

ECONOMIC METHODS & EMPIRICAL ESTIMATES OF USE & PASSIVE USE VALUES OF INSTREAM FLOW FOR RECREATION AND FISHERIES

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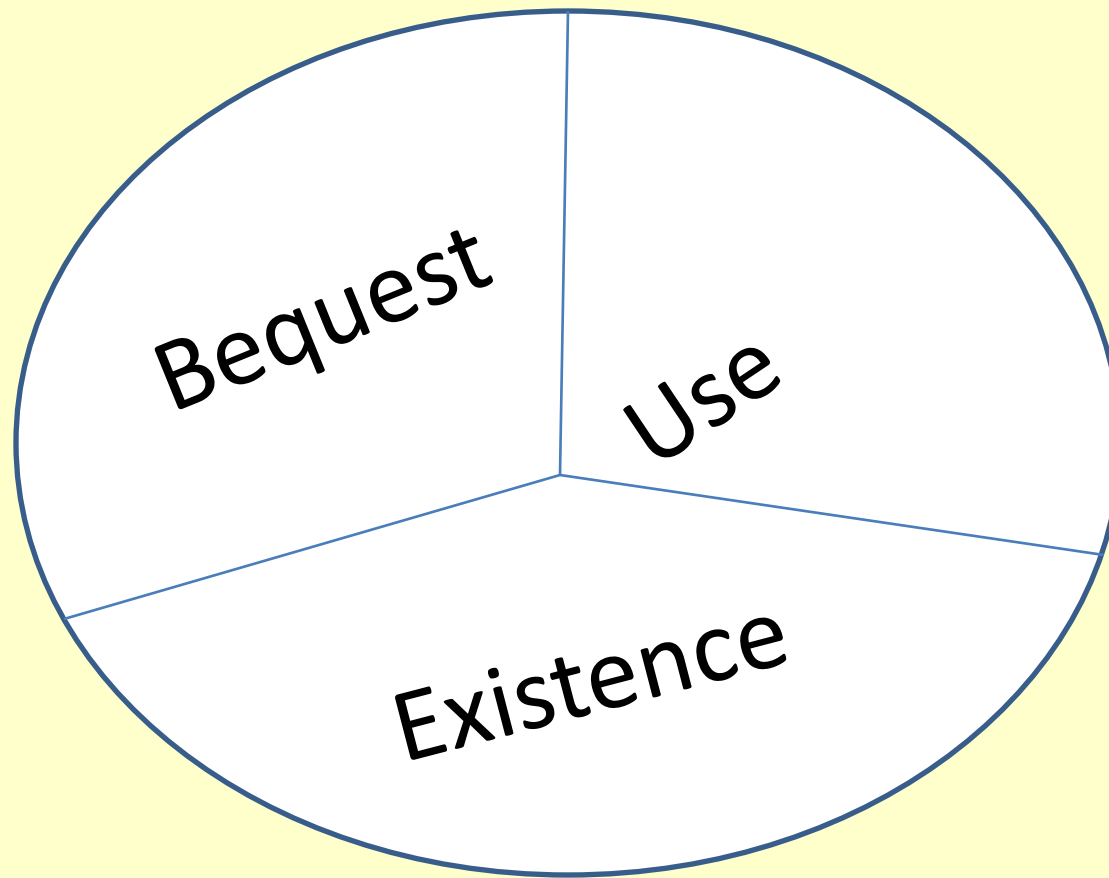
Fort Collins, CO

Overview

- **Total Economic Values Measured by Willingness (& Ability) to Pay (WTP):**
 - **Use (Recreation & Commercial)**
 - **Passive Use (Existence & Bequest)**

- **Passive Use Values (PUV) of Flows & Fish**
 - Existence Value: to know species exists
 - Bequest Values: value to know protection
 - PUV most important for rare or T & E species
 - PUV are public goods:
 - non-rival so value per household added up

Total Economic Value: The Complete Picture for T&E Species



Optimum flows not minimum flows!

Economic efficiency suggests society should maximize net benefits by allocating water to instream flow (ISF) & fisheries to achieve:

- Optimum flows not minimum flows

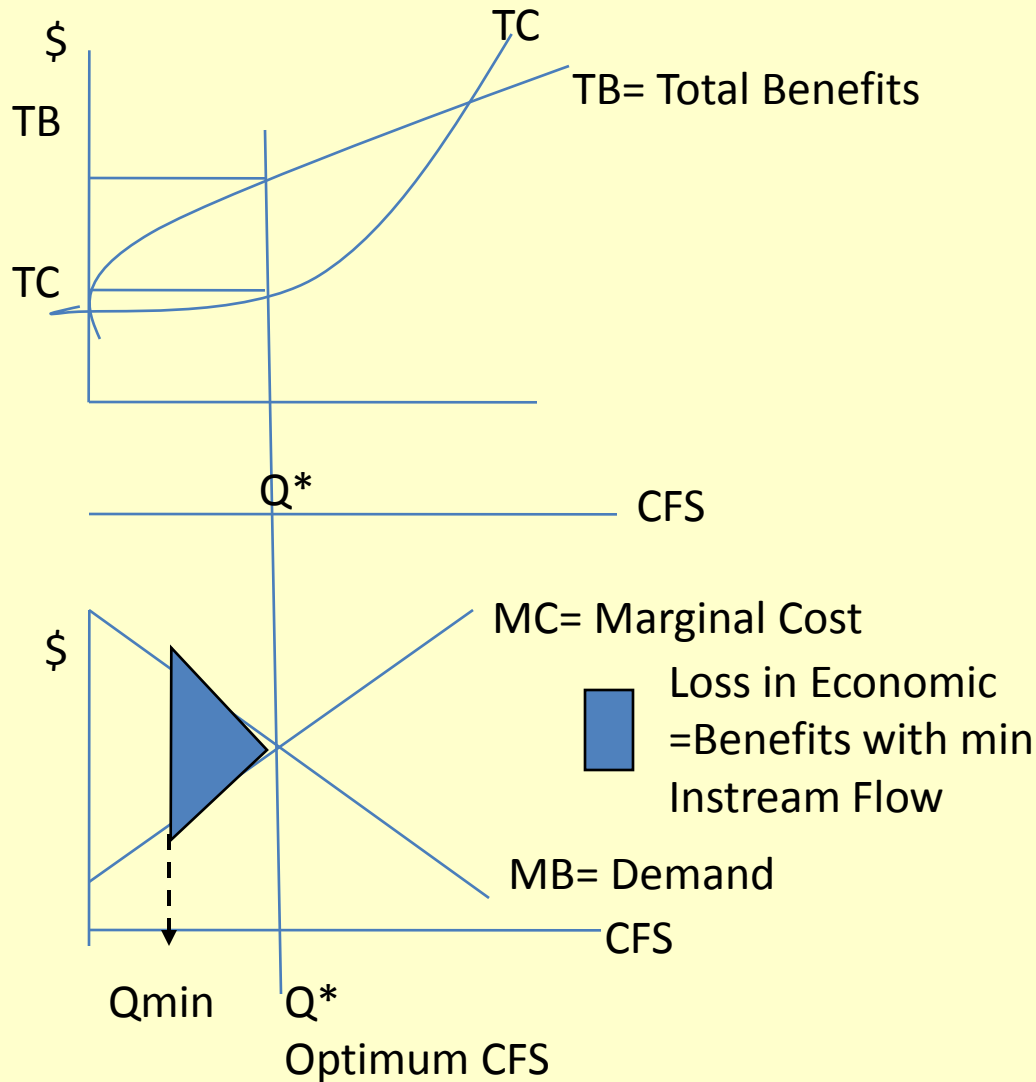
Optimum flows not minimum flows!

Economic efficiency suggests society should maximize net benefits by allocating water to instream flow (ISF) & fisheries to achieve:

- Optimum flows not minimum flows:
- **Allocate water to ISF & fish until marginal value of water in all uses is equal.**
- **Maximize difference between total benefits and total cost.**
- **Or where Marginal Benefits of additional flow equals the Marginal Cost**

- Minimum Flow concept is inconsistent with the way farmers apply irrigation water, people select cars, houses, etc.
- Minimum flows should be a legal minimum only if economic analysis yields $TB < TC$.

Optimum Instream Flow & Losses with Minimum Instream Flow



Overview of Valuation Methods to Measure WTP for ISF

- **Recreation:**
 - Travel Cost Method
 - Contingent Valuation Method
- **Passive Use Values**
 - Contingent Valuation
 - Conjoint/Choice Experiments
- **Market Transactions**

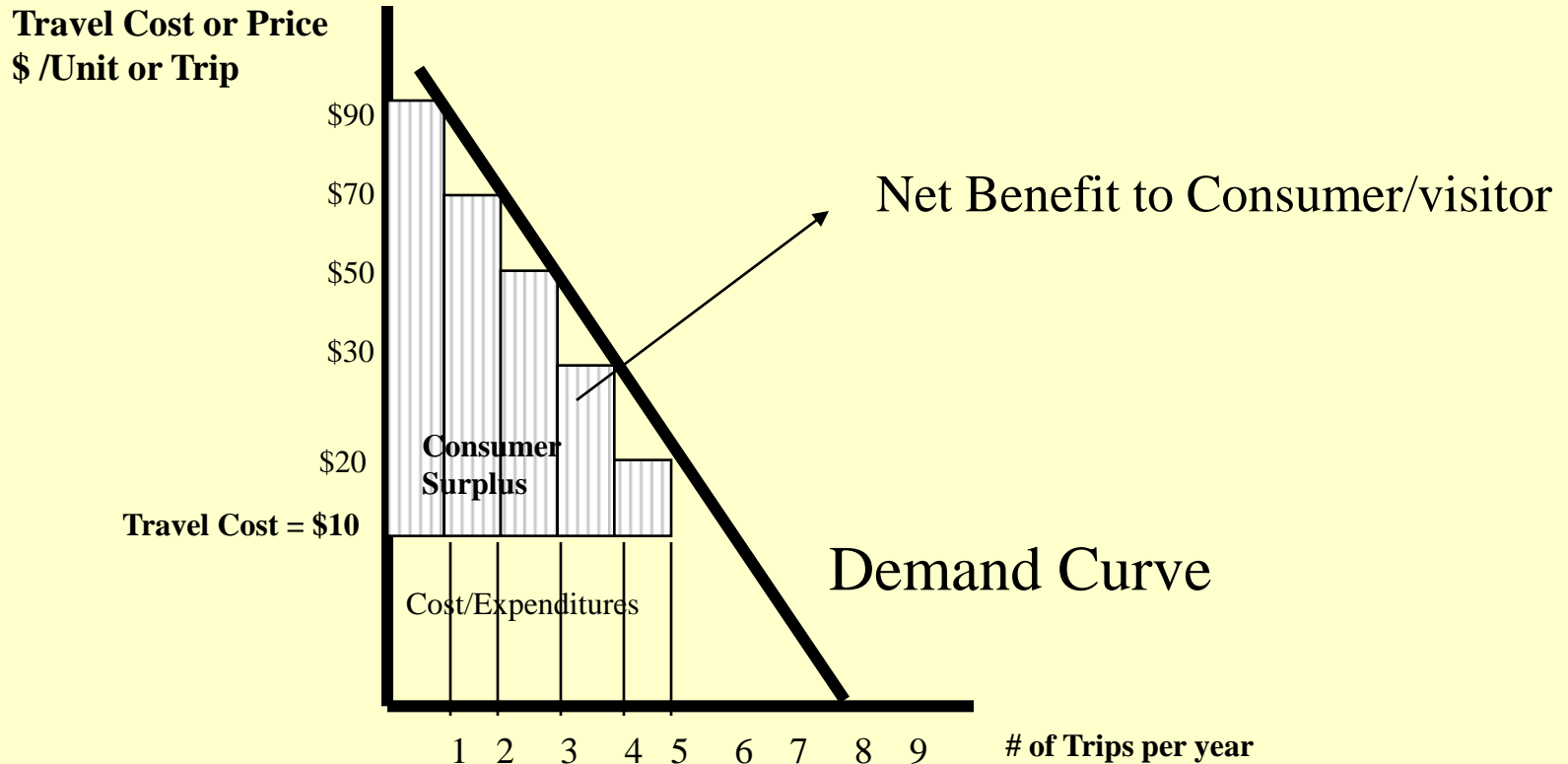
Methods to Value Flow & Fish

Recreation: Travel Cost Method

- Variations in Visitors Travel Cost
Trace out Demand Curve
- From Demand Curve Net WTP
or Consumer Surplus is calculated

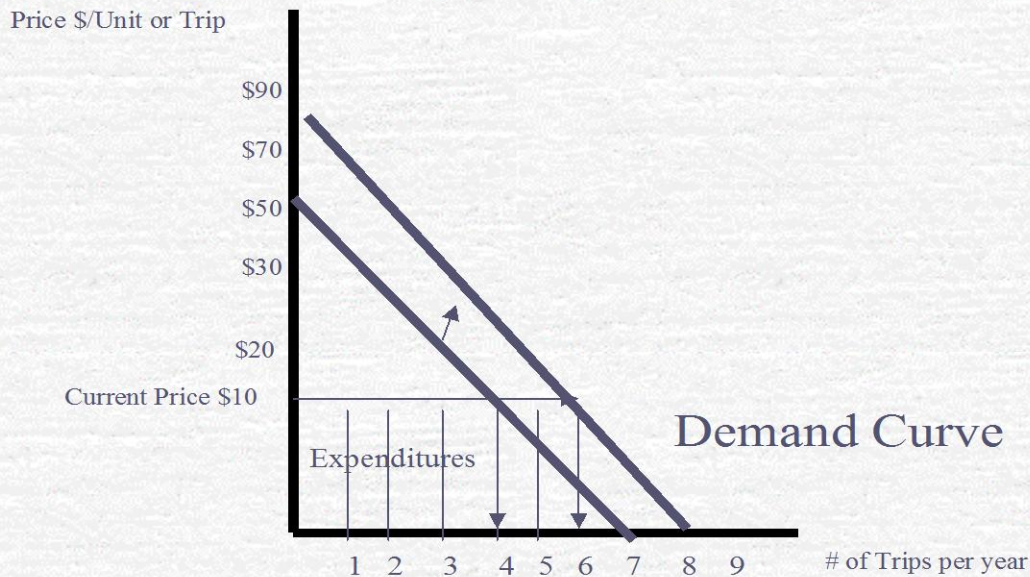


Travel Cost Method Demand Curve and Consumer Surplus



How Instream Flow Increases Demand for Recreation & Consumer Surplus

Shifts in Demand Curve & Instream Flow



Contingent Valuation Method

- Survey of Visitors (use) or Household (PUV)
Hypothetical or Simulated Market or
- Voter Referendum to elicit WTP

Conjoint/Choice Experiment

- Survey
- Allows estimation of Marginal WTP for separate river characteristics such as:
 - fish populations
 - fish catch
 - instream flow (CFS)

When to use CVM or when to use Conjoint

1. Use CVM when all attributes are ecologically linked together.
2. Use Conjoint when resource management allows attributes to vary somewhat individually from each other.

EMPIRICAL ESTIMATES OF INSTREAM FLOW VALUES

- Recreation Use Values
 - Instream flows & recreational fisheries
- Total Economic Values of Fish
- Market Transactions Value for Flows & Fish

Recreation Boating Use values for Flows

<u>State</u>	<u>Value \$/AF</u>	<u>Method</u>
Colorado (Rafting)	\$7-\$13/Year	CVM
Colorado (Kayaking)	\$12-\$24/Year	CVM
New Mexico (Rafting)	\$900/PV*	TCM

* PV is Present Value or Water Right Price

Annual Recreational Fishing Values per Acre Foot of Flow

<u>Where:</u>	<u>Value \$/AF</u>	<u>Method</u>
<u>California</u>		
• San Joaquin River	\$45-\$116 per All year August	TCM
• Stanislaus River	\$11-\$13	TCM
• Feather River	\$46-\$73 per	TCM
<u>Colorado</u>		
Western CO	\$43-\$86 per	CVM

Total Economic Values of Fish & Flows

<u>Where</u>	<u>Annual Value</u>	<u>Method</u>
<u>New Mexico</u> Rio Grande	\$29 per household for Silver Minnow	CVM
<u>California</u> San Joaquin	\$181 for 14,900 more Salmon	CVM
<u>Montana</u>	\$3-\$23 per household for Arctic Grayling	CVM

Where

Annual Value

Method

AZ, CO, NM, UT

Colorado & Green
Rivers

\$132-\$268 per household
for 8 desert fish in
1,000 miles of river

CVM

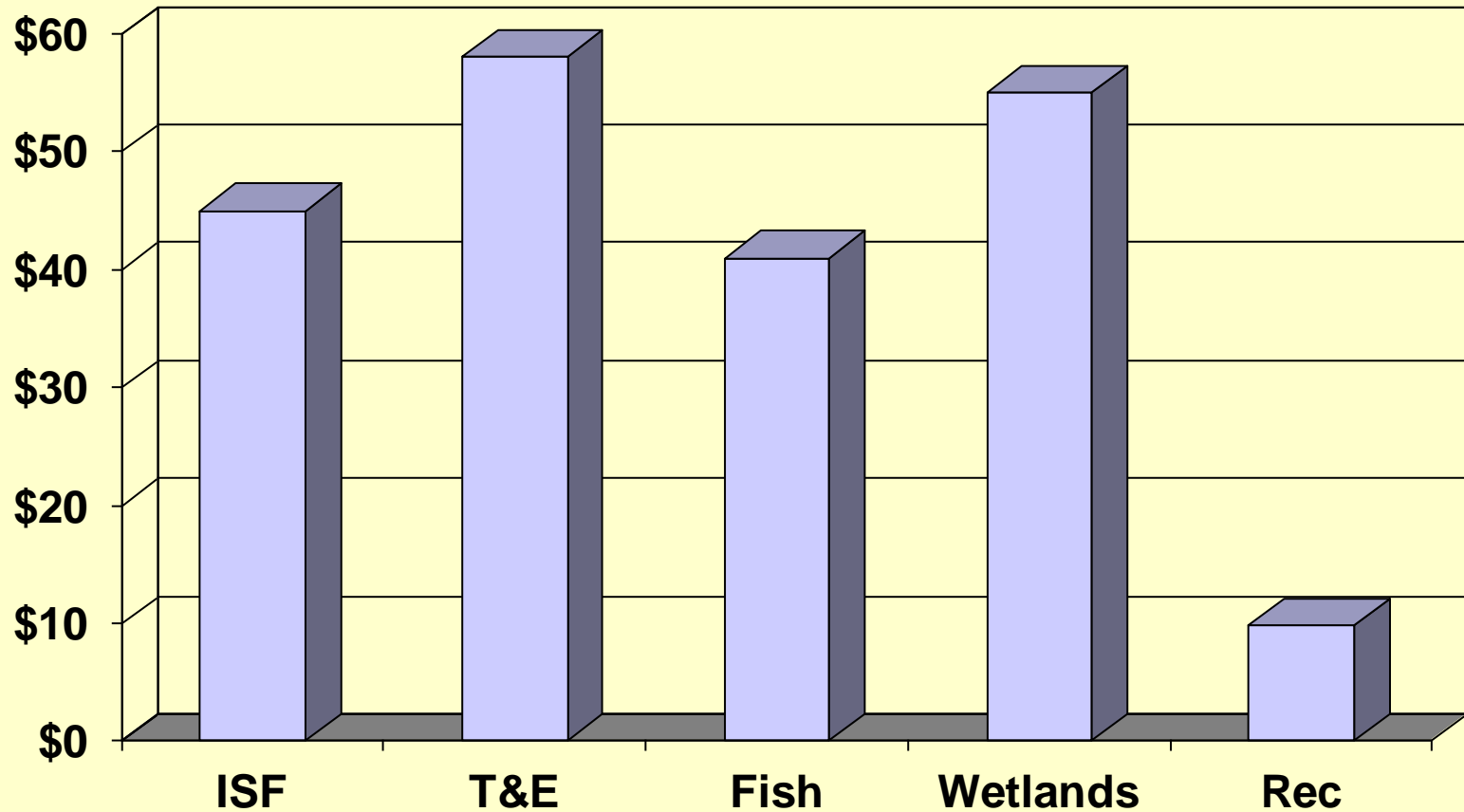
Columbia River

\$120-\$240 per household
for Salmon

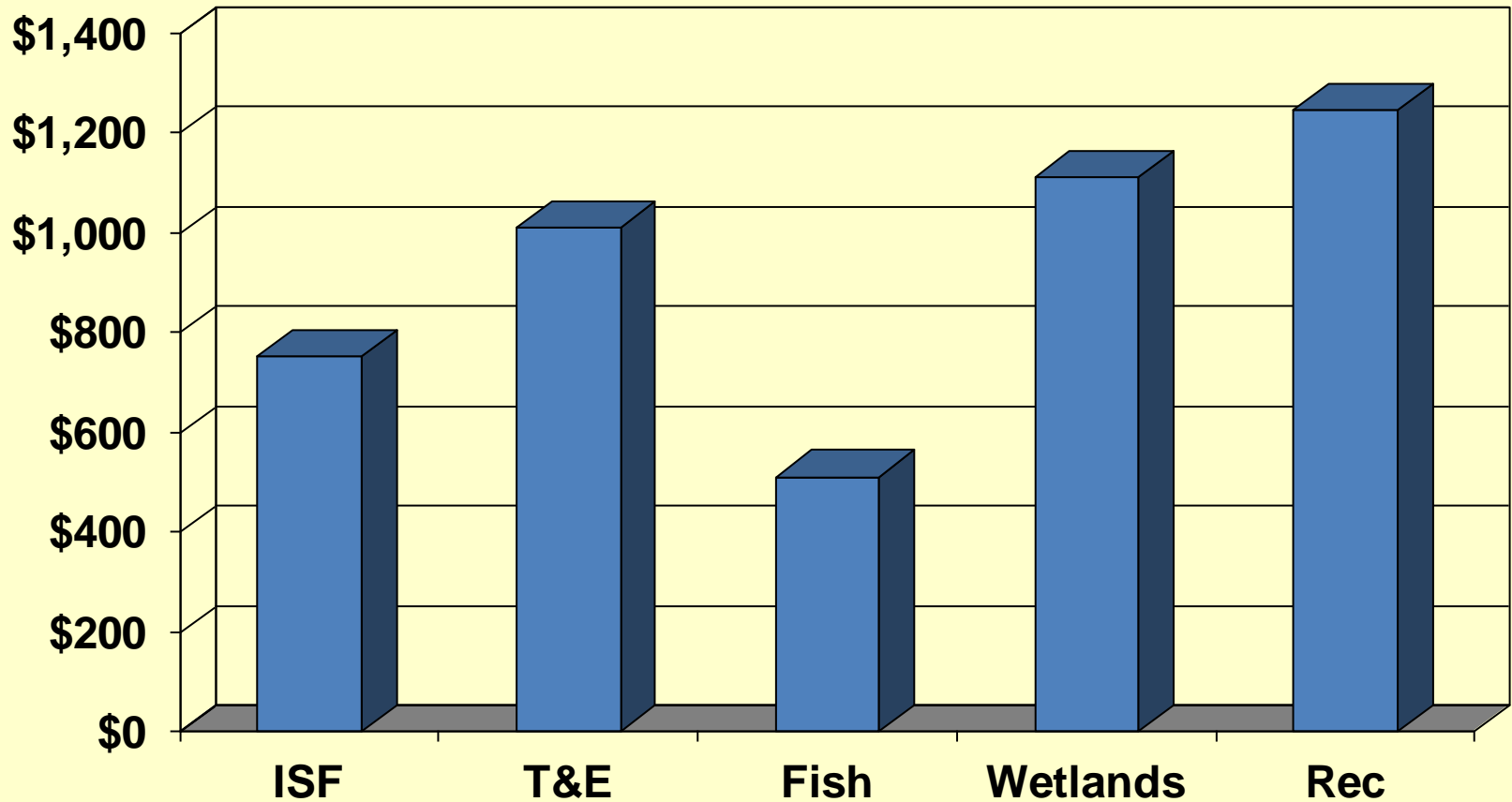
Choice
Exp

Evidence of Instream Flow Values from Market Transactions

Water Lease Rates by Purpose in Western US (\$/Ac Ft)

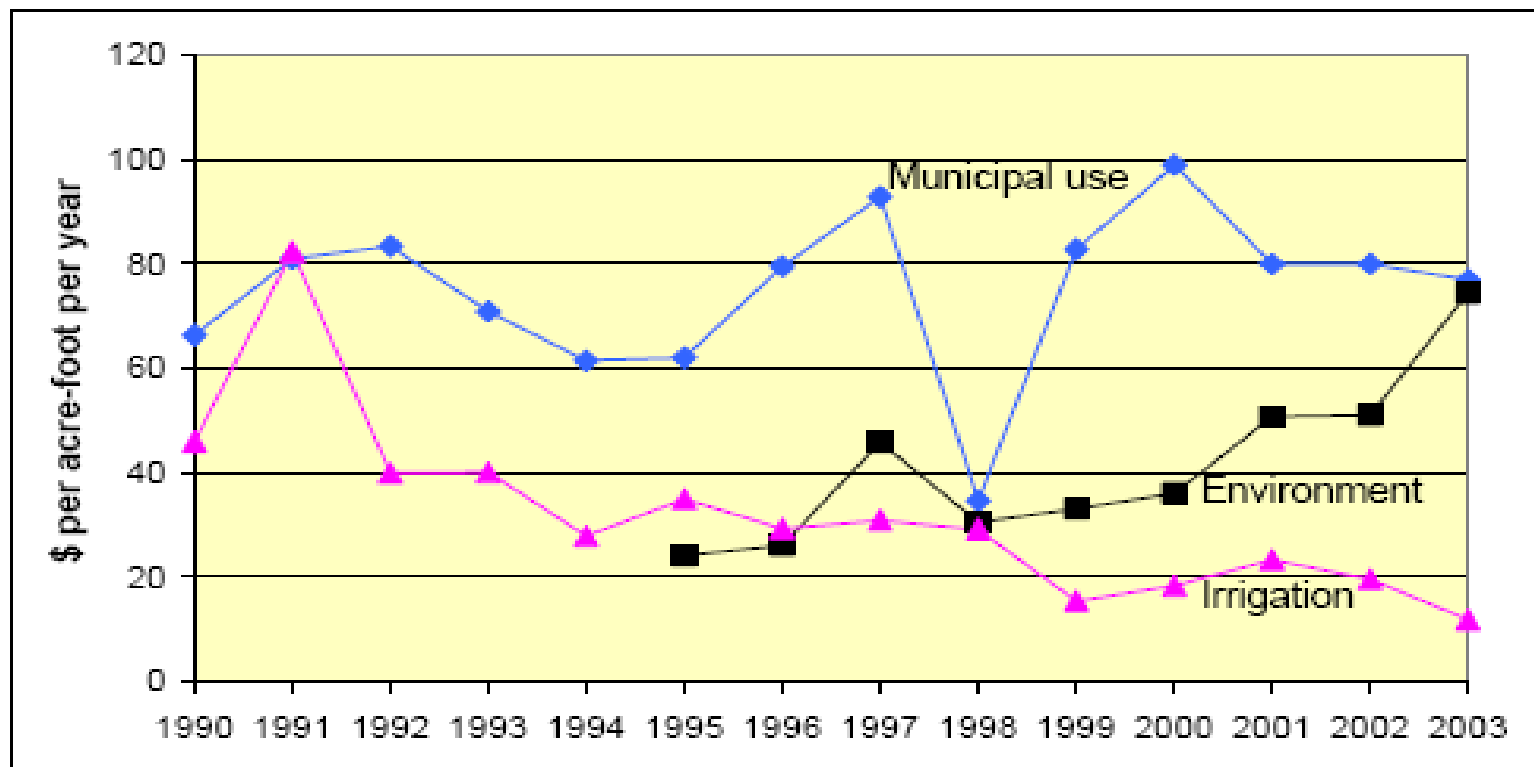


Water Right Prices by Purpose in Western US(\$/Ac Ft)



Trend in Water Prices for M&I, Irrigation & Environment

Figure 21. Trends in median price of water purchased for municipal, irrigation and environmental purposes (year 2003 dollars)



From Brown, 2004, USFS

Comparison of NMV & Market Values for Leasing Instream Flow

Environmental Use	Non Market Value: \$/AF	Market Transaction
Fishing in CA	\$34-\$67	\$41
Fishing in CO	\$43-\$86	\$41
Recreation-CO	\$10-\$19	\$10
<u>Wetlands-CA:</u> Hunting only Hunt, View, Fish	\$8 \$300	\$55

Conclusions

- Economists recognize both use and non use values of instream flows and fisheries
- Economists have several federally accepted methods to measure these values.

- The market transactions for water validate that these environmental values of water for flows & fish often exceed irrigated agricultural values otherwise the sale would not have happened between willing sellers.
- Non Market values of water are similar in size to what is observed in actual transactions for water.

Conclusions

- It's optimum flows not minimum flows that are economically justified in many cases.