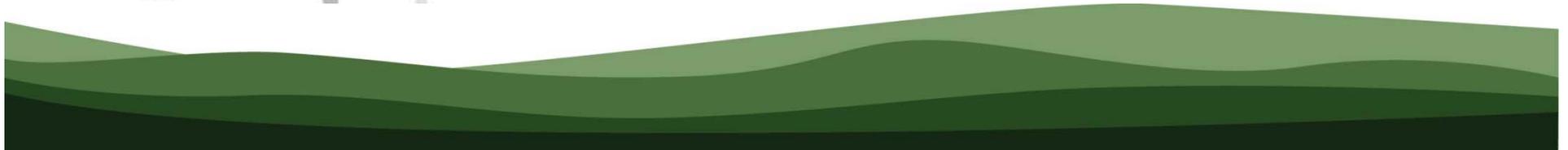


# MN Lake Superior Watershed Stream Science Symposium: **Economic Aspects of Stream Restoration**

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# Economic Objectives

- Economic Impact Analysis
- Benefit-Cost Analysis

Environmental Justice, Subsistence, Jobs, Equity, efficiency, participation

Non-market values, Ecosystem Services

# Stream Restoration

- Social Impact Analysis
- Environmental Justice

Traditional, cultural and ecological knowledge, Sense of Place, empowerment

# Ecological Objectives

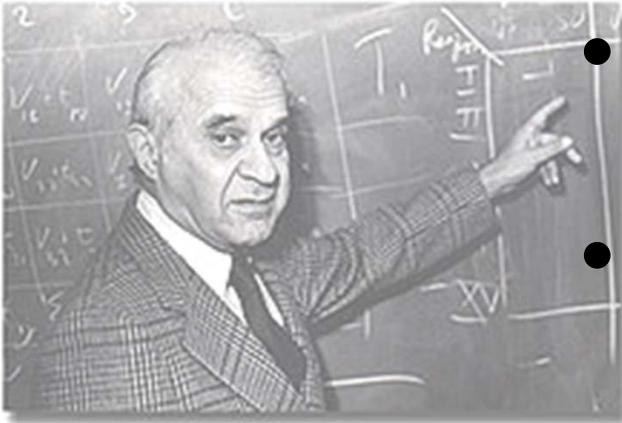
# Social Objectives

# ***Economic Impact Analysis***

## **Measures:**

- **Employment** – Estimates are in terms of jobs, not in terms of full-time equivalent employees. Hence, these may be temporary, part-time or short-term jobs.
  - **Value Added** – A measure of the impacting industry's contribution to the local community; it includes wages, rents, interest and profits.
  - **Output** – Represents the value of local production (price \* quantity).
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# ***Economic Impact Analysis***



- Built on well accepted theory - “Input-Output” (I-O).
- I-O developed by Wassily Leontief for which he won the Nobel Prize in 1973.



- IMPLAN (“IM”pact analysis for “PLAN”ning)
- Developed by the Forest Service to look at the “big picture” - regional economics.

# I-O primer: Direct, Indirect and Induced Effects

Direct



Indirect



Linkages



Transportation



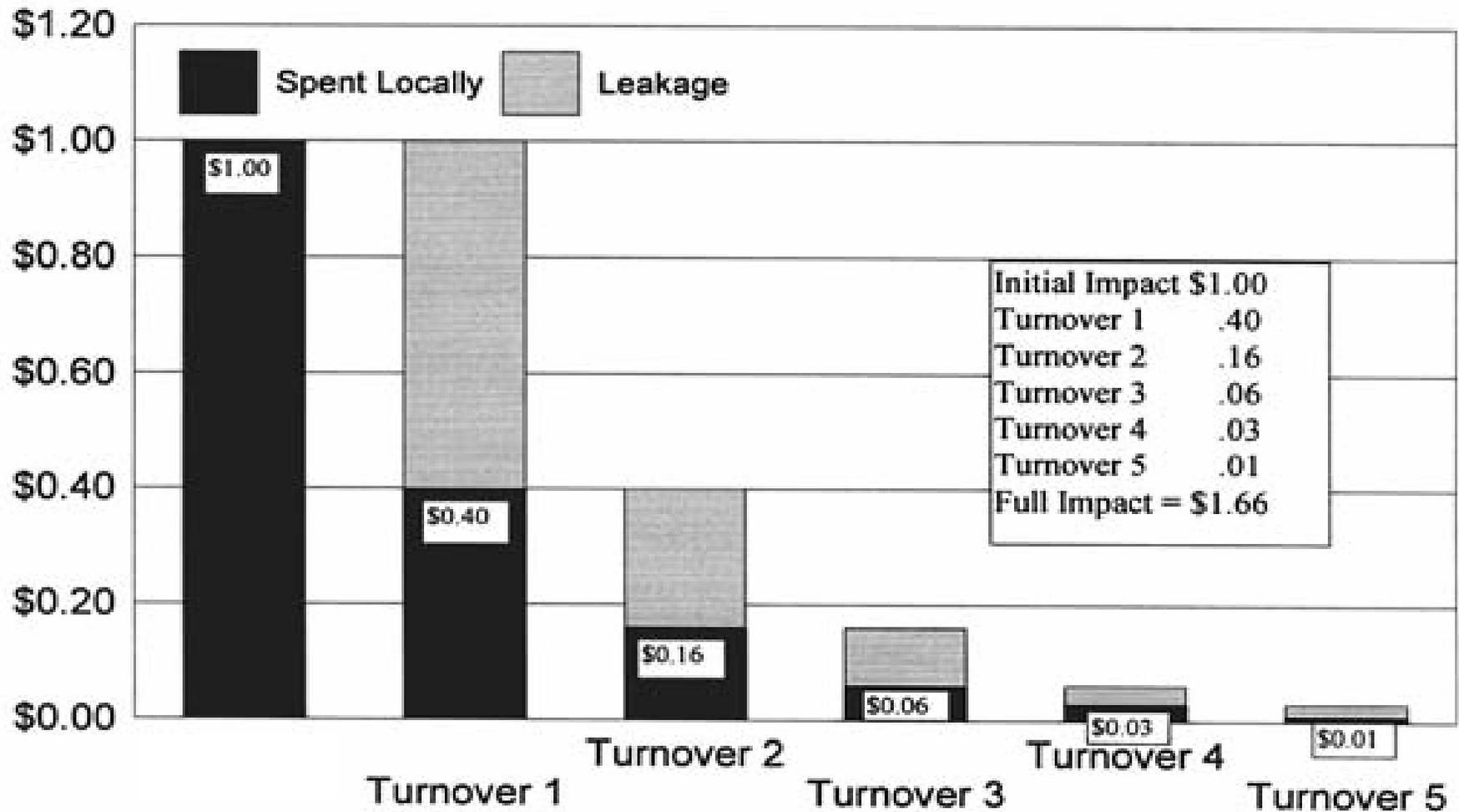
Payroll



Utilities



# I-O primer: Regional Economic Multipliers and Turnover



Source: Western Rural Development Center

# Restoration Expenditure Profiles

Past/current efforts: Use basic IMPLAN sectors

- Logging, Construction, Environmental consultants and Ag and Forestry Support Services

Working on Expenditure profiles for:

1. Large-scale general services contractors
  2. Small-scale general service contractors
  3. Manually-intensive service contractors
  4. Equipment-intensive service contractors
  5. Material-intensive services contractors
- Maybe by FS Region, High/Avg/Low spending, individual firm type (Aquatic restoration, civil engineering, biological surveys, Nx./invasives control, etc.)



# ***Benefits and Costs of Restoration***

*Job and labor income impacts are important but need to accompany an analysis of other economic and social values.*

- Cost of restoration activities
- Benefits of restoration activities
  - Value of market goods produced/enhanced
  - Social and Non-market Values



# ***Benefits of Restoration***

- Value of goods and services produced or enhanced
  - Market goods: Commercial products from restoration
  - Enhancement of in-stream uses (water quality and quantity)
  - Other Non-Market goods and services
    - Use Values and Non-use Values



# ***Non-Market Values***

- Difficult to quantify!!
- Constraints (time & \$\$) and limitations (revealed preference and hypothetical)
- However, economic analysis should consider all relevant values, not merely those that are easy to quantify.
- **Benefit transfer**
- In the absence of quantitative information they are often discussed qualitatively.



# Benefit Transfer: value of streamflow

- Economic valuation and market transactions in the western U.S. from 1990 through 2003
  - Municipal supply, irrigation, hydro, recreation, habitat, channel maintenance, navigation, etc.
- price of water is highly variable within and between western states.
- information from local markets or local studies should be used.



# Example Project: New York City Watershed Forest Management Plan

	East of Hudson Watershed Economy				West of Hudson Watershed Economy			
	Employment (full and part-time)		Labor Income (2011 dollars)		Employment (full and part-time)		Labor Income (2011 dollars)	
	Direct	Total	Direct	Total	Direct	Total	Direct	Total
Treatment costs	0.03	0.03	\$857	\$1,059	4.6	5.4	\$103,768	\$132,241
<b>Sawtimber</b>								
removal	2.2	3.0	\$68,570	\$108,497	8.5	12.7	\$262,092	\$424,973
processing	1.8	2.8	\$74,055	\$135,664	6.9	12.6	\$283,060	\$533,253
<b>Total</b>	<b>4.0</b>	<b>5.9</b>	<b>\$142,625</b>	<b>\$244,162</b>	<b>15.4</b>	<b>25.3</b>	<b>\$545,152</b>	<b>\$958,226</b>
<b>Potential Low-grade</b>								
removal	3.3	4.5	\$101,639	\$160,822	11.8	17.7	\$364,765	\$591,451
processing	3.7	5.8	\$152,458	\$279,293	13.3	24.3	\$547,147	\$1,030,764
<b>Total</b>	<b>7.0</b>	<b>10.3</b>	<b>\$254,097</b>	<b>\$440,115</b>	<b>25.1</b>	<b>42.0</b>	<b>\$911,911</b>	<b>\$1,622,215</b>



# New York City Watershed Forest Management Plan

	<b>East of Hudson Watershed Treatments</b>	<b>West of Hudson Watershed Treatments</b>	<b>East of Hudson 2<sup>nd</sup> Decade treatments</b>	<b>West of Hudson 2<sup>nd</sup> Decade treatments</b>
<b>Cost of treatments</b>	\$2,850,488	\$5,137,363	\$730,662	\$2,138,905
<b>Sawtimber revenues</b>	\$2,080,548	\$7,952,416	\$3,554,789	\$5,154,303
<b>Net-present value</b>	\$(769,940)	\$2,815,054	\$2,824,127	\$3,015,399
<b>Benefit to Cost ratio</b>	0.7	1.5	4.9	2.4
<b>Potential Low-grade revenues</b>	\$140,896	\$505,651	\$136,751	\$234,188

# New York City Watershed Forest Management Plan

- Assuming no sawtimber is sold, the cost of treatments can be justified solely on an estimated **value of water yield from forest management** (\$190 for 100,000 gallons of water from forest health treatments; Romm et al. 1987).
- Suggests that from 459 and 828 million gallons would need to be produced annually from City forests to justify the discounted costs of treatment, which was ***less than one percent of annual consumption in 2009.***
- The benefit of treatment can also be evaluated in terms of **value for groundwater protection** (\$77.50 per household; Schultz and Lindsay 1990).
- suggest communities conservatively value groundwater protection at \$260 million dollars annually. ***The cost of treatment represents 1 percent of this value.***

# Social Analysis

- ***Social impact analysis*** - effects to communities who depend upon FS land for physical, mental, spiritual, traditional or other sources of well-being.
- Social analysis focuses on changes in well-being and quality of life of identified communities (communities of place and interest).
- Examples include individuals and groups interested in:
  - **recreation and access**
  - **Sense of place**

# Environmental Justice

- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low income populations.
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# Environmental Justice

- Establish presence of environmental justice populations (as defined by Council of Environmental Quality)
- Examine potential for disproportionate and adverse effects to communities
  - Are costs of restoration disparately born by EJ populations?



# Public perception and social acceptance

- *Acceptance based on perception of benefits and costs to society*
  - Are benefits of restoration perceived as realistic and achievable?
  - Importance of outreach and education
- *Acknowledgement of short-term costs can further acceptance of long-term benefits*
  - Importance of outreach and education



# Questions?

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