

# Measuring the Economic Impacts of Restoring and Using River Sites

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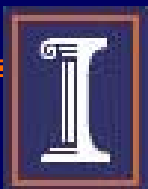
# Goals

- An overview of the Illinois River
  - Its diverse uses and users
  - Public roles and doles
- An overview of economic impact studies
  - Input-output models
  - Employment and income effects
    - Agricultural levees
    - Emiquon habitat restoration



# Uses of the Illinois River and its Floodplain

- Transportation
- Agriculture
- Flood protection
- Recreation
- Natural landscapes
- Conservation and production biology



# Transportation

- A shipping route for 60 million tons of commodities annually
- Lock and dam system—transformed river into a set of pools
- Congestion and delays
- Contested \$50 million feasibility study for \$1 billion extension of several locks
  - Federal government would pay 50%
  - Barge fuel tax the other 50%



# Agriculture

- Levees have made possible draining and leveling 280,000 acres in the floodplain
  - Stone and earth barriers along the river to prevent flooding and to the river to channel tributaries
- Levee districts are self-taxing units of local government to pay for construction and maintenance
  - Land and levees are mostly privately owned.
  - Levees are repaired by federal government after flood damage (75-80% of cost)



# Flood Protection

- Floodplains store floodwaters
- Floodplain development reduces storage space, increasing flood heights and potential flood damage
- Two strategies
  - Structural intervention to protect development
    - E.g. levees, walls, channels, fill, posts
  - Regulatory requirements and financial incentives to prevent development
    - E.g., Permits, FEMA sanctions, compensatory storage, relocation (Grafton, IL), buyouts, and land acquisition



# Fishing

- Illinois River was the second most productive inland fishery in North America
  - In 1908 – 10 million kilograms, 10% of US harvest
  - In 1950s – 0.3%
- Today federal and state efforts to support game fishing and production biology
  - Illinois Department of Natural Resources
  - U.S. Fish and Wildlife Service



# Recreation and Tourism

- Hunting, fishing, boating, hiking, birdwatching, camping, and more
- Ecotourism increasingly seen as a local economic development opportunity
- River increasingly seen as a community development opportunity



# Natural Landscape and Habitat

- Congress declared the Upper Mississippi River to be a nationally significant ecosystem and navigation system.
- Army Corps' mission expanded to include environmental restoration
- The Nature Conservancy completed an Illinois River Watershed Site Conservation Plan and has begun land acquisition and restoration



# Conservation Reserve Enhancement Program

- Joint program of USDA and State of Illinois on the Illinois River Basin
  - “Producers remove land from agricultural production and plant native grasses, trees, and other vegetation to improve water quality, soil, and wildlife habitat”
  - “Protect environmentally sensitive land ... restore the river’s flood plains”
- Goals include increase populations of listed species by 15% and native fish and mussel stocks by 10%



# CREP Parameters

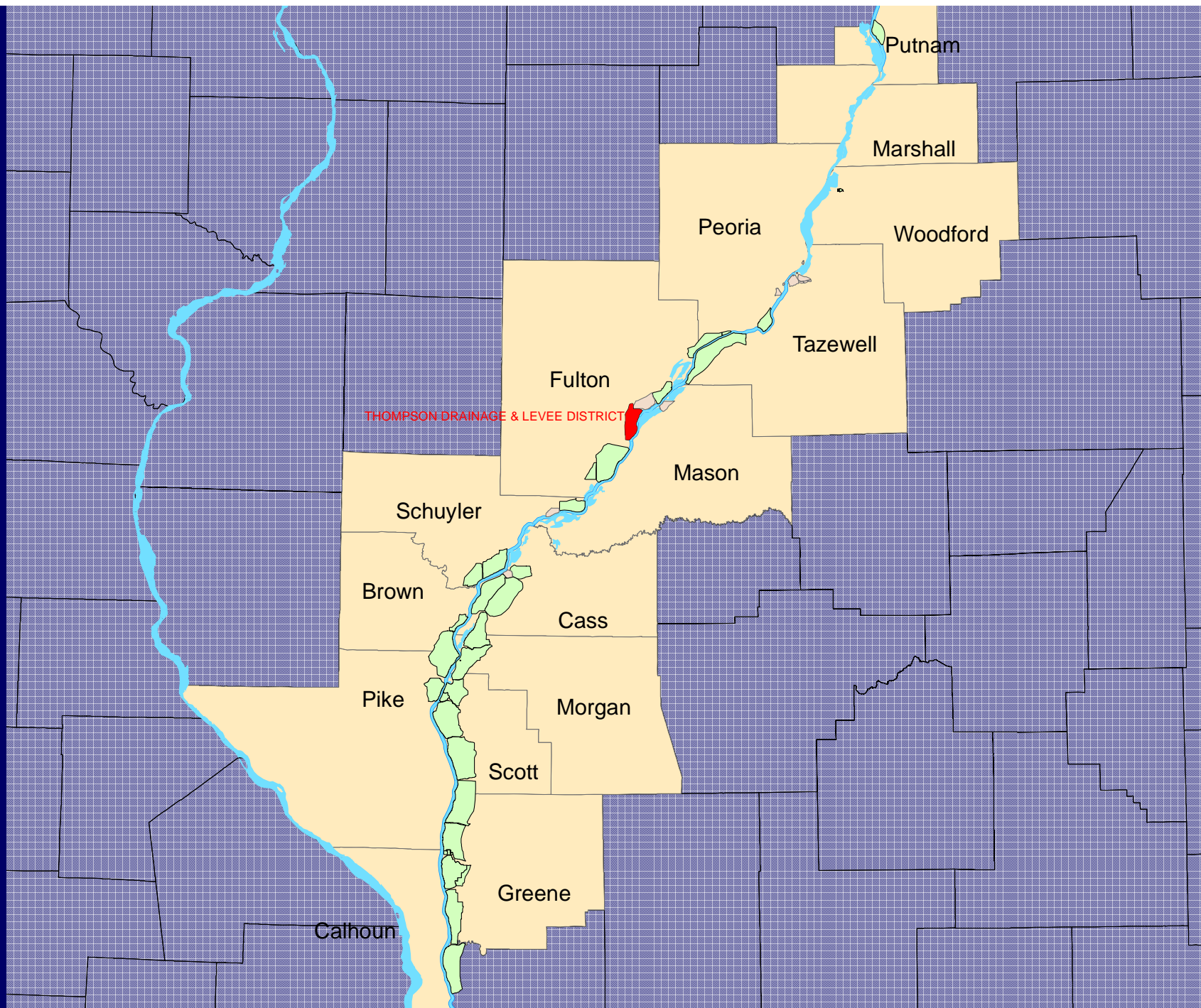
- Scope
  - 110,000+ acre enrollment since 1998
  - \$322 million over 15 years
  - \$260 million federal, \$62 million state
- CREP payments to participants
  1. Signing incentive--\$150 per acre in a riparian buffer practice, filtered strip, or grassed waterway.
  2. Practice incentive and cost-share—40% of cost of establishing practice plus 50% cost share
  3. Annual rental payment—130% cash rental rate
  4. Bonus payments for extensions beyond 15 years



# Levee Agriculture on the Illinois River

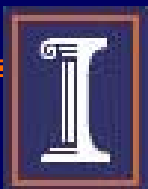
- 198,098 acres behind levees classified as agricultural
- 97% of all levee and drainage district land





# Illinois River Levees (2003)

Type	Number	Acres	Miles
Agricultural	34	198,098	312
Residential	11	6,291	65
Environmental	1	1,192	4
Industrial	2	370	4



# Output of Levee Agriculture— Measurement Difficulties

- Secondary data identifies acreage of levee district
  - Not output
- Primary data, if collected, would identify present use but not best use
- Best use and actual use change over time and with agricultural prices



# Measurement Difficulties

## Partial Solution: Remote Sensing

- Obtain land use data from NASS
- Use GIS to calculate land use within levee districts
- Problems:
  - Still not output
  - Modeling difficulties due to different classifications between NASS and IMPLAN
    - Have high confidence in the 78% of land that is grain or oilseed (soybean) farming



# Output of Levee Agriculture— Estimation Method

## 1. Levee Agricultural Acreage by NASS Classification

- Sum over levee districts to calculate levee agriculture acreage by county for each land use

## 2. Transfer to IMPLAN sectors

- “Other Crops” are imperfectly matched

## 3. Levee Agricultural Acreage Share

- Divide county levee agricultural acreage by county farmland acreage for each land use

## 4. Levee Output

- Multiply levee agriculture share times county agricultural output according to 2003 IMPLAN data

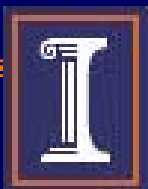


# Levee Agriculture, 2003

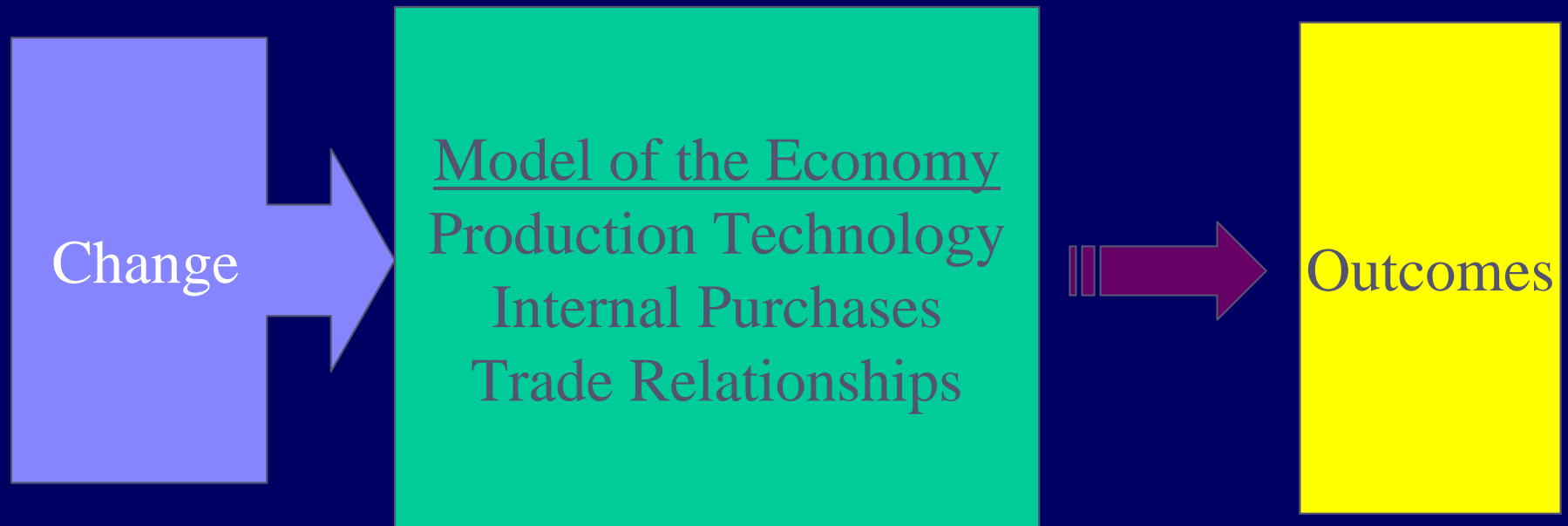
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<b>Total</b>	<b>\$53 mil</b>
Grain Farming	\$30 mil
Oilseed Farming	\$18 mil
Other	\$4 mil
Jobs	597

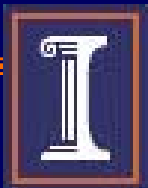
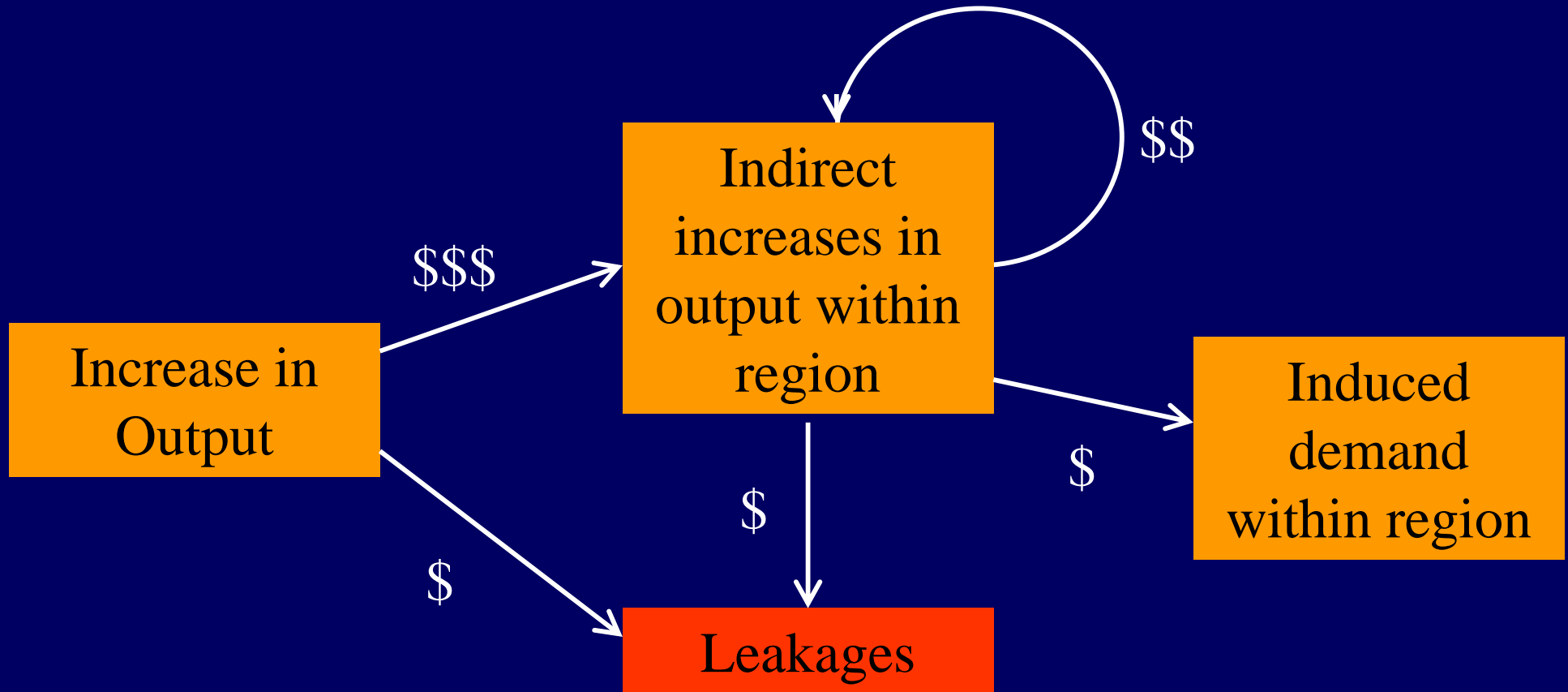
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# Input-Output Analysis



# Input-Output Multipliers



# Inside Input-Output Accounts

## Expenditures

- Purchases from other businesses
- Payments to labor
- Payment of taxes
- Imports
- Retained earnings

## Revenues

- Sales to other businesses
- Sales to consumers
- Sales to government
- Sales to exports
- Investment and inventory change



# Fundamental Input-Output Principles

- Model is demand driven
  - One industry's output requires inputs from other industries
  - Fixed proportions (linear)
- Model assumes no supply constraints
- Prices do not matter



# Net Effects of Loss of Levee Agriculture around the Illinois River

- \$74 million output lost (0.2% of regional total)
- \$13 million value added lost (0.1%)
  - Labor income
  - Indirect business tax
  - Property income
- 830 jobs lost (0.3%)



# Output of Levee Agriculture–False Assumptions

- Levee agricultural land is used no differently than other county agricultural land
- Levee agricultural land is not more productive or resource-intensive than other county agricultural land



# SAM Output Multipliers

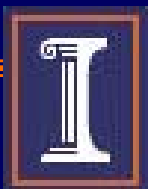
- Results are sensitive to assumptions
- Multipliers differ between sectors
  - Oilseed Farming = 1.40
  - Grain Farming = 1.39
  - Cattle Ranching = 1.52
  - All Other Crop Farming = 1.34

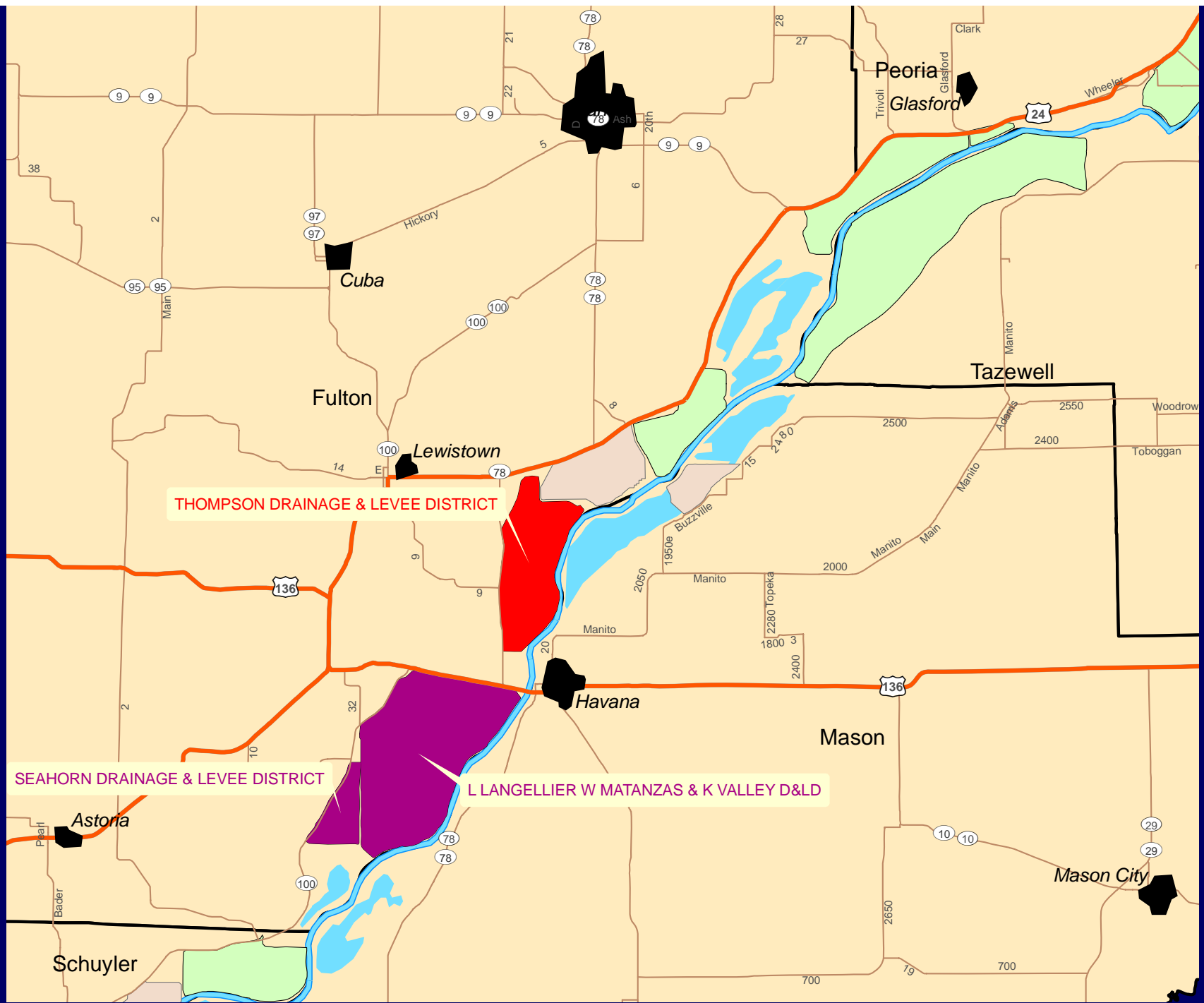


# Loss of Agriculture in Two Levees

- Used two levees immediately southwest of Emiquon for illustrative purposes
  - Region consists of Fulton County and Mason County

Total	\$3.8 mil
Grain Farming	\$2.3 mil
Oilseed Farming	\$1.4 mil
Other	\$0.1 mil
Jobs	35





# Net Effects of Loss of Levee

- \$4.6 million output lost (0.3%)
- \$2.4 million value added lost (0.3%)
  - Labor income
  - Indirect business tax
  - Property income
- 46 jobs lost (0.2%)



# Sensitivity to Assumptions

- Most multipliers increase if region is expanded to include Schuyler County and Cass County
  - Oilseed Farming: 1.18 to 1.19
  - Grain Farming: 1.19 to 1.21
  - All Other Crop Farming: 1.17 to 1.19



# Case Study: Emiquon

- There are both positive and negative economic impacts when restoring river sites
- This study from 2001 used 1997 data
- Examines entire Thompson Levee District



# The Wilder Farm and The Nature Conservancy

- The Nature Conservancy purchased the 6,300 leveed acres of the Wilder Farm for \$16 million
  - 1.5% of the farmland in Fulton county
  - \$1.6 million output, 17 employees  
(acreage based estimate, county output share)
- Almost entire Thompson Levee District
  - Commercial fisherman and State of Illinois had challenged draining of Thompson Lake
  - State Supreme Court ruled it was private property, and it was drained by 1923



# Closing Wilder Farm –Total Local Economic Effects

- \$2.1 million output
- \$911,000 value added
- 25 jobs
- \$469,000 labor income
  - \$185,000 employees
  - \$284,000 proprietors
- \$357,000 other property income

Fulton/Mason IMPLAN 1997



# Environmental Restoration Creates Jobs and Income

- Start up
  - Construction—Initial site preparation and restoration
- Operation
  - Production—Land, wildlife, and restoration management
- Spillovers
  - Consumption—Tourism, recreation, hunting, fishing, and other activities



# Operating The Emiquon Refuge

number of group: Emiquon Operation Refug

Event Name	Sector	Value	Employment	Basis	Year	Deflator	Margin		% Local
maintenance	56	110,000.	2	Industry	2001	1.093		☰	100.0%
pump & compressor	332	20,000.	0	Commodity	2001	N/A	Fed Gov't	☰	0.0%
computer equipment	339	9,000.	0	Commodity	2001	N/A	Fed Gov't	☰	1.9%
vehicle purchase	384	50,000.	0	Commodity	2001	N/A	Fed Gov't	☰	3.2%
▶ phone	441	3,600.	0	Commodity	2001	1.087		☰	49.0%
▶ electricity	443	30,000.	0	Commodity	2001	1.084		☰	76.4%
▶ gas	444	2,400.	0	Commodity	2001	0.991		☰	23.8%
▶ gasoline & diesel	451	40,000.	1	Commodity	2001	N/A	household	☰	100.0%
▶ general merchandise	455	14,000.	1	Commodity	2001	1.044		☰	82.5%
▶ salaries	5001	265,063.	0	Industry	2001	1.093		☰	100.0%
*								☰	



# Farming versus Refuge Operations— Net Effects

Measure	Farm Loss	Refuge Gain	Net
Jobs	25	10	-15
Labor income	\$469k	\$363k	-\$106k
Other property income	\$272k	\$43k	-\$229k



# But Wildlife Reserves Attract Visitors

- Estimates of annual visitor days and expenditures
  - Emiquon National Wildlife Reserve
  - (Hirschi and Braden 1997)
- 140,991 recreation visitors (\$4 per day)
- 136,500 anglers (\$11)
- 6,525 waterfowl hunters (\$31)
- 1,008 non-waterfowl hunters (\$17)



# Estimating Local Economic Effects of Visitors

Member of Group: **Angler expenditures 97**

	Event Name	Sector	Value	Employment	Basis	Year	Deflator	Margin		% Local
	Public Transport	434	0.01	0	Industry	1997	1.000		☰	100.0%
	Groceries	450	1.95	0	Commodity	1997	N/A	household	☰	100.0%
	Gasoline	451	1.76	0	Commodity	1997	N/A	household	☰	100.0%
	Apparel and accessory	452	3.86	0	Commodity	1997	N/A	household	☰	100.0%
	Eating and drinking	454	1.37	0	Industry	1997	1.000		☰	100.0%
	Access and launch fees	462	0.18	0	Industry	1997	1.000		☰	100.0%
	Hotels and lodging	463	0.79	0	Industry	1997	1.000		☰	100.0%
	Guide Services	468	0.15	0	Industry	1997	1.000		☰	100.0%
	Equipment rental	473	0.33	0	Industry	1997	1.000		☰	100.0%
	Auto repair	479	0.38	0	Commodity	1997	N/A	household	☰	100.0%
▶	Boat repair	482	0.14	0	Industry ▼	1997	1.000		☰	100.0%
*									☰	



# Effects of Tourists to the Emiquon Refuge

	<b>A</b>	<b>RV</b>	<b>WH</b>	<b>OH</b>	<b>CV</b>	<b>Old Gap</b>
<b>Number</b>	137k	141k	7k	1k	2k	--
<b>Jobs</b>	42	14	7	1	2	-15
<b>Labor Income</b>	\$536k	\$169k	\$78k	\$7k	\$24k	-\$106k
<b>Property Income</b>	\$202k	\$55k	\$26k	\$2k	\$8k	-\$229k



# Environmental Restoration without Economic Disruption?

- Restoration and recreation can replace lost agricultural jobs
- Key determinants
  - Nature of restoration and its labor intensity
  - Extent of recreation use
- Cost benefit ratio might be positive



# Conclusions

- The restoration and use of agricultural levees causes a variety of economic impacts
- Measuring economic impacts can be difficult
  - Lack of data on the value of agricultural production on specific parcels of land
  - Uncertainty in remote sensing data
  - Projections of visitors drive positive economic impacts
  - Unmeasured benefits of conversion?
    - Existence value: Intrinsic value of restored rivers
    - Decreased flood risk

