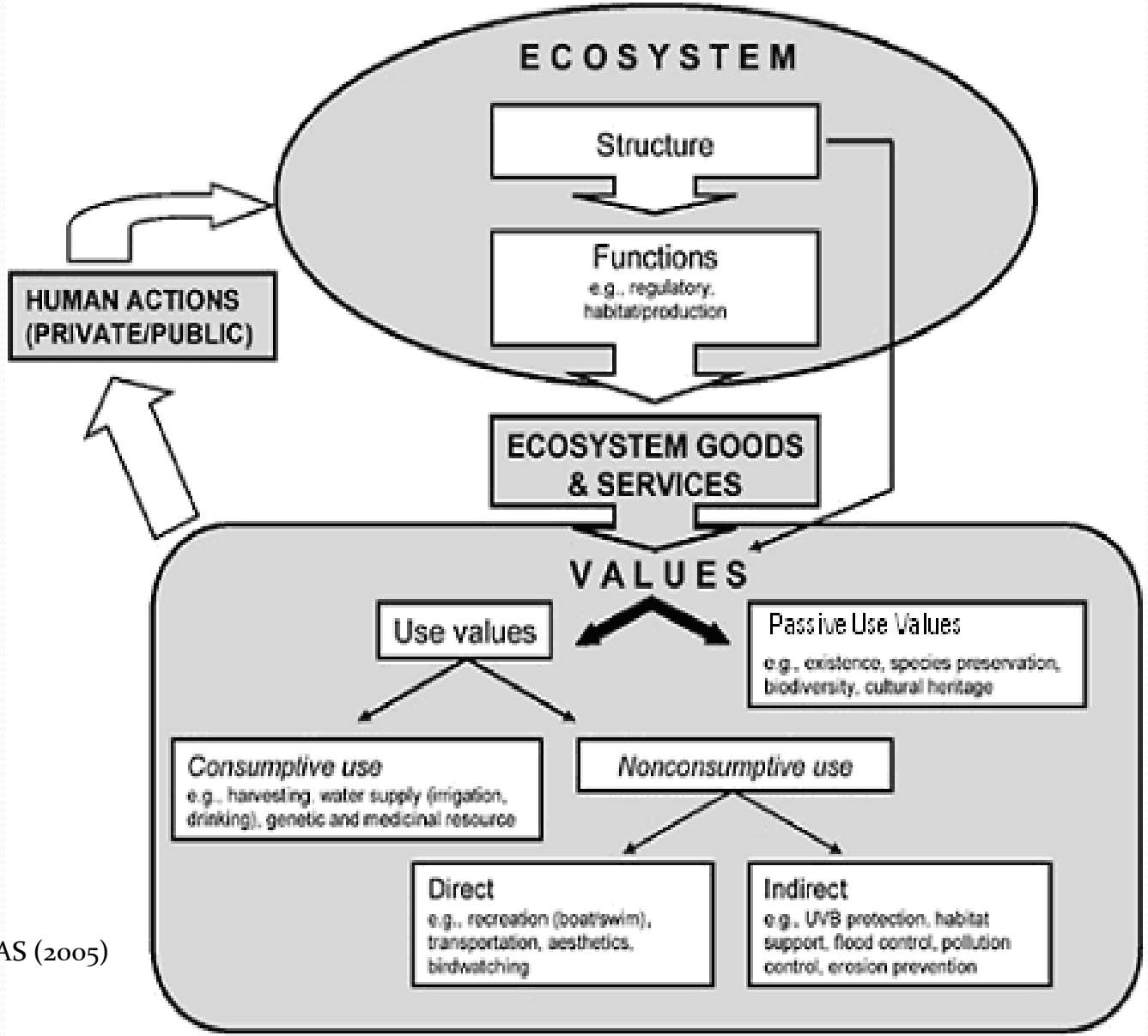
Glen Canyon Dam Operations: Passive Use Valuation-- History and Current Efforts

Objectives

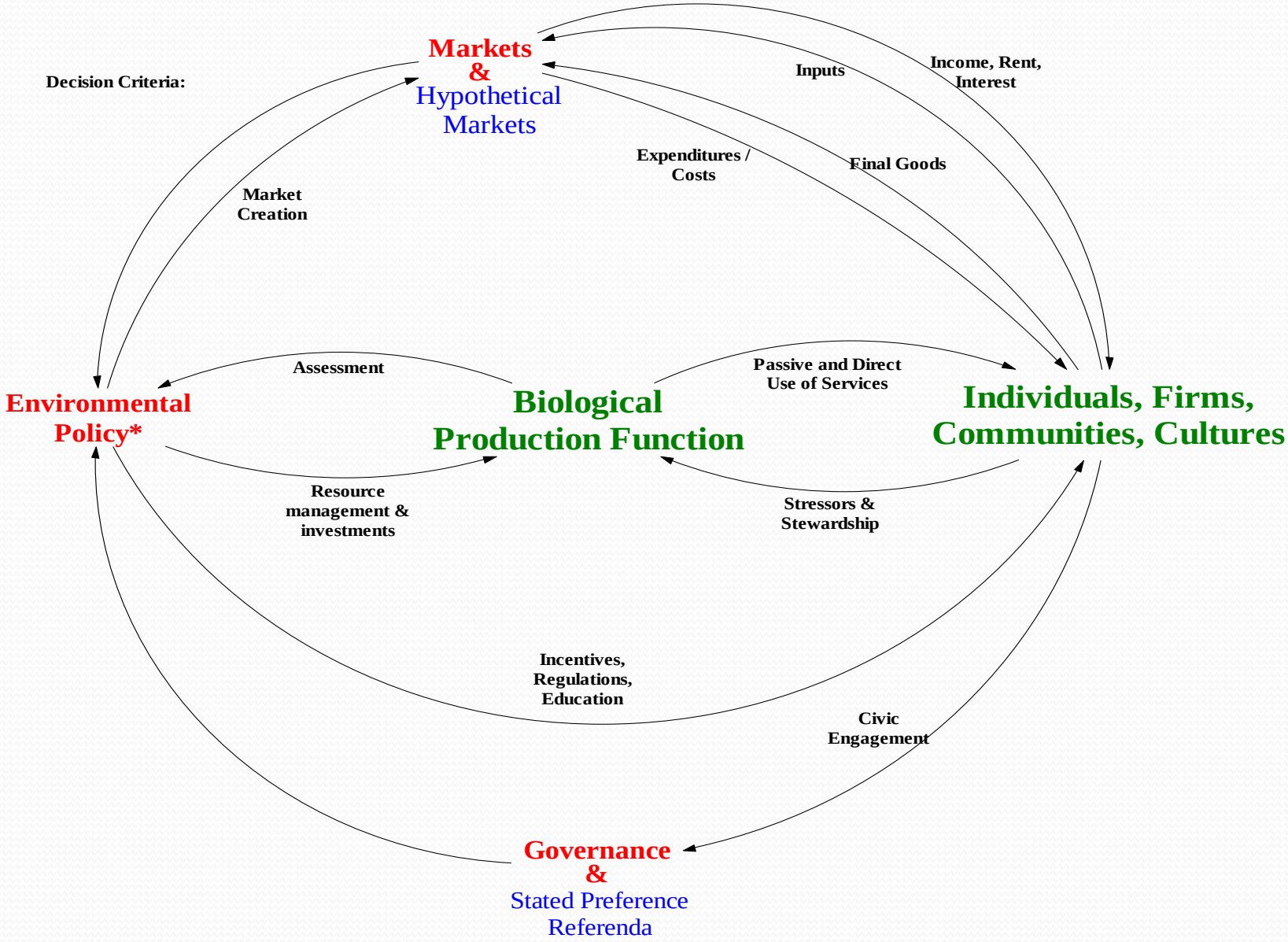
- Introduction to Economic Services Valuation
- Application
  - Grand Canyon of the Colorado River, Arizona-1994; 2013

Connections between ecosystem structure and function, services, policies and values (source, NAS 2005)



Adapted from NAS (2005)

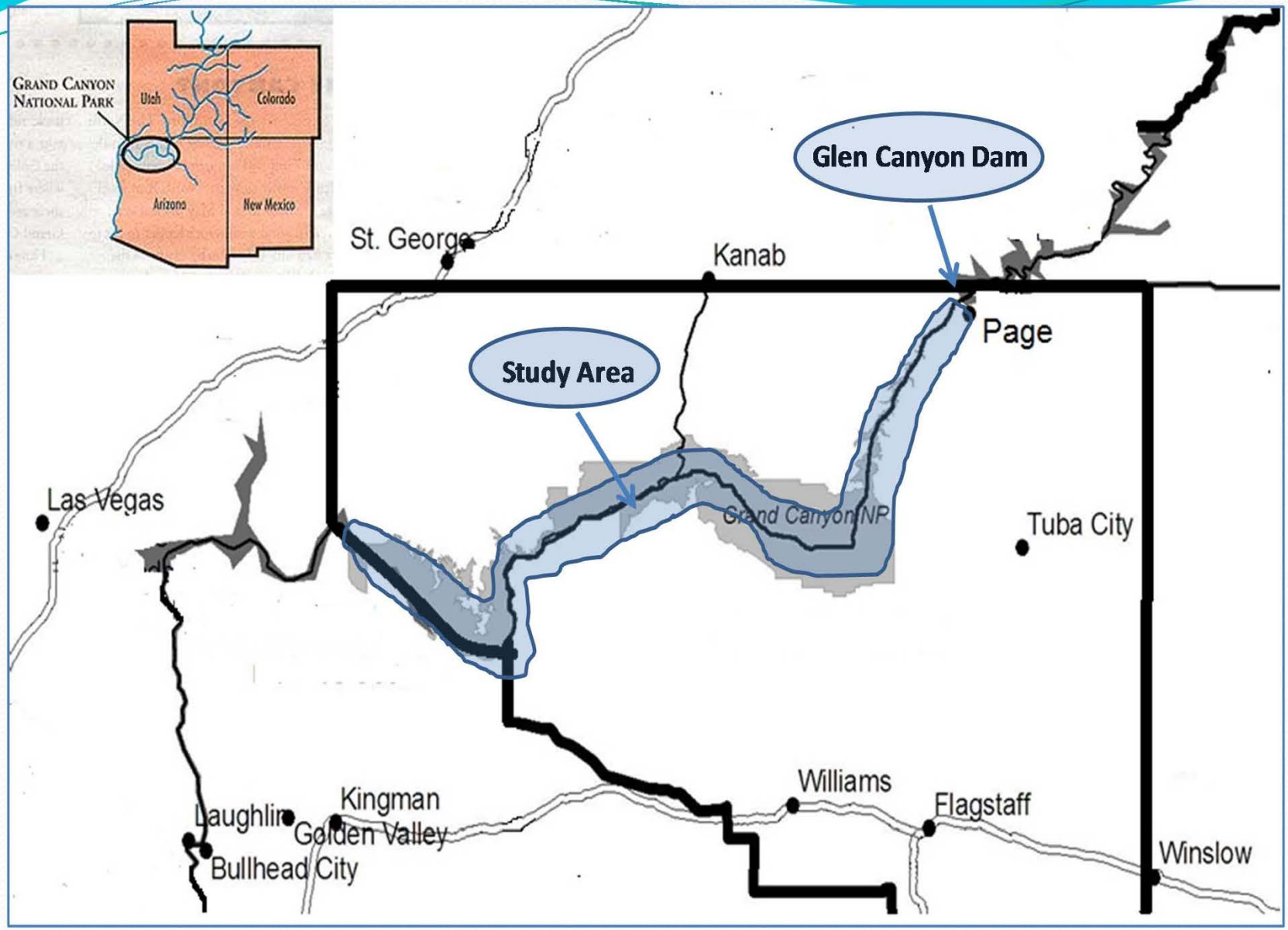
COSERA General Implementation Model: Environmental Economics Layer



U.S. Regulatory Guidance on Types of Approved Methods

- Approved methods based on 43 CFR include:
- Revealed preference methods: market, appraisal, factor income, travel cost, hedonic price, random utility model
- Stated preference methods: contingent valuation, conjoint analysis, random utility model
- Benefit transfer: unit day value method
- Equivalency Methods: HEA, REA, conjoint analysis
- "Other valuation methodologies that measure compensable value in accordance with the public's willingness to pay, in a cost-effective manner, are acceptable methodologies to determine compensable values .." (43 CFR 11.83 (e)(3))

Application


Grand Canyon National Park
Utah
Colorado
Arizona
New Mexico
Glen Canyon Dam
St. George
Kanab
Page
Study Area
Las Vegas
Grand Canyon NP
Tuba City
Williams
Flagstaff
Kingman
Laughlin
Golden Valley
Bullhead City
Winslow

Colorado River Economic Suite of Studies

- Phase I: White paper discussing proposed suite of studies (completed March 2006)
- Phase II: Existing Data on river and flow-related values, visitor expenditures, and remaining data gaps. (completed June 2007)
- Phase III: Data collection for direct use and passive use values (in process)
- Phase IV: Integration of all data into a comprehensive value/expenditure modeling framework (?????)

Publications from Colorado River Studies thus far

- Neher, C., J. Duffield, and D. Patterson. 2013. Modeling the influence of water levels on recreational use at Lakes Mead and Powell. *Lake and Reservoir Management* 29:233-246.

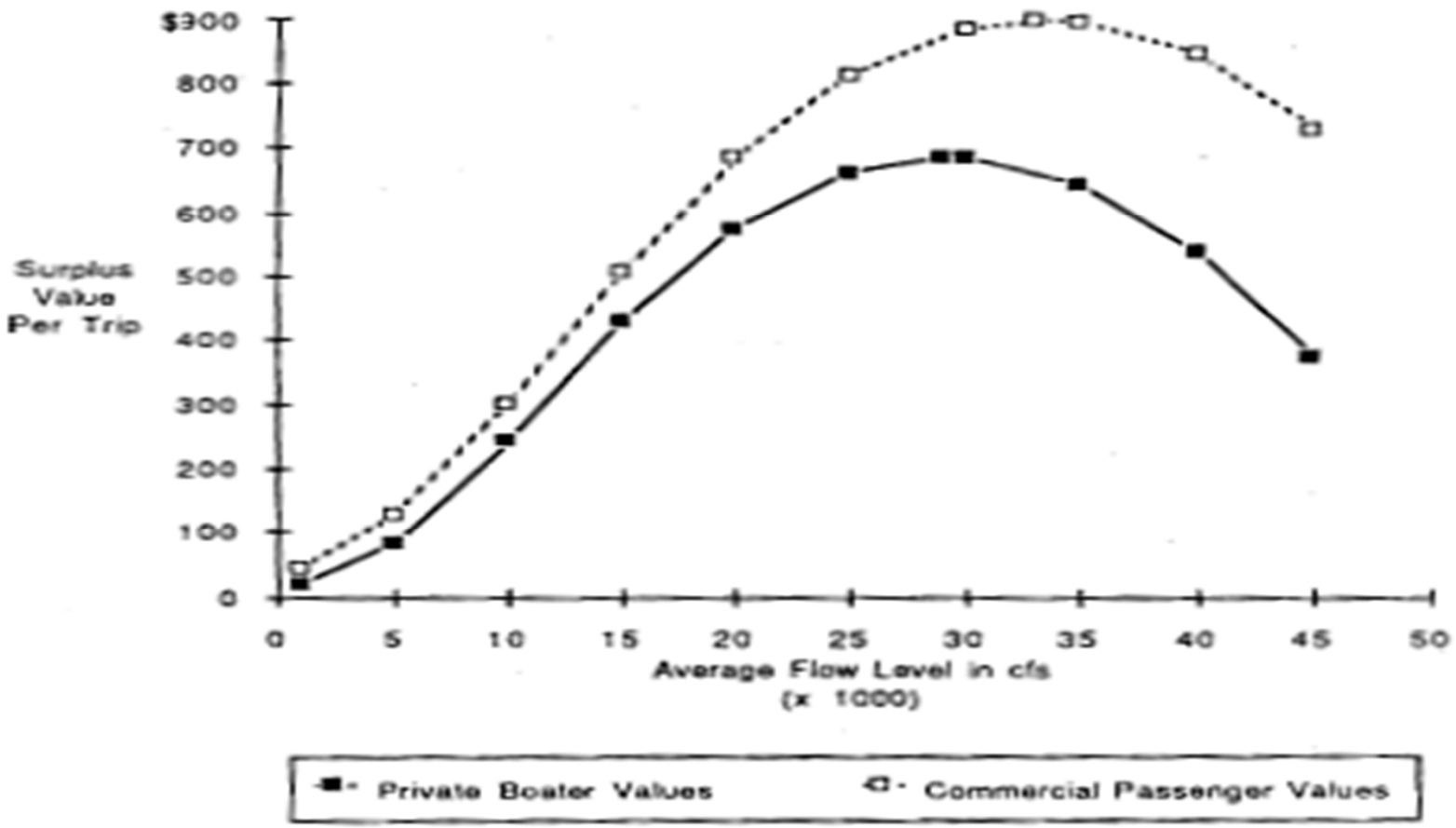
- Duffield, J.W., C.J. Neher, and D.A. Patterson. "Economic values for National Park System Resources within the Colorado River Watershed".pp. 123-132 in Melis, T.S. et al. 2010. Proceedings of the Colorado River Basin Science and Resource Management Symposium, November 18-20, 2008, Scottsdale, Arizona: U.S. Geological Survey Scientific Investigations Report 2010-5135, 372 p.

Prior Research: Grand Canyon Ecosystem Economic Studies

- Issue: management of Glen Canyon Dam for peaking operations, studies began in early 1980´s
- Economics focus on direct recreation use values as function of flow & ecosystem service values for sediment conservation and endangered species (humpback chub recovery)
- EIS process resulted in a new Record of Decison in 1995 that reduced daily allowable fluctions for peaking power from historical 25,000 plus-minus to 6,000 to 8,000 daily

Key previous studies of Grand Canyon of the Colorado resources

- Direct use values- Bishop et al 1987
- Nonuse values- Welsh et al 1995
- Studies were in context of Glen Canyon Dam operations
- Focus was Grand Canyon river corridor below the dam


$300
800
700
600
500
400
300
200
100
0
Surplus Value Per Trip
0
5
10
15
20
25
30
35
40
45
50
Average Flow Level in cfs (x 1000)
Private Boater Values
Commercial Passenger Values

Glen Canyon (Welsh et al. 1995) CV Question Format

The higher electric rates described earlier cannot make up for all the revenue lost as a result of this proposal. Taxpayers would have to make up the difference. How would you, as a taxpayer, vote on this proposal? As you think about your answer, please remember that if this proposal passes, you would have less money for household expenses or to spend on other environmental issues.

3. Would you vote for this proposal if passage of the proposal would cost your household $ ____ in increased taxes **every year** for the foreseeable future? *(CIRCLE ONE NUMBER)*

1	Definitely No	-	I would definitely vote against the proposal.
2	Probably No	-	I would probably vote against the proposal.
3	Not Sure	-	I am not sure if I would vote for the proposal.
4	Probably Yes	-	I would probably vote for the proposal.
5	Definitely Yes	-	I would definitely vote for the proposal.

Glen Canyon Passive Use CV Question Bid Distribution: National Sample

	Annual Dollar Amount								
	$5	$15	$30	$60	$90	$120	$150	$200	Total
National Sample									
Definitely no	5%	4%	7%	12%	11%	19%	19%	19%	12%
Probably no	2	10	13	18	22	25	24	21	17
Not sure	12	10	16	20	22	16	21	17	17
Probably yes	44	47	41	35	33	26	28	31	35
Definitely yes	37	29	23	15	12	14	8	12	19
	100%	100%	100%	100%	100%	100%	100%	100%	100%
	(154)	(164)	(165)	(157)	(145)	(175)	(157)	(149)	(1,266)

Annual Values Associated with Alternative Dam Operations ($ 1994 millions)

Flow Scenario	Power	Recreation	Nonuse Values	
			National	Marketing Area
Moderate Fluctuating Flows	-36.7 to -54.0	+0.4	+2,286.4	+52.2
Low Fluctuating Flows	-15.1 to -44.2	+3.7	+3,375.2	+50.5
Seasonally Adjusted Steady Flow	-88.3 to -123.5	+4.8	+3,442.2	+81.4

Policy Application of Passive Use Values by U.S. Dept. of the Interior

Although there would be a significant loss of hydropower benefits due to the selection of the preferred alternative (between $15.1 and $44.2 million annually) a recently completed non-use value study conducted under the Glen Canyon Environmental Studies indicates that the American people are willing to pay much more than this loss to maintain a healthy ecosystem in the Grand Canyon. "

(Record of Decision, Operation of Glen Canyon Dam Final EIS, October 1996.

Signed by Bruce Babbitt, Secretary of the Interior

2015 Glen Canyon Passive Use Study

- Funded by NPS in 2012
- Has spent nearly 3 years navigating the changing landscape of the LTEMP process and OMB approval
- May be approved for survey mailing in September

Review and work thus far

- Began as an academic study of validation of passive use values over time (part of initial plan in 2005)
- Was fully funded to help inform the LTEMP process (2012)
- In-person cognitive interviews of survey instrument (2013)
- Draft surveys and sampling plan were peer reviewed (2013)
- Limited pre-test of survey bid levels and survey understandability (Nov 2014)

Structure and focus

- Conjoint valuation question
- 4 attributes based on extensive conservations with LTEMP team and review of current alternatives

Ask yourself whether you believe the improvements offered under Proposed Plan A are worth $40 each year to your household for the next 20 years. Voting for Proposed Plan A would mean you would have $40 less each year to spend on other things. You would be making a commitment to pay this additional amount each year for the next 20 years. Please check ONE box at the bottom of the table to indicate whether you prefer Proposed Plan A, or the Existing Management Plan

Resources impacted by policies	Existing Management Plan—conditions over the next 20 years	Proposed Plan A—conditions over the next 20 years
River Beaches (Size and number) 	25% reduction in size and number	Remain at present levels
Native fish (humpback chub) populations 	Remain at present levels of native fish populations	Remain at present levels of native fish populations
Trout populations 	Remain at present levels of large trout populations	50% increase in large trout populations
Cost to your household 	$ 0	$40 per year for 20 years
I would vote for (check only one)	❑	❑

Q1.How certain do you feel about the choice you made above?

- ☐ Very certain
- ☐ Somewhat certain
- ☐ Not certain at all

Colorado River Direct Use Valuation Work Also Underway

- USGS is currently funding the completion of a study to replicate and extend the surveys of Glen Canyon Anglers and Grand Canyon whitewater boaters that was originally conducted by Bishop et al. (1987).
- This work has received final OMB approval (August 14th) and initial angler survey mailing is beginning.
- The surveys for boaters and anglers each include two versions which differ only in the methodology used for the stated preference valuation questions.

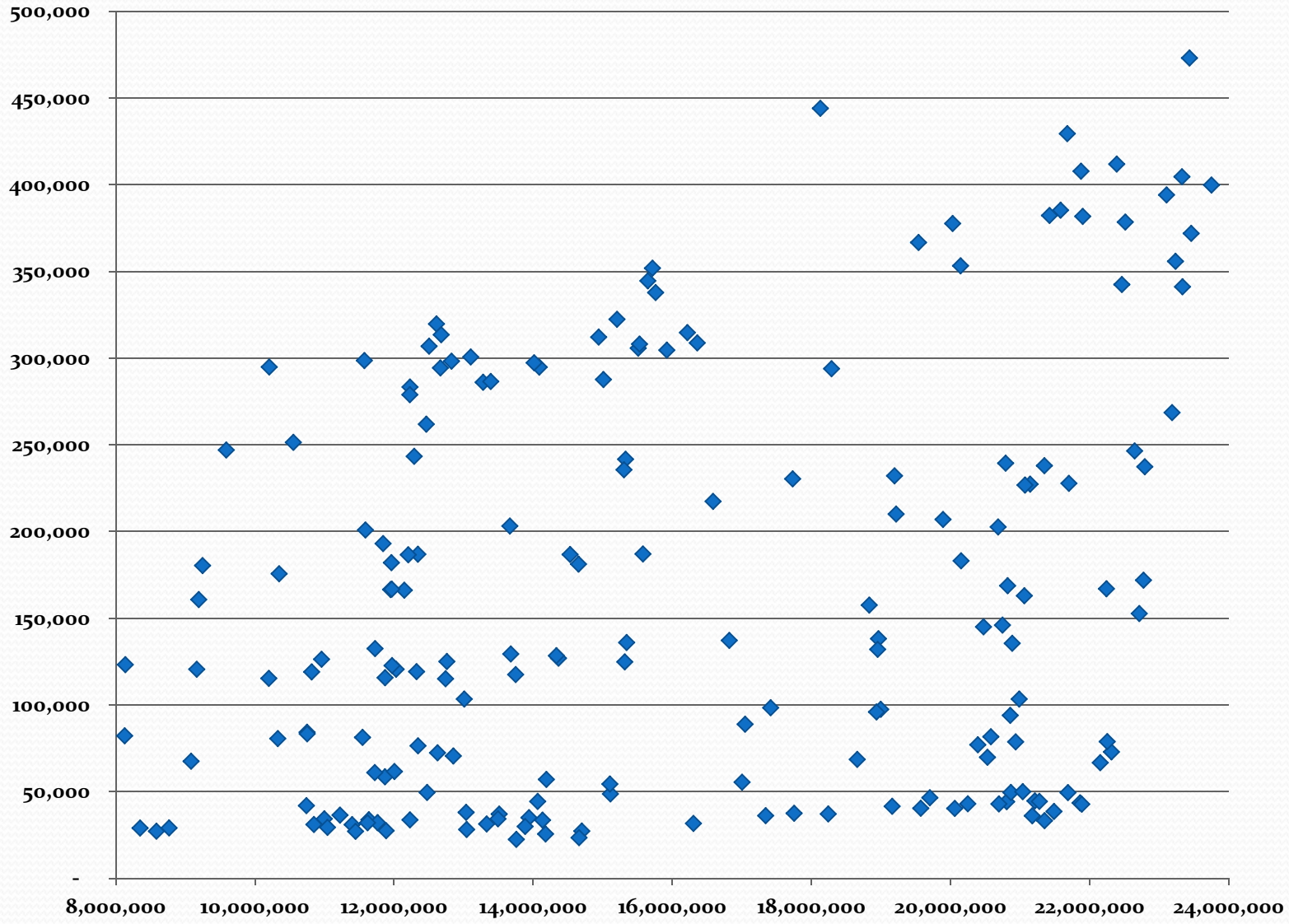
Methods for Angler and Whitewater Direct Use Valuation

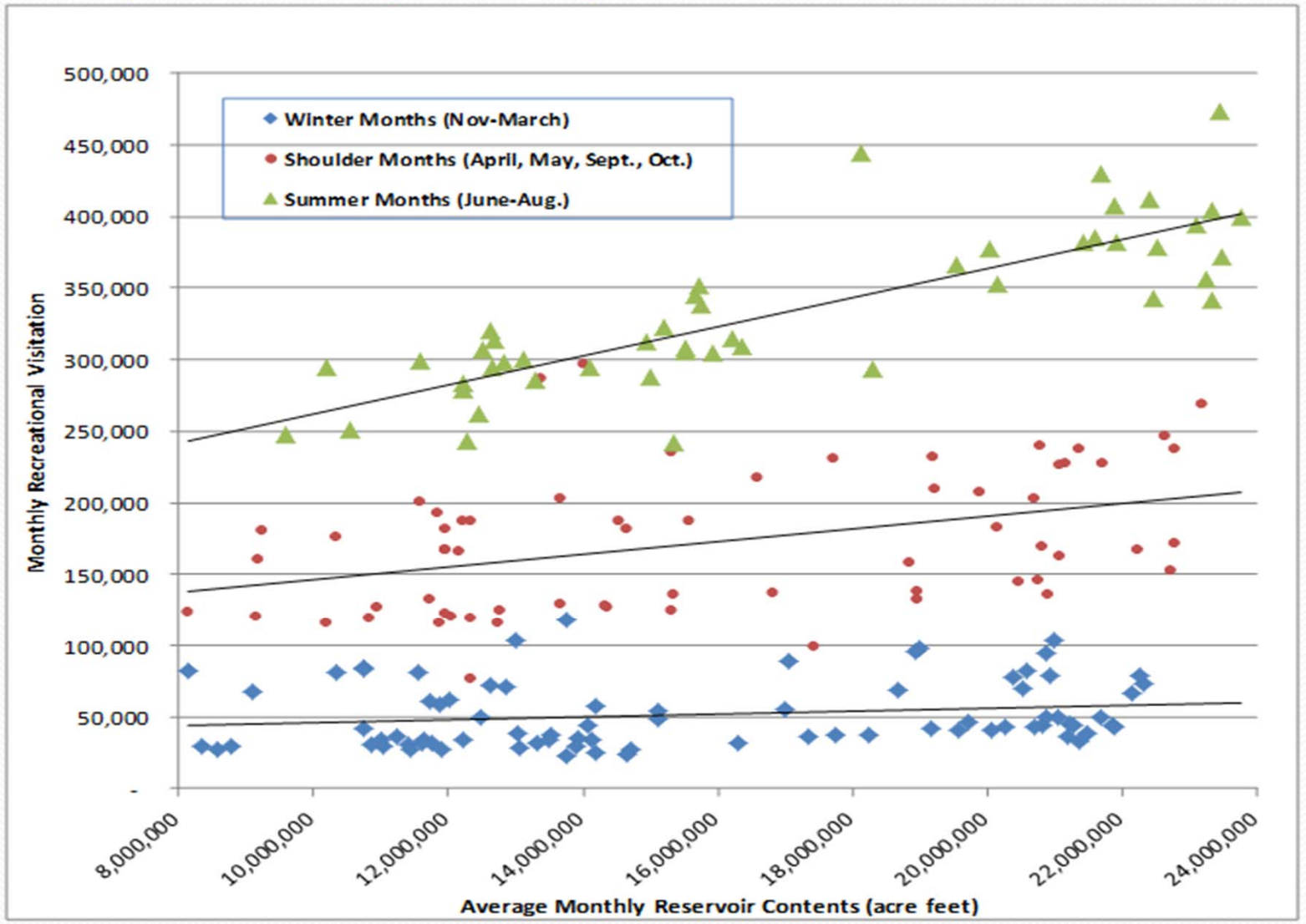
- Direct replication of the Bishop method using dichotomous choice CV questions
- Discrete choice question format

Related work on recreational use on Lakes Mead and Powell.

- Observed (not survey) based recreational data from NPS entrance stations
- Observed lake levels/volumes
- Regression analysis correlating use and water levels
- Implication for regional economic impacts at Paige
- Published: *Lake and Reservoir Management* 2013

Lake Powell Plot of Monthly Visitation by Storage





Neher et al. "Modeling the Influence of Water Levels on Recreational Use at Lakes Mead and Powell." Lake and Reservoir Management 29:233-246, 2013.

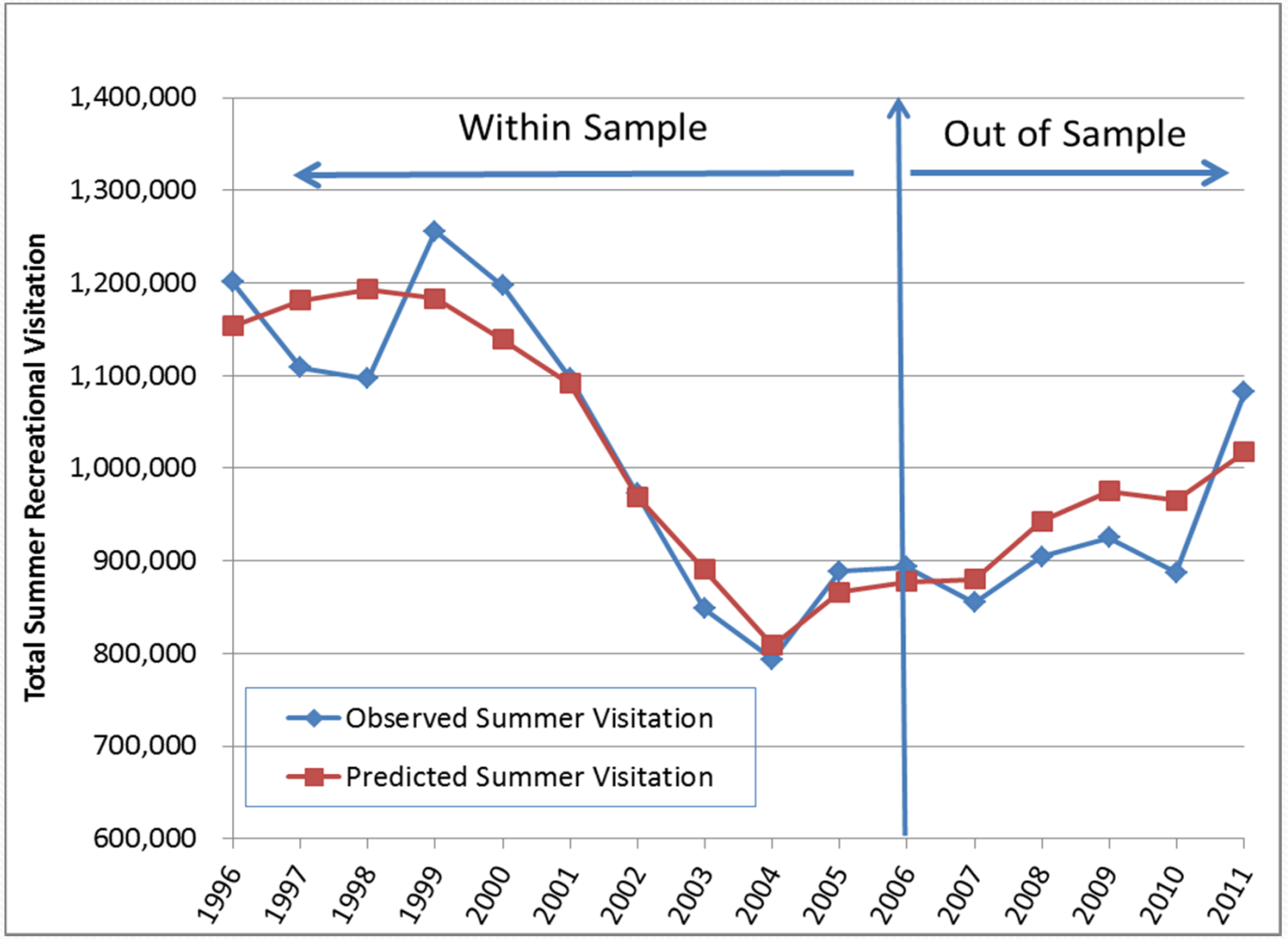
Estimated Marginal Impact of Reservoir Elevation Changes, Lake Powell.

Season	Months	Marginal impact of 100,000 acre feet change in volume (recreational visits per month)
		Lake Powell
Entire Year	January-December	--
Summer	June-August	8.95 + 1.16 = 1,011
Shoulder	April, May, September, October	3.0 + 1.16 = 416
Off-season	November-March	116
Effect of 100,000 af increase across entire year in additional predicted recreational visits		5,280

Coconino County, AZ Gross Sales-Lake Powell Volume Model

Variable	Coefficient (Standard Error)
INTERCEPT	15,329,484 (2,437,138)***
LAKE POWELL VOLUME	0.312 (0.12)***
GRAND CANYON NP MONTHLY VISITATION	73.41 (5.78)***
SUMMER	1,133,630 (2,349,646)
SHOULDER	5,084,052 (1,393,028)***
TREND YEAR	1,948,360 (166.485)***
UNEMPLOYMENT	(1,874,518) (201,230)***
R-Square	0.912
Sample Size	180

Lake Powell summer season visitation: actual v. model predictions



Coconino County Predicted versus Observed Gross Sales based on Lake Powell Average Volume Model