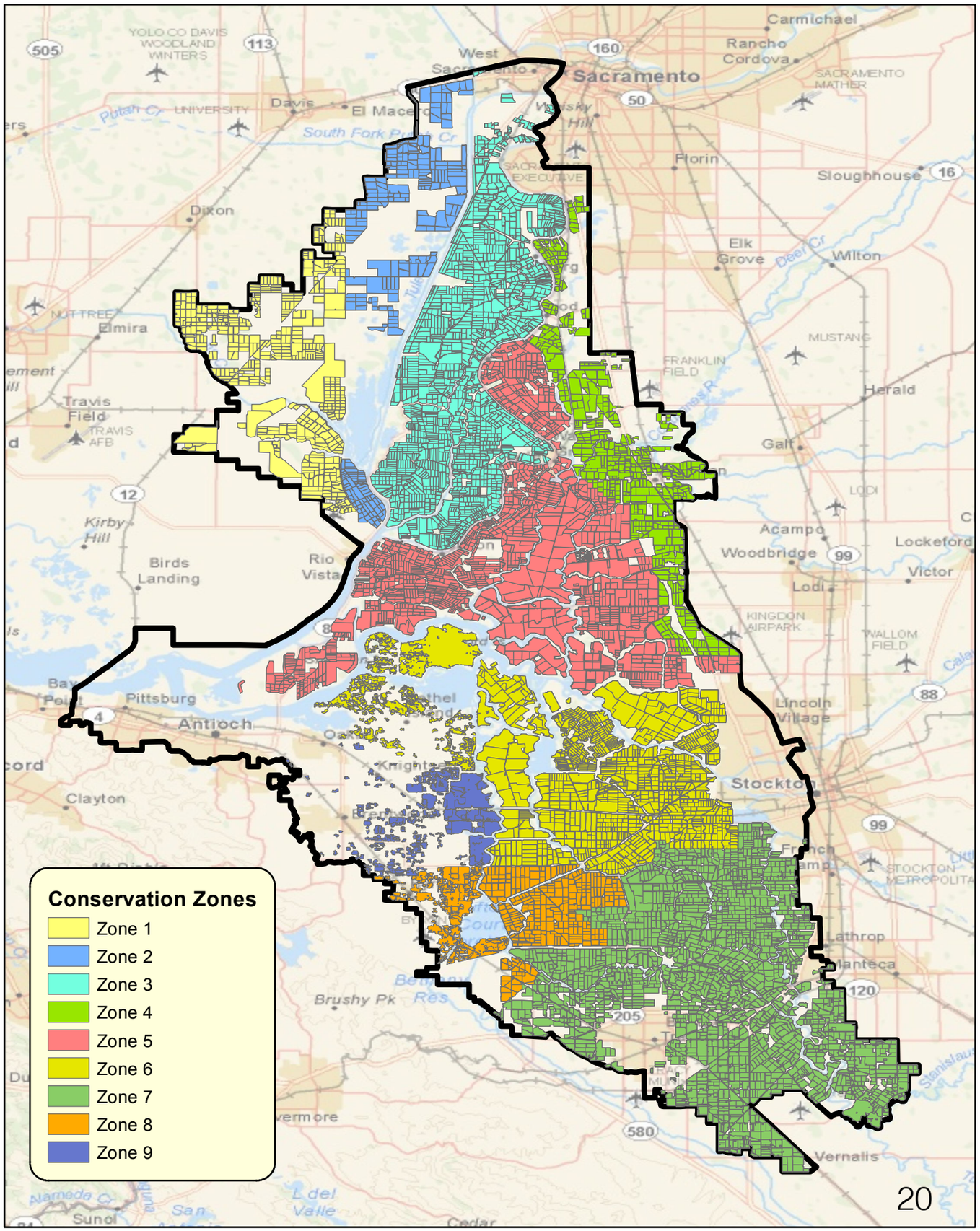
- 2010-2011 period policy proposals affecting salinity:
    - Phase 1 (as of February 2009) of SWRCB's Bay-Delta Estuary Water Quality Control Plan - proposing increased salinity objectives at San Joaquin River at Vernalis, and interior south Delta locations:
        - San Joaquin River at Brandt Bridge
        - Old River at Middle River
        - Old River at Tracy Boulevard Bridge
    - Conceptual BDCP isolated conveyance proposal around or under the Delta characterized as using "dual conveyance."

Salinity Impacts

- Broad salinity changes in the Delta would be similar, the DESP expected.
    - Phase 1 would increase San Joaquin River inflow while relaxing salinity objectives for the River and along Old and Middle River during irrigation season.
- Isolated conveyance would subtract Sacramento River water during irrigation season upstream of Delta Cross Channel.
    - Its absence would be filled in part by more flows from the San Joaquin River and some tidal and east side flows.

Salinity Impacts

BDCP Conservation Zones



- MNL model focused on south Delta channels and lands where existing conditions were already higher than in north Delta.
- Centered on crop fields within BDCP conservation zones 6 through 9.

Salinity Impacts

Forecasted Crop Revenue and Job Loss Impacts from Increasing Delta Salinity

		Forecast Acreage					Total Revenue				
Crop Category	Crop Category Average Revenue per Acre	Baseline	25% Salinity Increase	50% Salinity Increase	100% Salinity Increase	200% Salinity Increase	Baseline	25% Salinity Increase	50% Salinity Increase	100% Salinity Increase	200% Salinity Increase
[column]	[a]	[b]	[c]	[d]	[e]	[f]	[g]	[h]	[i]	[j]	[k]
Deciduous	$4,612	6,954	5,971	5,051	3,486	1,499	$32,071,848	$27,538,252	$23,295,212	$16,077,432	$6,913,388
				Percent Change from Baseline, Positive/(Negative)				(14.1%)	(27.4%)	(49.9%)	(78.4%)
Field	$780	80,752	83,621	85,246	85,011	74,848	$62,986,560	$65,224,380	$66,491,880	$66,308,580	$58,381,440
				Percent Change from Baseline, Positive/(Negative)				3.6%	5.6%	5.3%	(7.3%)
Grain	$426	15,925	19,197	22,734	30,335	45,892	$6,784,050	$8,177,922	$9,684,684	$12,922,710	$19,549,992
				Percent Change from Baseline, Positive/(Negative)				20.5%	42.8%	90.5%	188.2%
Pasture	$116	2,963	3,757	4,667	6,810	12,056	$343,708	$435,812	$541,372	$789,960	$1,398,496
				Percent Change from Baseline, Positive/(Negative)				26.8%	57.5%	129.8%	306.9%
Truck	$3,903	29,804	24,460	19,843	12,741	5,029	$116,325,012	$95,467,380	$77,447,229	$49,728,123	$19,628,187
				Percent Change from Baseline, Positive/(Negative)				(17.9%)	(33.4%)	(57.3%)	(83.1%)
Vineyard	$3,566	3,519	2,911	2,376	1,534	594	$12,548,754	$10,380,626	$8,472,816	$5,470,244	$2,118,204
				Percent Change from Baseline, Positive/(Negative)				(17.3%)	(32.5%)	(56.4%)	(83.1%)
Totals	$1,651	**139,917**	**139,917**	**139,917**	**139,917**	**139,918**	**$231,059,932**	**$207,224,372**	**$185,933,193**	**$151,297,049**	**$107,989,707**
				Scenario Revenue Losses from Baseline				**($23,835,560)**	**($45,126,739)**	**($79,762,883)**	**($123,070,225)**

Source: October 10, 2011 Public Draft: Economic Sustainability Plan for the Sacramento-San Joaquin Delta, p. 131, Table 20; California WaterFix RDEIR/SDEIS, p. 4.3.10-1, lines 22-26; Restore the Delta.

MNL model predicted large shift from high-value truck, deciduous, and vineyard crops to lower-value grain and pasture crops should salinity levels rise in the south Delta.

Salinity Impacts

- DESP analysis does not account for loss of 5,404 acres of agricultural land in the Delta (1,495 acres temporarily; 3,909 acres permanently).

- Agricultural crop revenue foregone from these land losses on average we assumed would be about $1,651 per acre.

- A 25% salinity increase would result in an addition $9 million in decreased crop revenue, for a total loss from this scenario of $32.8 million.

Forecasted Crop Revenue and Job Loss Impacts from Increasing Delta Salinity

	Forecast Acreage					Total Revenue				
Crop Category Average Revenue per Acre	Baseline	25% Salinity Increase	50% Salinity Increase	100% Salinity Increase	200% Salinity Increase	Baseline	25% Salinity Increase	50% Salinity Increase	100% Salinity Increase	200% Salinity Increase
$1,651		Land Loss of 5,404 acres to Tunnels alignment					($8,924,204)	($8,924,204)	($8,924,204)	($8,924,204)
		Crop + Land Direct Revenue Losses					($32,759,764)	($54,050,943)	($88,687,087)	($131,994,429)

Salinity Impacts

Using ratios from DESP input/output (I/O) results, we estimated job loss effects from crop and land revenue decreases. I/O ratios for without food processing.

Forecasted Crop Revenue and Job Loss Impacts from Increasing Delta Salinity

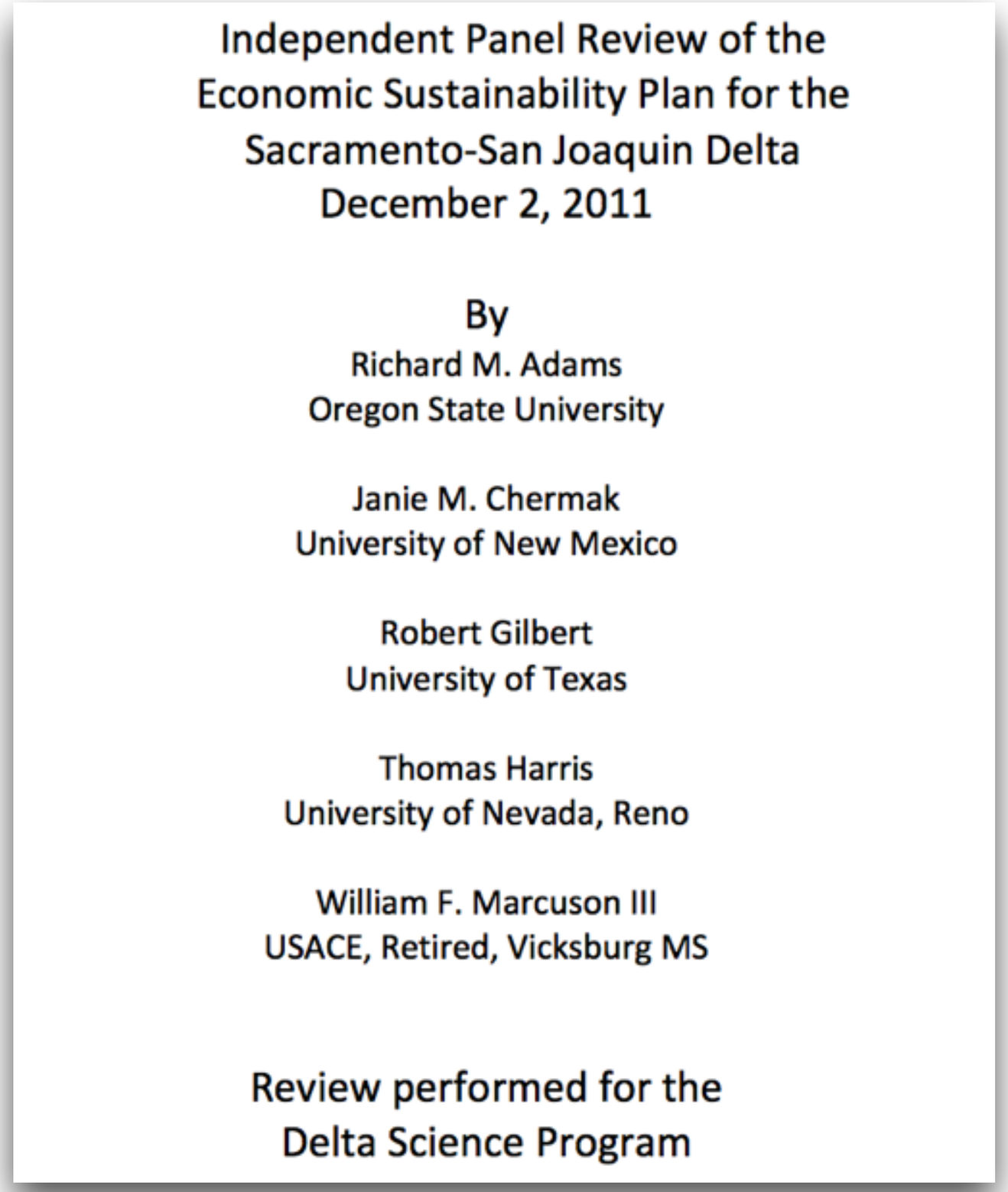
Crop Category	Crop Category Average Revenue per Acre	Forecast Acreage: Baseline	Forecast Acreage: 25% Salinity Increase	Forecast Acreage: 50% Salinity Increase	Forecast Acreage: 100% Salinity Increase	Forecast Acreage: 200% Salinity Increase	Total Revenue: Baseline	Total Revenue: 25% Salinity Increase	Total Revenue: 50% Salinity Increase	Total Revenue: 100% Salinity Increase	Total Revenue: 200% Salinity Increase
	$1,651		Land Loss of 5,404 acres to Tunnels alignment					($8,924,204)	($8,924,204)	($8,924,204)	($8,924,204)
			Crop + Land Direct Revenue Losses					($32,759,764)	($54,050,943)	($88,687,087)	($131,994,429)
Job Loss to Delta Counties (estimated from Table 13, DESP)			Direct Job Losses (at $197,434 of total direct output per Delta farm job)					(166)	(274)	(449)	(669)
			Indirect Job Losses (at $93,865 indirect output per Delta farm job)					(163)	(268)	(440)	(655)
			Induced Job Losses (at $146,592 induced output per Delta farm job)					(60)	(99)	(163)	(243)
			Total Job Losses to Delta Counties					(389)	(641)	(1,053)	(1,567)
Job Loss to California (estimated from Table 14, DESP)			Direct Job Losses (at $159,835 total direct output per Delta farm job)					(205)	(338)	(555)	(826)
			Indirect Job Losses (at $81,337 total indirect output per Delta farm job)					(221)	(365)	(598)	(890)
			Induced Job Losses (at $163,024 total induced output per Delta farm job)					(93)	(154)	(253)	(377)
			Total Job Losses to California					(519)	(857)	(1,406)	(2,093)

Source: October 10, 2011 Public Draft: Economic Sustainability Plan for the Sacramento-San Joaquin Delta, p. 131, Table 20; California WaterFix RDEIR/SDEIS, p. 4.3.10-1, lines 22-26; Restore the Delta.

Review

IRP's charge asked, "is MNL a sound method for estimating impacts in the Delta?"

IRP: "We commend the authors for using this approach. A MNL is a standard, recognized method in the extant literature for problems with discrete, limited dependent variables."



Independent Panel Review of the
Economic Sustainability Plan for the
Sacramento-San Joaquin Delta
December 2, 2011

By
Richard M. Adams
Oregon State University

Janie M. Chermak
University of New Mexico

Robert Gilbert
University of Texas

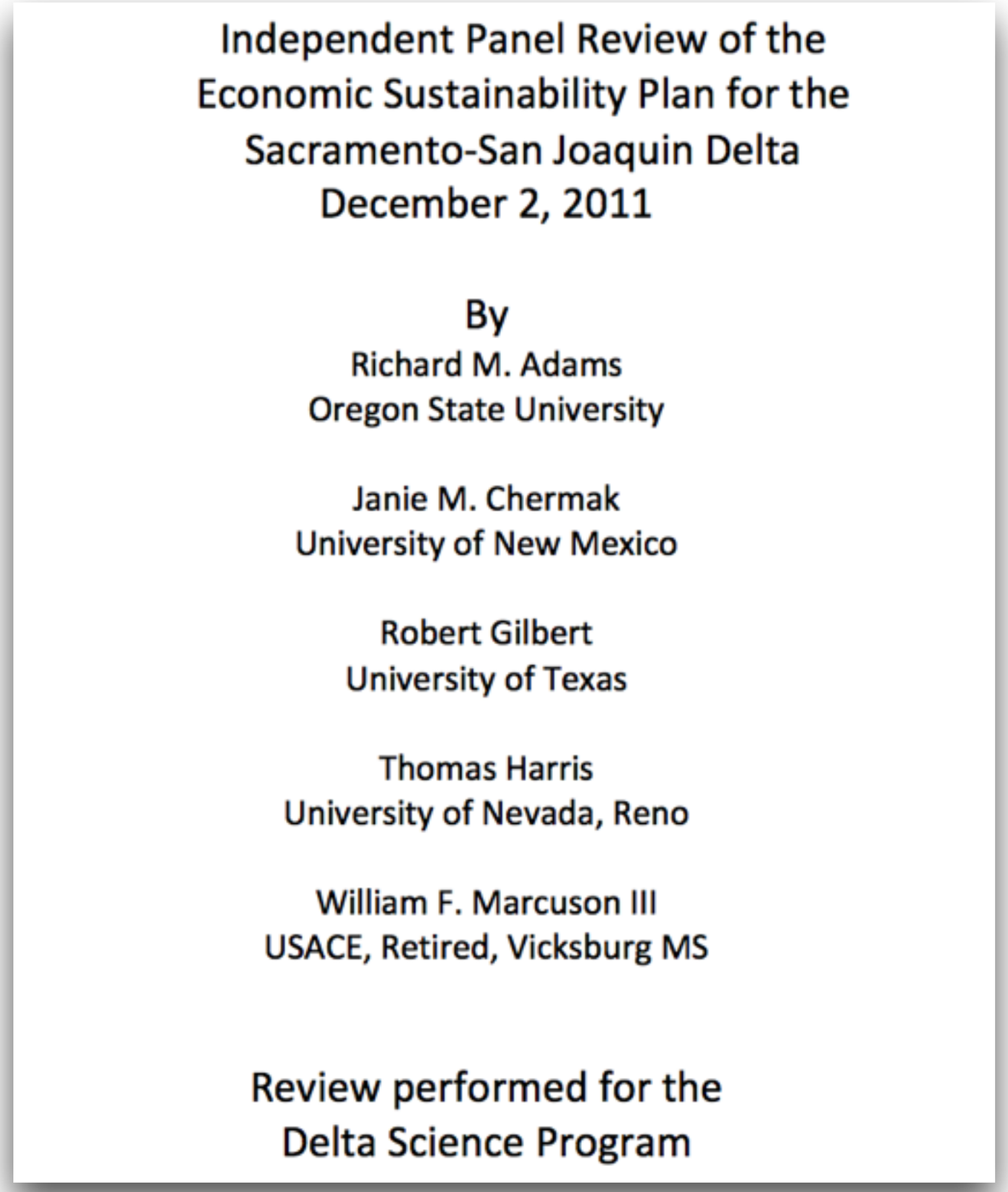
Thomas Harris
University of Nevada, Reno

William F. Marcuson III
USACE, Retired, Vicksburg MS

Review performed for the
Delta Science Program

Review

IRP: “[A]n isolated conveyance to improve water-supply reliability could potentially impact the sustainability of the Delta by increasing salinity and decreasing local water availability because it will reduce through-flow of fresher Sacramento River water in the Delta. Therefore, the costs required to mitigate salinity impacts, local water supply impacts and catastrophic salt-water intrusion in the event of a large earthquake are a relevant consideration in assessing isolated conveyance.”



Independent Panel Review of the
Economic Sustainability Plan for the
Sacramento-San Joaquin Delta
December 2, 2011

By
Richard M. Adams
Oregon State University

Janie M. Chermak
University of New Mexico

Robert Gilbert
University of Texas

Thomas Harris
University of Nevada, Reno

William F. Marcuson III
USACE, Retired, Vicksburg MS

Review performed for the
Delta Science Program

Review

IRP: “To the extent that these alterations in flows increase south Delta salinity levels, the economic and ecosystem impacts of these alterations must be recognized, and where appropriate, mitigated. **Given that water exporters will be the primary beneficiaries of such a conveyance system, the DPC and the DSC need to ensure that the sponsors of a conveyance system fully pay for any and all Delta mitigation.**”

Independent Panel Review of the
Economic Sustainability Plan for the
Sacramento-San Joaquin Delta
December 2, 2011

By

Richard M. Adams
Oregon State University

Janie M. Chermak
University of New Mexico

Robert Gilbert
University of Texas

Thomas Harris
University of Nevada, Reno

William F. Marcuson III
USACE, Retired, Vicksburg MS

Review performed for the
Delta Science Program

Answers

Will proposed changes cause injury to any municipal, industrial, or agricultural uses of water, including associated legal users of water?

Yes, removal of fresh Sacramento River water at new intakes in the north Delta can reasonably be expected to injure agricultural uses of water in the Delta, including those diverting and using water directly from Delta channels to irrigate crops.

Answers

Will proposed changes in points of diversion alter water flows in a manner that causes injury to municipal, industrial, or agricultural uses of water?

Yes, the new points of diversion will alter water flows in a manner that causes injury to agricultural uses of water, particularly in the south Delta. The DESP analyzed impacts reflecting changes in salinity to Delta farmers' crop choices based on a broad change in flows that would trigger salinity increases of varying levels.

Answers

Will the proposed changes in points of diversion alter water quality in a manner that causes injury to municipal, industrial, or agricultural uses of water?

Yes, new points of diversion would alter water quality by increasing salinity generally in Delta channels in a manner that would injure agricultural uses of water. For a 25% salinity increase, lost direct crop revenues (including land consumed for project facilities) would amount to about $32 million a year, and cost about 389 total Delta jobs.