Staff Technical Workshop Part 4: Regional Economic Effects and IMPLAN Multipliers

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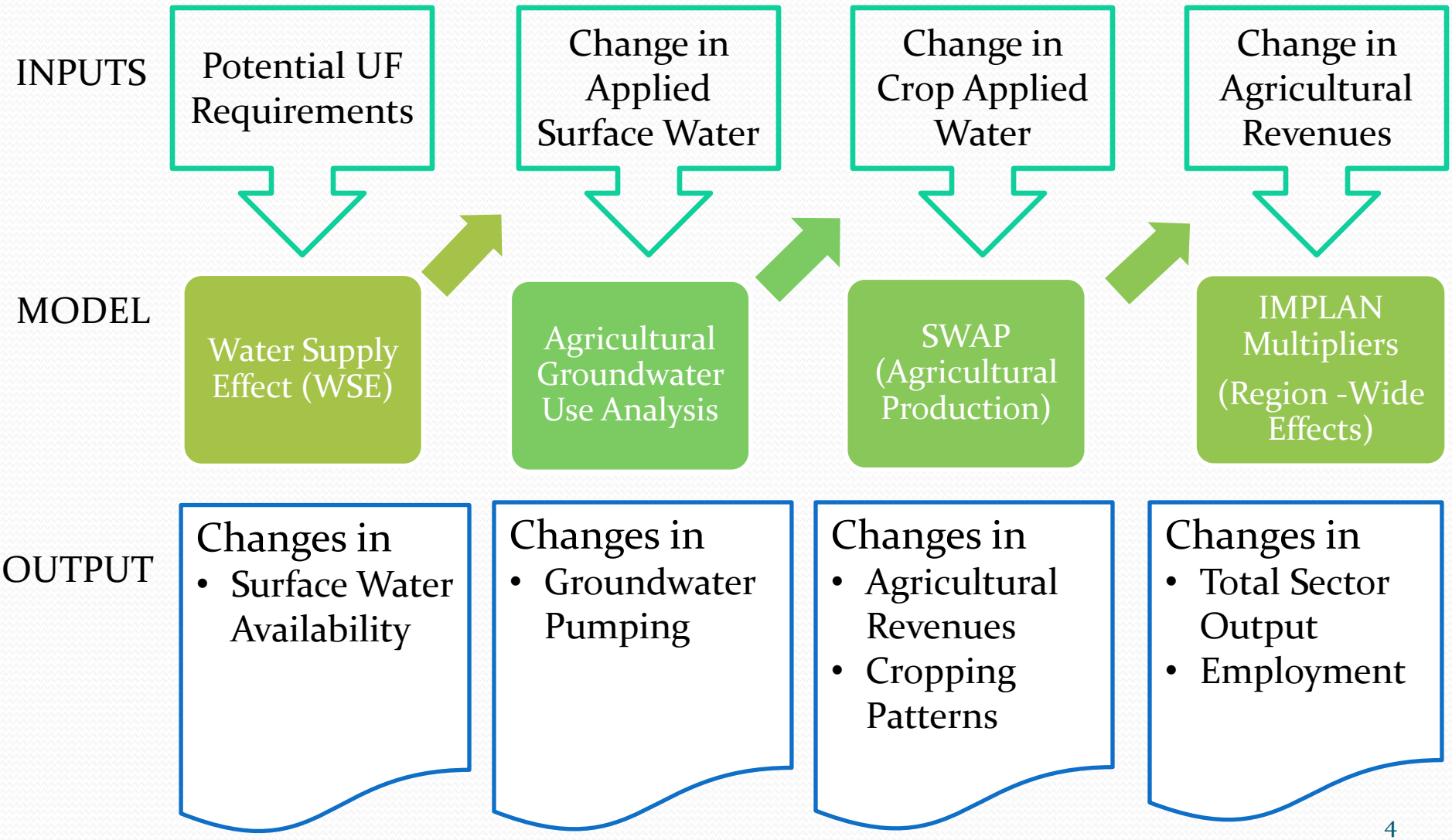
Topics Covered

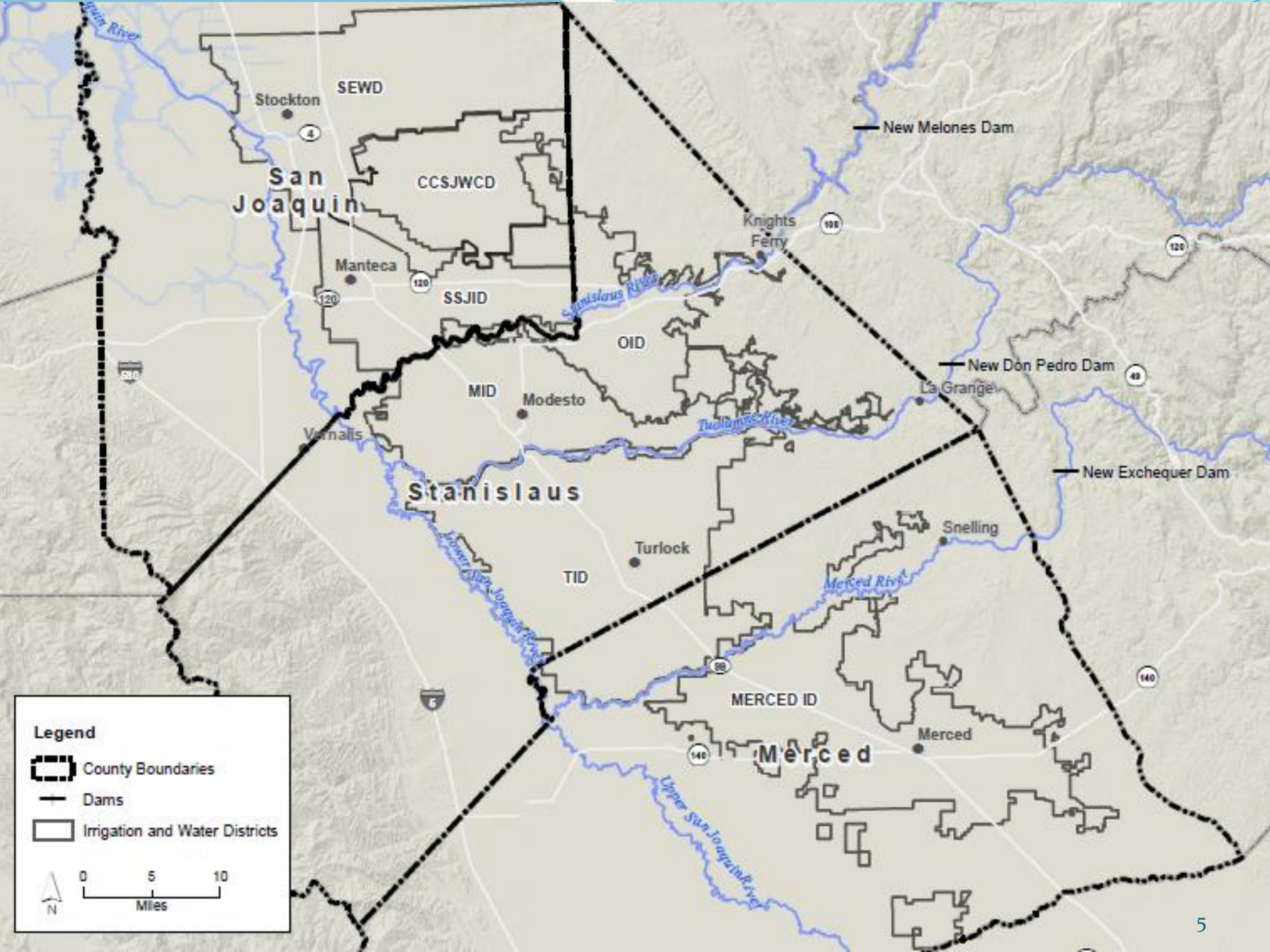
- Overview of the regional economic analysis
- Description of IMPLAN Model
- Derivation of IMPLAN Multipliers for Regional Economic and Employment Effects
- Regional Economic and Employment Results
- Fiscal Effects Analysis

Regional Economic Analysis Framework

- Based on the results of the SWAP model some agricultural acreage could go out of production in response to reduced water availability
- Less crop production means less revenue and fewer jobs in the agricultural industry
- Other economic sectors may also see revenue and employment impacts related to impacts in the agricultural industry
- Reduced economic activity in the agricultural industry could reduce tax revenue for the government (fiscal analysis)

Suite of Models for Studying Regional Economic Impacts




SEWD
Stockton
San Joaquin
CCSJWCD
Manteca
SSJID
Knights Ferry
New Melones Dam
OID
New Don Pedro Dam
La Grange
MID
Modesto
Vernalis
Stanislaus
New Exchequer Dam
Snelling
Turlock
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Merced
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Legend
County Boundaries
Dams
Irrigation and Water Districts
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Economic Impact Analysis

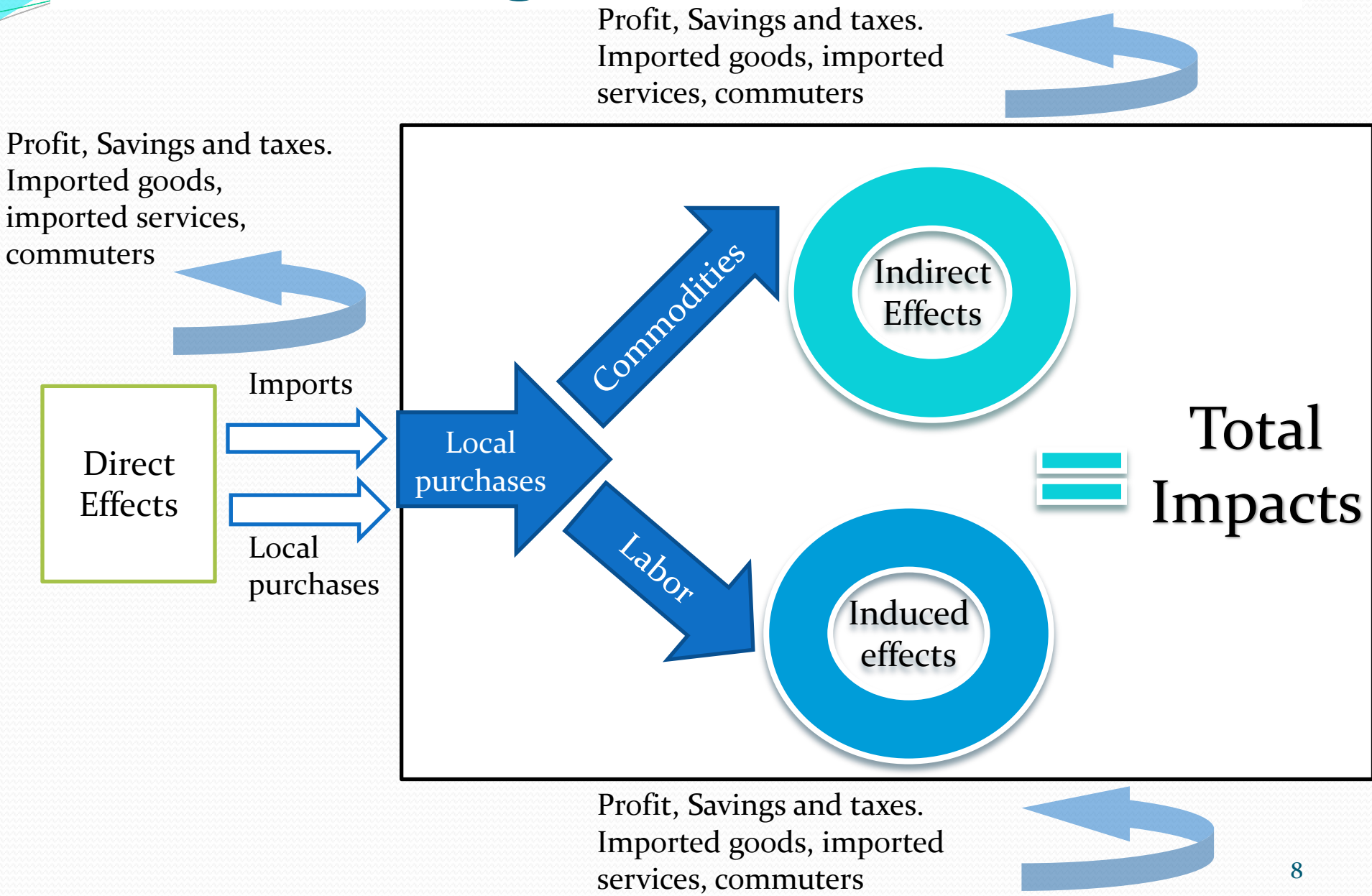
- Use of Input-Output Developed in the 1950s (Leontief)
- Helps tracing expenditures in a region's economy after an economic event has occurred
- We use IMPLAN (From MIG Corp) with statewide databases for California, Oregon and Washington
- IMPLAN provides economic direct and multiplier effects of the facility construction and operation on employment sector output and value added

Input-Output Analysis

- Input output models map economy using social accounting matrix
- Transactions among sectors, institutions and the rest of the world.
- Multiplier effects occur as an increase in the total demand for one sector are linked to other economic sectors and households income and expenditure.

	Industry	Commodity	Factors	Institutions	Enterprises	Capital	Trade	Total
Industry		*Make*					*Exports*	Total Industry Income
Commodity	*Use*			*Consumption*		*Consumption*		Total Commodity Income
Factors	*Value Added*						*Exports*	Total Factor Income
Institutions		*Sales*	*Transfers*	*Transfers*	*Transfers*		*Exports*	Total Institution Income
Enterprises								Total Enterprise Income
Capital						*Transfers*	*Exports*	Total Capital Income
Trade	*Imports*		*Factor Trade*	*Imports*		Transfers	*Exports*	Total Trade Income
Total	Total Industry Outlay	Total Commodity Outlay	Total Factor Outlay	Total Institution Outlay	Total Enterprise Outlay	Total Capital Outlay	Total Trade Outlay	

Linkages in IMPLAN



Multipliers

- The notion of multipliers rests upon the difference between the initial effect of an exogenous change (final demand) and the total effects of a change.
- Backward linkage is the tracking of industry purchases backward through the supply chain.

  - **Direct Effects:** Measure the response for a given industry given a change in final demand for that same industry.
  - **Indirect Effects**: The response by industries that support a given industry from a change in final demand for a specific industry.
  - **Induced Effects**: Changes in economic activity for all regional industries caused by increase/decrease of expenditures by employees of an industry and supporting industries.
  - **Total Effects**: Sum of direct, indirect, and induced effects.

Derivation of IMPLAN Multipliers

- Models and multipliers employing IMPLAN were developed
  - County models
  - Three-county model
- Models were crop specific match of multipliers and crops categories is described in Appendix G
- Geographies and effects may over predict impacts as these go beyond sub-district boundaries and assume a snapshot of the economy and its interlinkages

Regional Economic Multipliers

	Subregional IMPLAN Economic Multipliers ($ of Regional Revenue/$ of Agricultural Revenue)			
IMPLAN Industry Code	Direct	Indirect	Induced	Total
Code 1 - Oilseed	1.00	0.39	0.18	1.57
Code 2 - Grain	1.00	0.59	0.20	1.79
Code 3 - Vegetable and Melon	1.00	0.36	0.40	1.76
Code 4 - Fruit	1.00	0.34	0.44	1.78
Code 5 - Tree Nut	1.00	0.32	0.38	1.70
Code 8 - Cotton	1.00	0.60	0.27	1.88
Code 9 - Sugar Beets	1.00	0.44	0.23	1.68
Code 10 - All Other Crops	1.00	0.47	0.29	1.76

Table G.5-2, Page G-66 of Appendix G

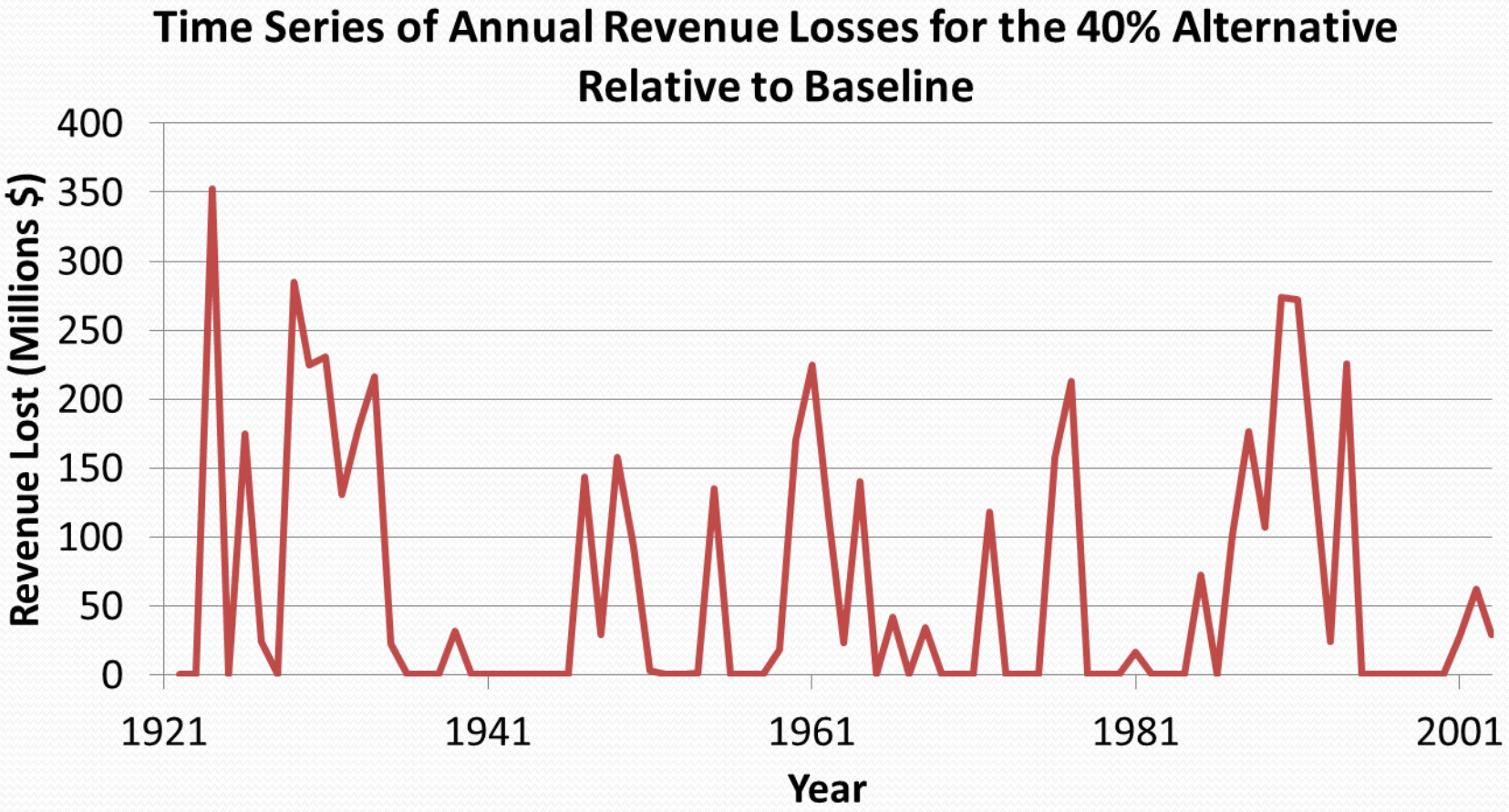
Regional Employment Multipliers

	Subregional IMPLAN Employment Multipliers (jobs/$ Million of revenue, 2008)			
IMPLAN Industry Code	Direct	Indirect	Induced	Total
Code 1 - Oilseed	7.49	3.07	1.51	12.08
Code 2 - Grain	11.83	4.47	1.68	17.97
Code 3 - Vegetable and Melon	2.15	3.60	3.34	9.09
Code 4 - Fruit	3.11	4.06	3.69	10.86
Code 5 - Tree Nut	7.44	3.91	3.16	14.51
Code 8 - Cotton	2.81	4.77	2.27	9.85
Code 9 - Sugar Beets	21.07	4.08	1.95	27.09
Code 10 - All Other Crops	2.84	4.15	2.39	9.38

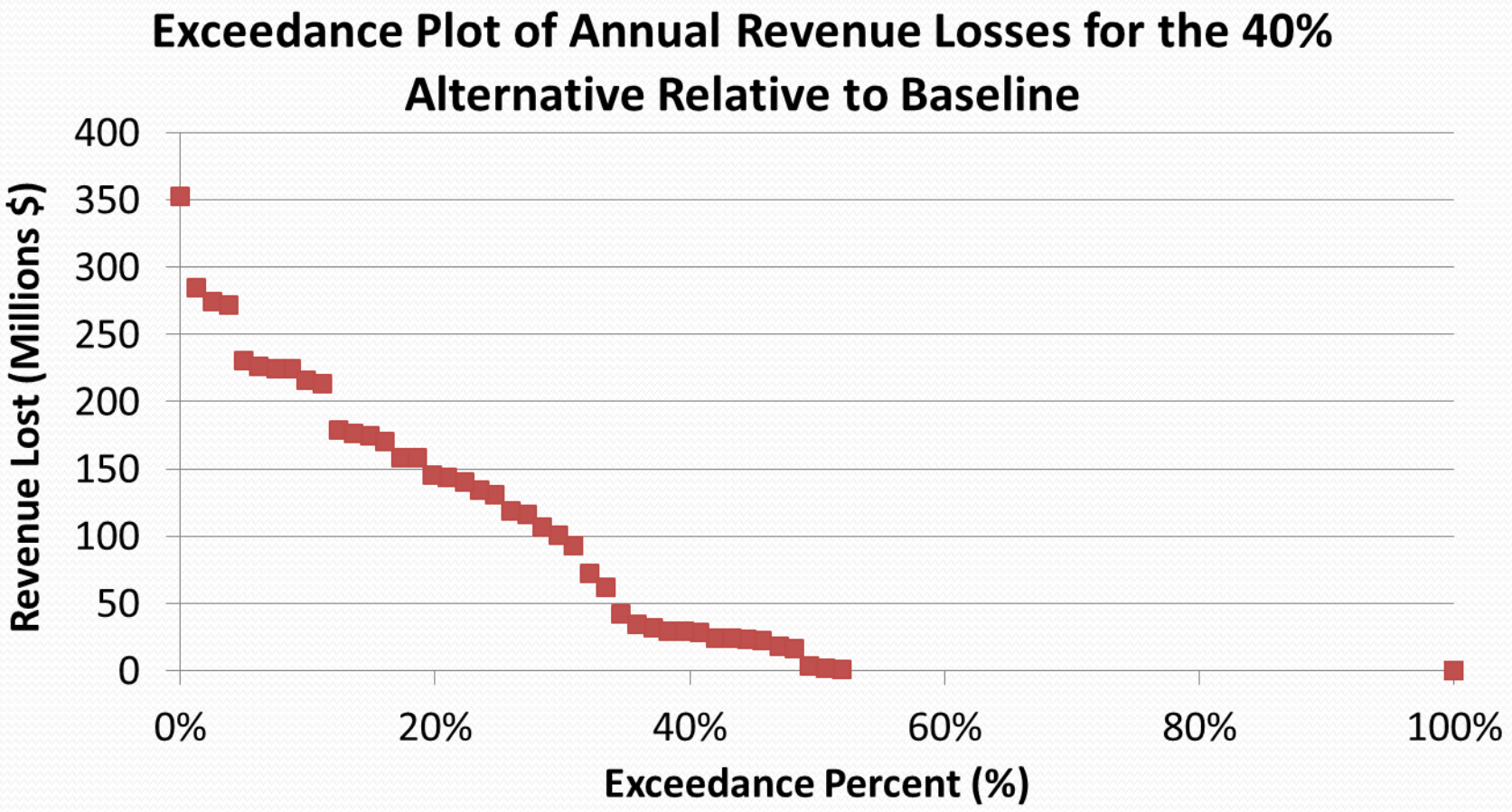
Table G.5-2, Page G-66 of Appendix G

Regional Economic Impacts

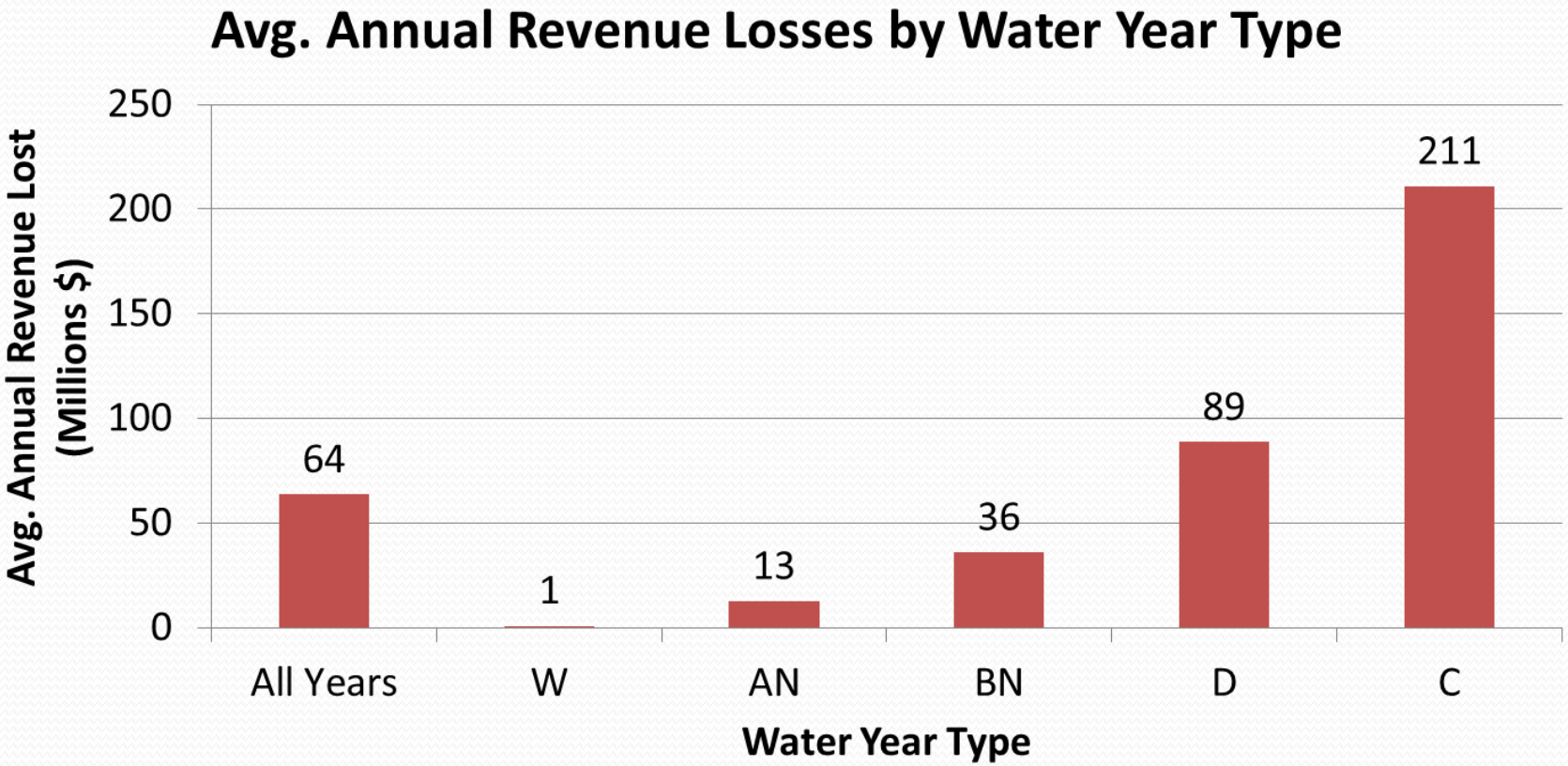
Time Series of Annual Regional Economic Impacts



Exceedance Plot of Annual Regional Economic Impacts



Avg. Annual Regional Economic Impact



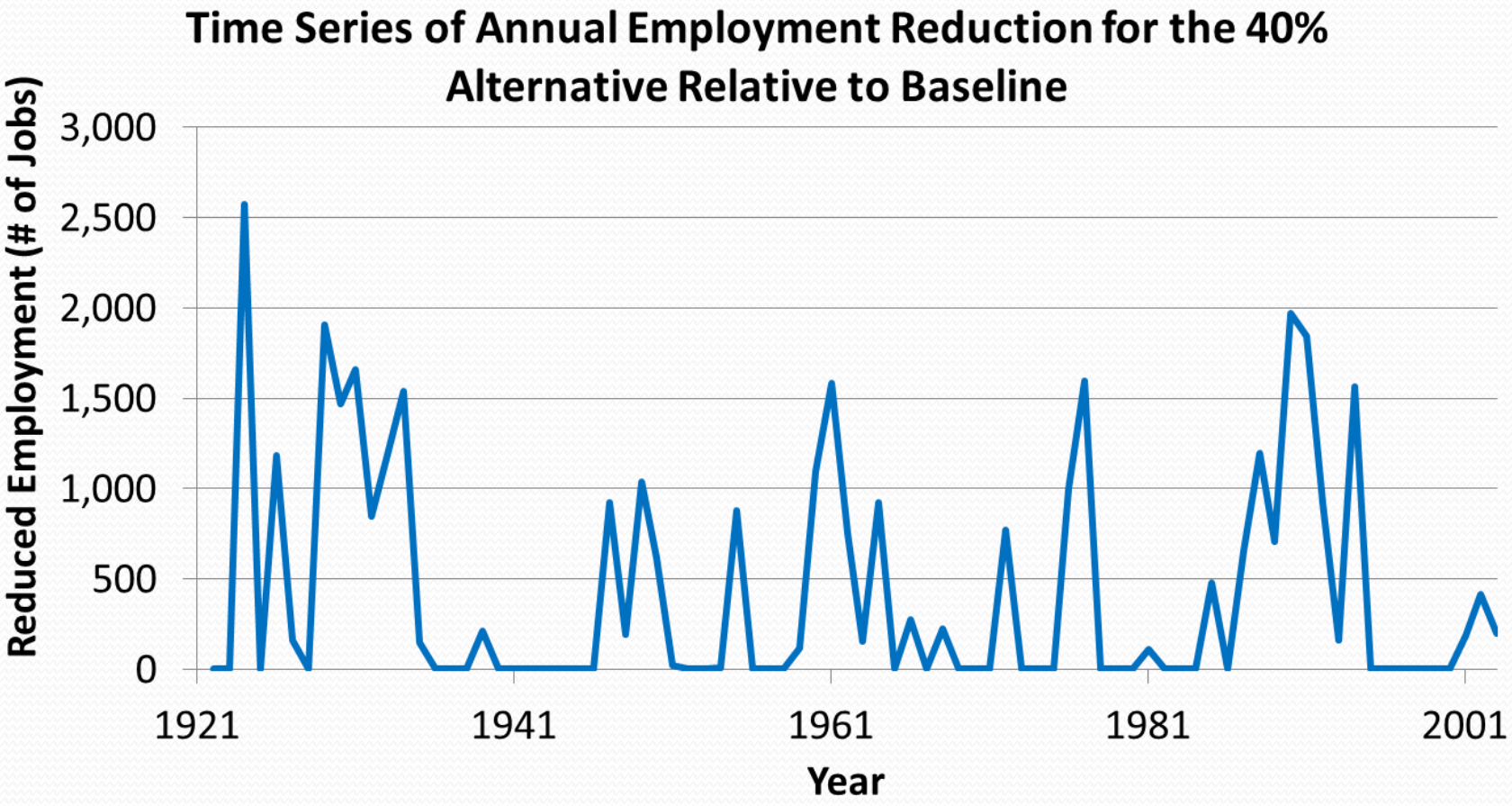
Summary of Regional Economic Impacts

Table G.5-4. Average Annual Total Economic Output Related to Agricultural Production in the Irrigation Districts under Baseline Conditions and the Change for Each of the LSJR Alternatives (page G-67)

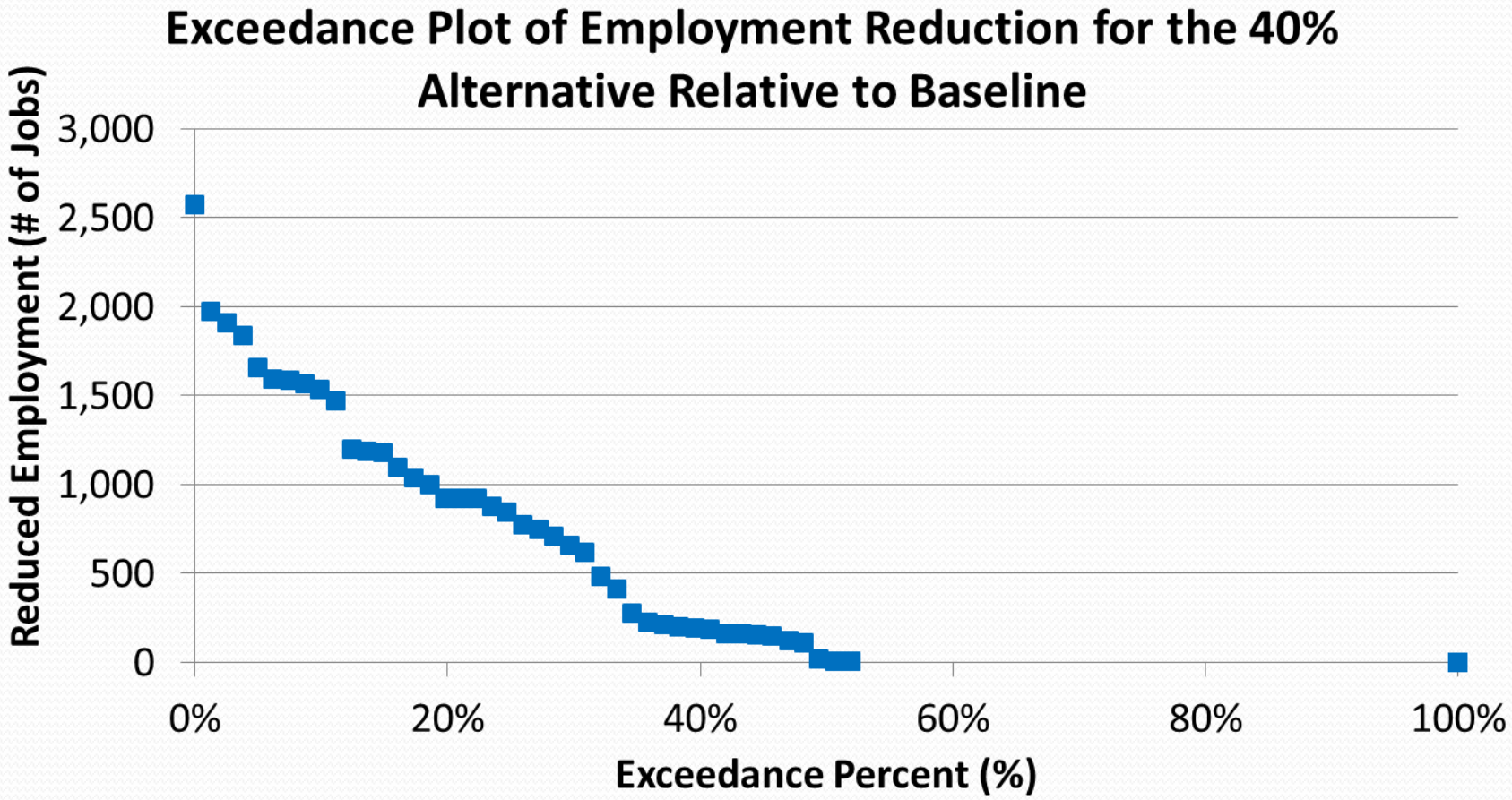
Economic Effects	Baseline Total Economic Output ($ Millions, 2008)	Change from Baseline ($ Millions, 2008)		
		30% Unimpaired Flow Objective	40% Unimpaired Flow Objective	50% Unimpaired Flow Objective
Direct Effects	*$1,477*	*-$19*	*-$36*	*-$70*
Indirect and Induced Effects	*$1,109*	*-$14*	*-$27*	*-$53*
Total Sector Output	$2,586	-$33	-$64	-$124
% of Baseline Total Economic Output	100%	-1.3%	-2.5%	-4.8%

Modified from Table G.5-4, Page G-67 of Appendix G

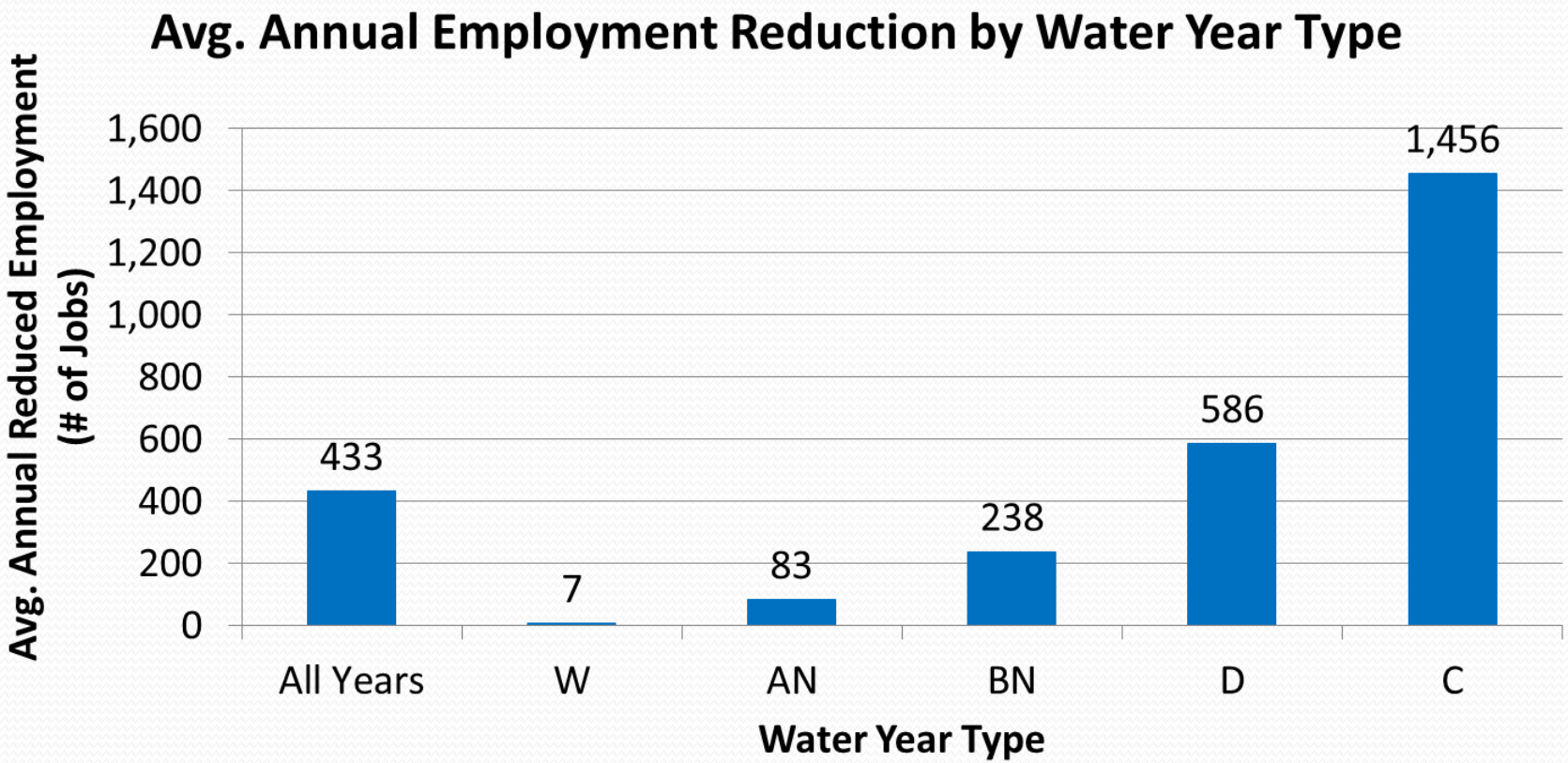
Time Series of Annual Regional Employment Impacts



Exceedance Plot of Annual Regional Employment Impact



Avg. Annual Regional Employment Impact



Summary of Regional Employment Impacts

Table G.5-6. Average Annual Total Employment Related to Agricultural Production in the Irrigation Districts under Baseline Conditions and the Change for Each of the LSJR Alternatives (page G-70)

	Baseline Total Economic Output	Change from Baseline (# of Jobs)		
Employment Effects	(# of Jobs)	30% Unimpaired Flow Objective	40% Unimpaired Flow Objective	50% Unimpaired Flow Objective
Direct Employment	*8,097*	*-99*	*-190*	*-406*
Indirect and Induced Employment	*10,514*	*-124*	*-242*	*-471*
Total Employment	18,601	-224	-433	-877
% of Baseline Total Employment	100%	-1.2%	-2.3%	-4.7%

Modified from Table G.5-6, Page G-70 of Appendix G

Fiscal Analysis

Fiscal Analysis Overview

- Reductions in agricultural production may have fiscal impacts (reduce tax revenue)
- The federal and state government would be insulated from regional impacts as their total tax revenue is significantly larger than the contribution of a single county
- County and municipal governments could experience a greater impact
- Were there to be a significant loss in tax revenue from reduced agricultural production, it could result in impacts on public services

Derivation of Fiscal IMPLAN Multipliers

- Multipliers for direct and total effects were developed for a three-county region and by individual county based on the IMPLAN tax impact report for 1 million dollars in revenues
- Multipliers then were applied to all flow alternatives and baseline conditions to obtain estimated change in tax revenues for 1) federal, and 2) lumped state and local governments

Derivation of Fiscal IMPLAN Multipliers

Level of Government	Tax Revenue Impact ($ Million, 2010)		Fiscal Impact Multipliers	
	Direct	Total[a]	Direct	Total
San Joaquin				
Federal	-75,482	-154,003	0.075	0.154
State	-27,156	-61,415	0.027	0.061
Local	-15,691	-44,731	0.016	0.045
Stanislaus				
Federal	-83,268	-153,658	0.083	0.154
State	-28,707	-60,647	0.029	0.061
Local	-15,998	-40,519	0.016	0.041
Merced				
Federal	-70,966	-108,684	0.071	0.109
State	-26,757	-47,082	0.027	0.047
Local	-15,404	-32,610	0.015	0.033

Table G.5-12, Page G-76 of Appendix G

Fiscal Impact summary

County	Governmental body	Baseline Tax Revenue Related to District Agricultural Production	Change in Tax Revenue Under the 40% Alt	Estimated Total Annual Tax Revenue	Change in Tax Revenue as % of Total 2010 Tax Revenue
		($ Millions, 2008 dollars)	($ Millions, 2008 dollars)	($ Millions, 2008 dollars)	(%)
San Joaquin	Federal	91	-1.08	2,119,839	0.0%
	State	36	-0.43	92,646	0.0%
	Local	26	-0.31	963	0.0%
Stanislaus	Federal	77	-3.60	2,119,839	0.0%
	State	31	-1.42	92,646	0.0%
	Local	20	-0.95	722	-0.1%
Merced	Federal	42	-0.63	2,119,839	0.0%
	State	18	-0.27	92,646	0.0%
	Local	13	-0.19	278	-0.1%

Modified from Tables G.5-13, Page G-77 of Appendix G

Further information

- More information on these topics can be found in the following chapters and appendices of the SED:
  - Chapter 20, *Economic Analyses*
  - Appendix G, *Agricultural Economic Effects of the Lower San Joaquin River Flow Alternatives: Methodology and Modeling Results*
- These chapters, as well as the Agricultural Economic Analysis spreadsheet, can be found at:

http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/water_quality_control_planning/2016_sed/index.shtml.