U.S. Fish & Wildlife Service

Net Economic Values for Wildlife-Related Recreation in 2011

Addendum to the 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation

Report 2011-8

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This report is intended to complement the National and State Reports for the 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. The conclusions in this report are the author's and do not represent official positions of the U.S. Fish and Wildlife Service. The author thanks Sylvia Cabrera and Matt Fuller for their able review of initial drafts.

Contents

Abstract

This report presents state estimates of the net economic values for smallmouth and largemouth bass, trout and walleye fishing, deer, elk and moose hunting, and away-from-home wildlife watching. These values are based on contingent valuation questions from the 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

Each state was classified as either a bass, trout or walleye state. Based on these classifications, anglers were asked to answer a contingent valuation question for their bass, trout, or walleye fishing during 2011.

Likewise, each state was classified as either a deer, elk or moose state. Based on these classifications, hunters were asked contingent valuation questions for their 2011 hunts.

People who took trips in 2011 to watch wildlife at least one mile from their residence were asked contingent valuation questions for this activity.

Net economic values are developed for current resource conditions. The net economic values reported here are appropriate measures of economic value for use in cost-benefit analyses, damage assessments, and project evaluations.

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I. Introduction

The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (Survey hereafter) is a comprehensive source of data on people's use of wildlife resources that has been collected on a national level since 1955 and on a state level since 1975. The first time the Survey collected net economic value data was in 1980. The effort was repeated, with some changes, in the 1985, 1991, 1996, 2001, 2006, and 2011 Surveys.

This report presents estimates of net economic values for smallmouth and largemouth bass, trout and walleye fishing, deer, elk and moose hunting, and away-from-home wildlife watching. These values were derived from contingent valuation questions asked in the 2011 Survey. The report also compares the 2011 values with those of the 2006 Survey which used a similar contingent valuation methodology. Bass fishing refers to smallmouth and largemouth bass and excludes white bass, spotted bass, striped bass, striped bass hybrids, and rock bass. Trout fishing refers to all freshwater species commonly known as trout. Away-from-home wildlife watching refers to trips at least one mile from home taken for the primary purpose of observing, photographing, or feeding wildlife (wildlife watching hereafter).

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The 2006 and 2011 Surveys assigned a single fish and game species to be valued in each state. States were selected in the upper Midwest as walleye states and the rest of the states as either trout fishing or bass fishing states. Selected states in the Northwest and northern Rocky Mountains were designated as elk states, Alaska was designated a moose state, and the remainder of the states were deer states.

Away-from-home wildlife watching valuation questions were asked in both Surveys. The payment vehicle of the contingent valuation approach was trip-related expenditures, so around-the-home wildlife watching could not be included.

Responses were assigned to the state where the activity occurred. For example, the value of a person from Michigan who hunted deer in Utah would be assigned to Utah. No out-of-state valuation estimates are included in this report because the nonresident sample sizes were too low for reliable estimates in the 2011 Survey.

For the 2006 and 2011 Surveys, the open-ended approach was used, in which the respondent was simply asked the lowest level of how much was too much to spend for a recreational trip.

The following section discusses the conceptual framework for net economic values of wildlife-related recreation, differentiating between net economic values and economic impacts. The third section describes the contingent valuation questions used in the Survey and steps that were taken in analyzing the data. The fourth section consists of value estimates for deer, elk and moose hunting, bass, trout and walleye fishing, and wildlife watching. This section also compares the 2011 estimates with those from 2006. The fifth section discusses how to use the value estimates presented, and the last section provides concluding comments.

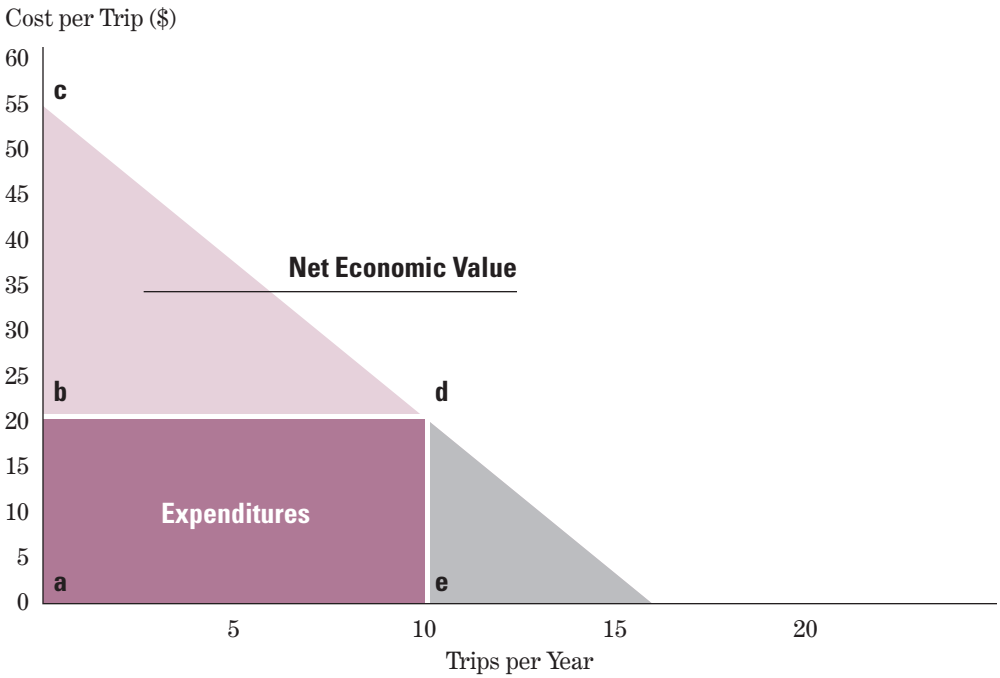
II. Measures of Economic Value

In 2011 90.1 million Americans 16 years old and older fished, hunted, photographed, fed, and closely observed wildlife in the U.S. These wildlife enthusiasts spent $49.5 billion on trips to participate in these activities, $70.4 billion on activity-related equipment, and $24.8 billion on other related items such as contributions and land leasing and ownership. Expenditures are a useful indicator of the importance of wildlife-related recreation to local, regional, and national economies. However, they do not measure the economic benefit to either the individual participant or, when aggregated, to society.

Expenditures and net economic values are two widely used but distinctly different measures of the economic value of wildlife-related recreation. Net willingness to pay, or "consumer surplus", is the accepted measure of the economic value of wildlife-related recreation to the individual recreationist and to society. It is the appropriate measure of economic value for a wide range of analyses that seek to quantify benefits and costs.

Net economic value is measured as participants' willingness to pay for wildlife-related recreation over and above what they actually spend to participate. The benefit to society is the summation of willingness to pay across all individuals. There is a direct relationship between expenditures and net economic value, as shown in Figure 1. A demand curve for a representative hunter is shown in the figure. An individual hunter's demand curve gives the number of trips the hunter would take per year for each different cost per trip. The downward sloping demand curve represents marginal willingness to pay per trip and indicates that each additional trip is valued less by the hunter than the preceding trip. All other factors being equal, the lower the cost per trip (vertical axis) the more trips the hunter will take (horizontal axis). The cost of a hunting trip serves as an implicit price for hunting since a market price generally does not exist for this activity. At $60 per trip, the hunter would choose not to hunt, but if hunting trips were free, the hunter would take 20 hunting trips.

Figure 1. Individual Hunter's Demand Curve for Hunting Trips



At a cost per trip of $20 the hunter takes 10 trips, with a total willingness to pay of $375 (area acde in Figure 1). Total willingness to pay is the total value the hunter places on participation. The hunter will not take more than 10 trips because the cost per trip ($20) exceeds what he would pay for an additional trip. For each trip between zero and 10, however, the hunter would actually have been willing to pay more than $20 (the demand curve, showing marginal willingness to pay, lies above $20).

The difference between what the hunter is willing to pay and what is actually paid is net economic value. In this simple example, therefore, net economic value is $175 (($55−$20) × 10 ÷ 2) (triangle bcd in Figure 1) and hunter expenditures are $200 ($20 × 10) (rectangle abde in Figure 1). Thus, the hunter's total willingness to pay is composed of net economic value and total expenditures. Net economic value is simply total willingness to pay minus expenditures. The relationship between net economic value and expenditures is the basis for asserting that net economic value is an appropriate measure of the benefit an individual derives from participation in an activity and that expenditures are not the appropriate benefit measure.

Expenditures are out-of-pocket expenses on items a hunter purchases in order to hunt. The remaining value, net willingness to pay (net economic value), is the economic measure of an individual's satisfaction after all costs of participation have been paid.

Summing the net economic values of all individuals who participate in an activity derives the value to society. For our example let us assume that there are 100 hunters who hunt at a particular wildlife management area and all have demand curves identical to that of our typical hunter presented in Figure 1. The total value per year of this wildlife management area to society is $17,500 ($175 × 100).

The example developed for hunting could have been developed in the context of fishing or wildlife watching. The basic concept of net economic value is the same for all three activities.

III. Contingent Valuation

Respondents to the 2011 Survey who had gone deer, elk or moose hunting, bass, trout, or walleye fishing, or wildlife watching were asked a series of contingent valuation (CV) questions during their personal interview as a basis for determining their net willingness to pay for those activities. Questions were designed to find the respondent's cost per trip in 2011, whether they would have continued to go had the cost been higher, and at what cost per trip they would not have gone at all in 2011 because it would have been too expensive (Appendix A presents the hunting and wildlife watching CV questions, as examples).

Respondents first were asked to estimate the number of trips they had taken in 2011 to hunt or fish for the designated species. For wildlife watching the number of trips was obtained from an earlier section of the questionnaire. Respondents then were asked to consider expenses such as transportation, food and lodging, and to estimate what their cost had been in 2011 for a typical trip[1]. Then they were asked at what cost per trip they would not have gone at all because it was too expensive. The question stipulated that the cost of other kinds of recreational activities that could be considered substitutes would not have changed.

In terms of Figure 1 the purpose of the question sequence is to have the respondent react as if he were moving up the demand curve, taking fewer trips as the cost per trip increased until he was priced out of the market at the cost per trip where the demand curve intersects the vertical axis. Assuming a linear demand curve, annual net economic value is then calculated using the difference between current cost ($20) and the maximum cost at the intercept ($55), and the number of trips taken in 2011 (10).

[1] Wildlife watchers were given the dollar figure per trip which they had reported earlier in the interview. If the respondent did not think this was accurate he or she could change it.

Using the example in Figure 1, Annual net economic value is

$$\frac{(\$55-\$20) \times 10}{2} = \$175$$

The average value per trip is that amount divided by the number of trips taken in 2011, or

$$\$175 \div 10 = \$17.50 \text{ per trip}$$

The valuation sequence was posed in terms of number of trips and cost per trip because respondents were thought more likely to think of their wildlife-related recreation in terms of trips rather than days, the unit most commonly used in project evaluation. The economic values reported here are in terms of days to facilitate their use in analysis.

The values are averages in two senses of the word. First, they are the arithmetic mean of the responses of all respondents in the sample, usually all those residing in a particular state who participated in the activity, e.g., all survey respondents who were Colorado residents and hunted elk in Colorado. Second, they are average values in that they are calculated for each respondent by dividing his total annual consumer surplus for an activity by the number of days he participated during 2011.

Zero and negative net willingness to pay responses were deleted from the analysis, as were unreasonably high willingness-to-pay responses. Likely explanations of zero and negative willingness to pay are that the question was misunderstood by the respondent, incorrectly recorded by the interviewer, or that the response was a protest against higher costs rather than a legitimate bid, perhaps motivated by fear of an increase in the cost of a hunting or fishing license. To the extent that legitimate zero responses were among those deleted, the resulting values will be overestimates.

Willingness to pay for wildlife-related recreation or, for that matter, anything a consumer buys, must be limited by some measure of an individual's income and/or wealth. A person clearly is not able to pay some multiple of his household's annual income for deer hunting, for example. In a less extreme situation, it is possible that a truly avid deer hunter would actually be willing to pay a significant portion of his income to continue hunting deer even though the costs of substitute activities such as small game hunting would be unchanged. Since the purpose of the analysis is to use the CV responses as representative of the typical recreationist in the group rather than calculating the sample's aggregate net economic value, mitigating the effect of those extreme values on the sample mean is essential. Observations were dropped from the samples if the annual net economic value for an activity exceeded ten percent of the individual's household income[2].

[2] "By any measure, whether using complementary activities or the costs for access and equipment related expenditures, outdoor recreation is responsible for 2 to 6 percent of consumer expenditures and, very likely, accounts for at least as large a portion of an individual's leisure time." *Recreation Demand Models,* Daniel J. Phaneuf and V. Kerry Smith. Prepared for *Handbook of Environmental Economics.* K. Mäler and J. Vincent, Editors. Revision date January 29, 2004.

IV. Estimated Net Economic Values

Tables 1 through 7 give state by state mean and median net economic values for a day of deer, elk, and moose hunting, bass, trout, and walleye fishing, and wildlife watching in 2011. The state-level estimates are for state residents who recreated in their state of residence. Medians, the midpoint of the range of all values, are included because they are measures of central tendency that exclude the effects of observations that are on either end of the value distribution. A suggested rule of thumb is to use the mean as the preferred measure of recreation value and the median as a lower bound, for the most conservative uses of these values.

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Table 1. Deer Hunting Economic Value per Day: 2011
(In 2011 dollars. State resident values for in-state hunting)

	Means	*Medians*
Aggregate	**79**	**38**
Alabama	92	25
Arizona	…	…
Arkansas	43	32
California	143	100
Connecticut	190	80
Delaware	…	…
Florida	61	40
Georgia	56	42
Illinois	104	38
Indiana	112	50
Iowa	64	35
Kansas	65	25
Kentucky	60	24
Louisiana	49	20
Maine	64	41
Maryland	206	55
Massachusetts	…	…
Michigan	86	50
Minnesota	164	88
Mississippi	65	40
Missouri	64	40
Nebraska	76	38
Nevada	<<<	<<<
New Hampshire	62	40
New Jersey	67	25
New Mexico	98	28
New York	137	50
North Carolina	71	42
North Dakota	N.A.	N.A.
Ohio	43	20
Oklahoma	56	25
Pennsylvania	51	25
Rhode Island	98	25
South Carolina	35	25
South Dakota	71	30
Tennessee	<<<	<<<
Texas	96	50
Utah	121	59
Vermont	79	45
Virginia	53	35
Washington	35	25
West Virginia	47	25
Wisconsin	50	15

… Sample size less than 10.
<<< 95% confidence interval includes zero.
N.A. Not available for publication.

Table 2. Elk Hunting Economic Value per Day: 2011
(In 2011 dollars. State resident values for in-state hunting)

	Means	*Medians*
Aggregate	**97**	**50**
Colorado	63	52
Idaho	…	…
Montana	127	67
Oregon	92	50
Wyoming	159	125

… Sample size less than ten.

Table 3. Moose Hunting Economic Value per Day: 2011
(In 2011 dollars. State resident values for in-state hunting)

	Means	*Medians*
Alaska	64	35

Table 4. Bass Fishing Economic Values per Day: 2011
(In 2011 dollars. State resident values for in-state fishing)

	Means	*Medians*
Aggregate	**49**	**18**
Alabama	18	11
Arkansas	37	16
Delaware	14	10
Florida	36	6
Georgia	39	12
Illinois	46	18
Indiana	44	30
Iowa	31	21
Kansas	55	24
Kentucky	17	12
Louisiana	29	15
Maryland	34	42
Massachusetts	28	22
Mississippi	30	25
Missouri	41	15
Nebraska	645	40
North Carolina	75	30
Oklahoma	46	35
Rhode Island	14	10
South Carolina	28	5
Tennessee	<<<	<<<
Texas	74	33
Virginia	32	18
West Virginia	38	21

<<< 95% confidence interval includes zero.

Table 5. Trout Fishing Economic Values per Day: 2011
(In 2011 dollars. State resident values for in-state fishing)

	Means	*Medians*
Aggregate	**49**	**25**
Alaska	46	30
Arizona	79	34
California	39	25
Colorado	62	26
Connecticut	30	15
Idaho	31	20
Maine	39	40
Montana	44	30
Nevada	57	25
New Hampshire	43	28
New Jersey	19	13
New Mexico	37	30
New York	58	20
Oregon	69	34
Pennsylvania	33	12
Utah	62	30
Vermont	27	13
Washington	43	27
Wyoming	70	20

Table 6. Walleye Fishing Economic Values per Day: 2011
(In 2011 dollars. State resident values for in-state fishing)

	Means	*Medians*
Aggregate	**48**	**20**
Michigan	15	10
Minnesota	57	25
North Dakota	N.A.	N.A.
Ohio	113	25
South Dakota	30	26
Wisconsin	32	33

N.A. Not available for publication.

Table 7. Wildlife Watching Economic Values per Day: 2011
(In 2011 dollars. State resident values for wildlife watching in-state)

	Means	*Medians*
U.S. Total	**36**	**22**
Alabama	…	…
Alaska	56	25
Arizona	41	22
Arkansas	32	22
California	34	19
Colorado	28	14
Connecticut	26	15
Delaware	29	17
Florida	33	25
Georgia	<<<	<<<
Hawaii	41	20
Idaho	35	18
Illinois	34	22
Indiana	26	18
Iowa	28	18
Kansas	19	12
Kentucky	32	30
Louisiana	…	…
Maine	41	24
Maryland	31	20
Massachusetts	47	15
Michigan	32	24
Minnesota	43	25
Mississippi	81	110
Missouri	38	22
Montana	27	8
Nebraska	25	20
Nevada	34	24
New Hampshire	71	78
New Jersey	52	15
New Mexico	30	24
New York	27	22
North Carolina	37	25
North Dakota	…	…
Ohio	32	22
Oklahoma	26	27
Oregon	51	39
Pennsylvania	16	8
Rhode Island	37	16
South Carolina	44	22
South Dakota	…	…
Tennessee	24	15
Texas	35	41
Utah	33	28
Vermont	24	20
Virginia	66	32
Washington	41	25
West Virginia	63	56
Wisconsin	31	15
Wyoming	68	41

… Sample size less than 10.
<<< 95% confidence interval includes zero.

2006–2011 Comparisons of Daily Net Economic Values

Tables 8–14 provide the 2006 and 2011 means and medians for the day values of the activities that are being studied. The ratios of the means are included as a measure of the stability of the values. The standard errors of the 2011 means for the states are generally about 25% of the estimates, so a rule of thumb is that a 2011/2006 means ratio between .6 and 1.4 indicates stability at the 90% level of significance. For more precise calculations of day (or annual) value stability, contact the author at Richard_Aiken@fws.gov.

Table 8. State Resident Deer Hunting Economic Values per Day: 2006 and 2011
(In 2011 dollars. State resident values for in-state hunting)

	Means		*Medians*		*2011/2006*
	2006	*2011*	*2006*	*2011*	*Means Ratio*
Aggregate	**87**	**79**	**43**	**38**	**0.9**
Alabama	102	92	36	25	0.9
Arizona	131	…	78	…	N.A.
Arkansas	100	43	53	32	0.4
California	117	143	40	100	1.2
Connecticut	54	190	52	80	3.5
Delaware	<<<	…	<<<	…	N.A.
Florida	159	61	51	40	0.4
Georgia	62	56	20	42	0.9
Illinois	53	104	28	38	2.0
Indiana	73	112	25	50	1.5
Iowa	90	64	45	35	0.7
Kansas	58	65	49	25	1.1
Kentucky	86	60	36	24	0.7
Louisiana	114	49	31	20	0.4
Maine	57	64	34	41	1.1
Maryland	145	206	49	55	1.4
Massachusetts	164	…	81	…	N.A.
Michigan	53	86	39	50	1.6
Minnesota	91	164	50	88	1.8
Mississippi	56	65	34	40	1.2
Missouri	85	64	50	40	0.8
Nebraska	118	76	53	38	0.6
Nevada	<<<	<<<	<<<	<<<	N.A.
New Hampshire	54	62	39	40	1.1
New Jersey	<<<	67	<<<	25	N.A.
New Mexico	100	98	56	28	1.0
New York	92	137	36	50	1.5
North Carolina	41	71	31	42	1.7
North Dakota	N.A.	N.A.	N.A.	N.A.	N.A.
Ohio	74	43	30	20	0.6
Oklahoma	99	56	34	25	0.6
Pennsylvania	82	51	49	25	0.6
Rhode Island	33	98	35	25	3.0
South Carolina	55	35	28	25	0.6
South Dakota	108	71	43	30	0.7
Tennessee	76	<<<	28	<<<	N.A.
Texas	118	96	70	50	0.8
Utah	99	121	49	59	1.2
Vermont	78	79	28	45	1.0
Virginia	45	53	28	35	1.2
Washington	75	35	37	25	0.5
West Virginia	100	47	48	25	0.5
Wisconsin	91	50	56	15	0.5

… Sample size less than 10.
<<< 95% confidence interval includes zero.
N.A. Not available for publication.

Table 9. State Resident Elk Hunting Economic Values per Day: 2006 and 2011
(In 2011 dollars. State resident values for in-state hunting)

	Means		*Medians*		*2011/2006*
	2006	*2011*	*2006*	*2011*	*Means Ratio*
Aggregate	**91**	**97**	**43**	**50**	**1.1**
Colorado	100	63	38	52	0.6
Idaho	57	…	35	…	N.A.
Montana	90	127	45	67	1.4
Oregon	105	92	49	50	0.9
Wyoming	72	159	42	125	2.2

… Sample size less than ten.
N.A. Not available.

Table 10. State Resident Moose Hunting Economic Values per Day: 2006 and 2011
(In 2011 dollars. State resident values for in-state hunting)

	Means		*Medians*		*2011/2006*
	2006	*2011*	*2006*	*2011*	*Means Ratio*
Alaska	174	64	98	35	0.4

Table 11. State Resident Bass Fishing Economic Values per Day: 2006 and 2011
(In 2011 dollars. State resident values for in-state fishing)

	Means		*Medians*		*2011/2006*
	2006	*2011*	*2006*	*2011*	*Means Ratio*
Aggregate	**76**	**49**	**22**	**18**	**0.6**
Alabama	44	18	20	11	0.4
Arkansas	31	37	23	16	1.2
Delaware	209	14	29	10	0.1
Florida	36	36	17	6	1.0
Georgia	350	39	22	12	0.1
Illinois	49	46	26	18	0.9
Indiana	68	44	25	30	0.6
Iowa	52	31	11	21	0.6
Kansas	50	55	22	24	1.1
Kentucky	66	17	35	12	0.3
Louisiana	48	29	18	15	0.6
Maryland	44	34	11	42	0.8
Massachusetts	81	28	28	22	0.3
Mississippi	100	30	20	25	0.3
Missouri	133	41	28	15	0.3
Nebraska	236	645	40	40	2.7
North Carolina	24	75	14	30	3.1
Oklahoma	65	46	21	35	0.7
Rhode Island	34	14	12	10	0.4
South Carolina	51	28	28	5	0.5
Tennessee	37	<<<	19	<<<	N.A.
Texas	45	74	28	33	1.6
Virginia	135	32	28	18	0.2
West Virginia	70	38	39	21	0.5

<<< 95% confidence interval includes zero.
N.A. Not available

Table 12. State Resident Trout Fishing Economic Values per Day: 2006 and 2011
(In 2011 dollars. State resident values for in-state fishing)

	Means		*Medians*		*2011/2006*
	2006	*2011*	*2006*	*2011*	*Means Ratio*
Aggregate	**63**	**49**	**26**	**25**	**0.8**
Alaska	82	46	28	30	0.6
Arizona	98	79	37	34	0.8
California	87	39	39	25	0.4
Colorado	58	62	25	26	1.1
Connecticut	48	30	17	15	0.6
Idaho	54	31	25	20	0.6
Maine	33	39	17	40	1.2
Montana	43	44	19	30	1.0
Nevada	56	57	31	25	1.0
New Hampshire	43	43	17	28	1.0
New Jersey	61	19	13	13	0.3
New Mexico	51	37	28	30	0.7
New York	52	58	13	20	1.1
Oregon	65	69	22	34	1.1
Pennsylvania	48	33	18	12	0.7
Utah	68	62	29	30	0.9
Vermont	33	27	19	13	0.8
Washington	55	43	28	27	0.8
Wyoming	57	70	28	20	1.2

Table 13. State Resident Walleye Fishing Economic Values per Day: 2006 and 2011
(In 2011 dollars. State resident values for in-state fishing)

	Means		*Medians*		*2011/2006*
	2006	*2011*	*2006*	*2011*	*Means Ratio*
Aggregate	**71**	**48**	**30**	**20**	**0.7**
Michigan	48	15	20	10	0.3
Minnesota	67	57	30	25	0.9
North Dakota	N.A.	N.A.	N.A.	N.A.	N.A.
Ohio	74	113	34	25	1.5
South Dakota	79	30	40	26	0.4
Wisconsin	91	32	25	33	0.4

N.A. Not available for publication.

Table 14. State Resident Wildlife Watching Economic Values per Day: 2006 and 2011
(In 2011 dollars. State resident values for wildlife watching in-state)

	Means		*Medians*		*2011/2006*
	2006	*2011*	*2006*	*2011*	*Means Ratio*
U.S. Total	**63**	**36**	**24**	**22**	**0.6**
Alabama	62	…	14	…	N.A.
Alaska	45	56	17	25	1.2
Arizona	82	41	45	22	0.5
Arkansas	48	32	33	22	0.7
California	125	34	56	19	0.3
Colorado	<<<	28	<<<	14	N.A.
Connecticut	56	26	25	15	0.5
Delaware	17	29	8	17	1.7
Florida	43	33	28	25	0.8
Georgia	58	<<<	42	<<<	N.A.
Hawaii	<<<	41	<<<	20	N.A.
Idaho	54	35	25	18	0.6
Illinois	38	34	21	22	0.9
Indiana	29	26	20	18	0.9
Iowa	36	28	15	18	0.8
Kansas	50	19	13	12	0.4
Kentucky	58	32	12	30	0.6
Louisiana	35	…	28	…	N.A.
Maine	43	41	21	24	1.0
Maryland	21	31	15	20	1.5
Massachusetts	<<<	47	<<<	15	N.A.
Michigan	58	32	21	24	0.6
Minnesota	30	43	24	25	1.4
Mississippi	70	81	31	110	1.2
Missouri	33	38	12	22	1.2
Montana	34	27	10	8	0.8
Nebraska	65	25	27	20	0.4
Nevada	49	34	11	24	0.7
New Hampshire	51	71	25	78	1.4
New Jersey	25	52	14	15	2.1
New Mexico	153	30	28	24	0.2
New York	56	27	29	22	0.5
North Carolina	43	37	15	25	0.9
North Dakota	…	…	…	…	N.A.
Ohio	63	32	20	22	0.5
Oklahoma	38	26	24	27	0.7
Oregon	54	51	17	39	0.9
Pennsylvania	82	16	28	8	0.2
Rhode Island	20	37	10	16	1.9
South Carolina	36	44	17	22	1.2
South Dakota	43	…	28	…	N.A.
Tennessee	59	24	28	15	0.4
Texas	58	35	28	41	0.6
Utah	41	33	16	28	0.8
Vermont	19	24	14	20	1.3
Virginia	31	66	12	32	2.1
Washington	46	41	28	25	0.9
West Virginia	29	63	27	56	2.2
Wisconsin	88	31	42	15	0.4
Wyoming	54	68	39	41	1.3

<<< 95% confidence interval includes zero.
… Sample size less than 10
N.A. Not available

V. Using the Value Estimates

When and how can these values be used? These numbers are appropriate for any project evaluation that seeks to quantify benefits and costs. They can be used to evaluate management actions that increase or decrease participation. Two types of willingness-to-pay values have been reported, mean net economic values per day per participant and net economic values per year of participation. Each of these values has a slightly different use and interpretation in conducting benefit and cost calculations of wildlife management and policy decisions.

Mean net economic values per year per participant can be thought of as "all or nothing values." Take trout fishing in Montana as an example, with a mean value of $397 (Table B-5 in Appendix B). The $397 represents the mean value to a resident trout angler in Montana given the current resource condition and trout fishing regulations. This is the estimate of net economic value portrayed in Figure 1. If a wildlife refuge in Montana changes its policies and allows 100 more trout anglers to visit per year, the total value to society due to this policy change would be $39,700 ($397 × 100) per year (assuming all visitors are state residents). This value, however, assumes that these 100 anglers could and would fish for trout only at this refuge and that they would take a certain number of trips to this refuge. Thus, while mean net economic values per year per participant are interesting in terms of characterizing the current value of the resource and in calculating losses for a catastrophic change in the resource, they are not applicable for most management and public policy decisions faced by resource managers.

Management and policy actions generally increase or decrease participation. Let us continue with the Montana example. Assume an environmental pollution accident results in the closure of a lake to fishing for a whole season. If a fishery manager knows the number of days of state resident fishing that occur on the lake over the whole season, 1,200 for example, it is possible to develop a rough estimate of the fishery losses from the accident. This estimate is accomplished by multiplying the net economic value per day ($44 from Table 5) by the days of participation, resulting in $52,800 ($44 × 1,200). If the refuge had data on the number of in-state visitors then the numbers could be adjusted to reflect their appropriate value.

Two caveats exist to the examples above: (1) if recreationists can shift their activity to another location then the values are an over-estimate; and (2) if a loss of wildlife habitat causes an overall degradation in the number of game, fish, or wildlife and in the quality of wildlife-related recreation then the values are an under-estimate.

The key issues that must be understood are:

- Each of the different value estimates has slightly different interpretations and uses;
- If an action changes participation, it is necessary to consider the extent to which participants substitute another site to fish, hunt, or wildlife watch. Failure to consider substitution will result in overestimation of resource losses; and
- Using per participant value estimates to compute losses or benefits requires additional information, particularly on resource conditions and participation rates.

Thus, the value estimates reported here must be used with caution in order to avoid misuse, which would result in incorrect estimates of aggregate costs or aggregate benefits.

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VI. Regression Results

Bag and size of catch questions were included in the question sequence to measure quality of the recreation. The intent was to see if there was a positive correlation between hunting success, as measured by whether or not an animal was bagged, and economic value. For fishing, it was to see if there was a positive correlation between catching bigger fish and economic value. A simple model was used, which was not fully specified.

The hunting equation for deer, elk, and moose was Annual Value = 21.27 × (the number of hunting trips) + 30.89 × (1 if bagged game, 0 if did not) + 555.55. Getting an animal increased the hunter's annual hunting value by 5%.

The fishing regression analysis assumed that fish were caught. If no fish were caught, the observation was deleted from the regression.

For trout, the equation was Annual Value = 17.77 × (the number of fishing trips) + 15.97 × (the average length of fish caught, in inches) − 0.95. Assuming ten trout fishing trips in a year, catching fish measuring an average of 24 inches increased the annual value of fishing by 105% compared to catching fish measuring an average of 6 inches and by 52% compared to catching fish measuring an average of 12 inches.

For bass, the equation was Annual Value = 13.81 × (the number of fishing trips) + 2.69 × (the average length of fish caught, in inches) + 206.14. Assuming fifteen bass fishing trips in a year, catching fish measuring an average of 24 inches increased the annual value of fishing by 11% compared to catching fish measuring an average of 6 inches and by 7% compared to catching fish measuring an average of 12 inches.

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VII. Concluding Comments

Contingent valuation questions in the 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation provide a nationwide data base for estimating net economic recreation values for selected wildlife-related recreation activities on a state-by-state basis. The data and the values they produce are important because they measure recreationists' net willingness to pay for such activities, the conceptually correct measure of net economic value for a wide range of analyses and project evaluations. Because they are available for individual states, the values allow for differences in recreation values in various parts of the country. For many kinds of analysis, using values that reflect wildlife-related recreation in the state in question rather than some other state or a national average gives the analysis a better and more convincing empirical base.

In this age of cost-benefit analysis these estimates can be used to justify the value of wildlife-related recreation. Be it deer hunting, trout fishing, or wildlife watching, the numbers prove that Americans benefit greatly from wildlife.

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Appendix A. Survey Contingent Valuation Questions

State Resident Hunting Questions
In the next few questions, I will ask you about ALL your trips taken during the ENTIRE calendar year of 2011 to PRIMARILY hunt for [fill GAME] in [fill RESIDENT STATE].

How many trips lasting a single day or multiple days did you take to hunt PRIMARILY for [fill GAME] during 2011 in [fill RESIDENT STATE]?

Think about what it costs you for a TYPICAL [fill GAME] hunting trip. Include expenses for things such as gasoline and other transportation costs, food, and lodging.

Remember to include ONLY YOUR SHARE of expenses.

How much did a TYPICAL hunting trip cost you during 2011 when you hunted PRIMARILY for [fill GAME] in [fill RESIDENT STATE]?

Did you bag a [fill GAME] in [fill RESIDENT STATE] in 2011?

Still thinking about a TYPICAL [fill GAME] hunting trip in [fill RESIDENT STATE]…

What is the cost that would have prevented you from taking even one such trip? In other words, if the trip cost was below this amount, you would have gone [fill GAME] hunting in [fill RESIDENT STATE], but if the trip cost was above this amount, you would not have gone.

Keep in mind that the cost per trip of other kinds of hunting, fishing and recreational activities would not have changed.

So, in other words, $[fill amount] would have been too much to pay for one TYPICAL [fill GAME] hunting trip last year in [fill RESIDENT STATE]?

If "No",

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How much would have been too much to pay for one TYPICAL [fill GAME] hunting trip last year in [fill RESIDENT STATE]?

State Resident Fishing Questions
How many trips lasting a single day or multiple days did you take to fish PRIMARILY for [fill TROUT, BASS, or WALLEYE] during 2011 in [fill RESIDENT STATE]?

Think about what it cost you for a TYPICAL [fill TROUT, BASS, or WALLEYE] fishing trip. Include your expenses for things such as gasoline and other transportation costs, food, and lodging. Remember to include only your share of expenses. How much did a TYPICAL fishing trip cost you during 2011 when you fished PRIMARILY for [fill TROUT, BASS, or WALLEYE] in [fill RESIDENT STATE]?

What was the average length in inches of your [fill TROUT, BASS, or WALLEYE] caught in [fill RESIDENT STATE] in 2011? Enter "0" if did not catch any [fill TROUT, BASS, or WALLEYE].

Still thinking about a typical [fill TROUT, BASS, or WALLEYE] fishing trip in [fill RESIDENT STATE]…

What is the cost that would have prevented you from taking even one such trip? In other words, if the trip cost was below this amount you would have gone [fill TROUT, BASS, or WALLEYE] fishing in [fill RESIDENT STATE], but if

the trip cost was above this amount, you would not have gone. Keep in mind that the cost per trip of other kinds of fishing, hunting and recreational activities would not have changed.

So, in other words, [fill amount] would have been too much to pay for one TYPICAL [fill TROUT, BASS, or WALLEYE] fishing trip in 2011 in [fill RESIDENT STATE]?

If "No",

How much would have been too much to pay for one TYPICAL [fill TROUT, BASS, or WALLEYE] fishing trip in 2011 in [fill RESIDENT STATE]?

State Resident Wildlife Watching Questions

In the next few questions, I will ask you about ALL your trips taken for the PRIMARY PURPOSE of observing, photographing, or feeding wildlife during the ENTIRE calendar year of 2011 in [fill RESIDENT STATE].

In your previous and current interviews you reported taking [fill total] trips for the PRIMARY PURPOSE of observing, photographing, or feeding wildlife in [fill RESIDENT STATE]. Is that correct?

If "No",

How many trips did you take for the PRIMARY PURPOSE of observing, feeding or photographing wildlife in [fill RESIDENT STATE] during 2011?

In your previous and current interviews, you reported that you spent on average $[fill amount] per trip during 2011 where your PRIMARY PURPOSE was to observe, photograph or feed wildlife in [fill RESIDENT STATE]. Would you say that cost is about right?

If "No",

How much would you say is the average cost of your [fill total] trips during 2011 where your PRIMARY PURPOSE was to observe, photograph, or feed wildlife in [fill RESIDENT STATE]? If you went with family or friends, include ONLY YOUR SHARE of the cost.

Still thinking about your [fill total] trips to observe, photograph, or feed wildlife in [fill RESIDENT STATE]…

What is the cost that would have prevented you from taking even one such trip? In other words, if the trip cost was below this amount, you would have gone observing, photographing, or feeding wildlife in [fill RESIDENT STATE], but if the trip cost was above this amount, you would not have gone.

Keep in mind that the cost per trip of other kinds of recreation would not have changed.

So, in other words, $[fill amount] would have been too much to pay to take even one trip to observe, photograph, or feed wildlife in 2011 in [fill RESIDENT STATE]?

If "No",

How much would have been too much to pay to take even one trip to feed, photograph, or observe wildlife in 2011 in [fill RESIDENT STATE]?

Appendix B. Annual Net Economic Value Tables

Table B-1. Deer Hunting Economic Values per Year: 2006 and 2011
(In 2011 dollars. State resident values for in-state hunting)

	Means		*Medians*		*2011/2006*
	2006	*2011*	*2006*	*2011*	*Means Ratio*
Aggregate	**736**	**843**	**280**	**332**	**1.1**
Alabama	848	527	358	280	0.6
Arizona	716	…	336	…	N.A.
Arkansas	902	1,389	403	300	1.5
California	<<<	523	<<<	490	N.A.
Connecticut	553	2,841	266	800	5.1
Delaware	753	…	392	…	N.A.
Florida	1,583	1,085	448	400	0.7
Georgia	754	581	101	250	0.8
Illinois	569	879	168	700	1.5
Indiana	631	950	188	532	1.5
Iowa	608	910	306	280	1.5
Kansas	492	558	235	225	1.1
Kentucky	560	904	392	475	1.6
Louisiana	1,136	656	336	250	0.6
Maine	503	518	280	248	1.0
Maryland	732	1,781	302	750	2.4
Massachusetts	1,343	…	504	…	N.A.
Michigan	477	846	242	500	1.8
Minnesota	568	1,018	168	600	1.8
Mississippi	784	649	420	200	0.8
Missouri	601	871	302	700	1.4
Nebraska	666	355	202	210	0.5
Nevada	615	<<<	224	<<<	N.A.
New Hampshire	625	1,245	210	1,720	2.0
New Jersey	632	1,245	370	300	2.0
New Mexico	401	839	188	750	2.1
New York	790	1,832	302	300	2.3
North Carolina	649	889	140	420	1.4
North Dakota	N.A.	N.A.	N.A.	N.A.	N.A.
Ohio	687	375	336	225	0.5
Oklahoma	945	930	336	382	1.0
Pennsylvania	850	792	314	490	0.9
Rhode Island	359	684	140	510	1.9
South Carolina	595	563	280	250	0.9
South Dakota	595	486	168	300	0.8
Tennessee	643	473	196	150	0.7
Texas	926	848	392	500	0.9
Utah	492	641	210	320	1.3
Vermont	803	1,063	224	350	1.3
Virginia	593	522	238	300	0.9
Washington	489	309	202	175	0.6
West Virginia	767	365	392	150	0.5
Wisconsin	715	437	210	88	0.6

… Sample size less than 10.
<<< 95% confidence interval includes zero.
N.A. Not available

Table B-2. Elk Hunting Economic Values per Year: 2006 and 2011
(In 2011 dollars. State resident values for in-state hunting)

	Means		*Medians*		*2011/2006*
	2006	*2011*	*2006*	*2011*	*Means Ratio*
Aggregate	**586**	**1,025**	**336**	**500**	**1.7**
Colorado	438	645	448	300	1.5
Idaho	281	…	235	…	N.A.
Montana	720	1,423	336	400	2.0
Oregon	681	587	336	246	0.9
Wyoming	522	1,647	281	665	3.2

… Sample size less than ten.
N.A. Not available

Table B-3. Moose Hunting Economic Values per Year: 2006 and 2011
(In 2011 dollars. State resident values for in-state hunting)

	Means		*Medians*		*2011/2006*
	2006	*2011*	*2006*	*2011*	*Means Ratio*
Alaska	1,350	537	532	188	0.4

Table B-4. State Resident Bass Fishing Economic Values per Year: 2006 and 2011
(In 2011 dollars. State resident values for in-state fishing)

	Means		*Medians*		*2011/2006*
	2006	*2011*	*2006*	*2011*	*Means Ratio*
Aggregate	**549**	**427**	**168**	**144**	**0.8**
Alabama	668	468	336	45	0.7
Arkansas	356	576	224	645	1.6
Delaware	1,141	94	549	68	0.1
Florida	492	521	112	100	1.1
Georgia	740	347	101	30	0.5
Illinois	411	350	168	90	0.9
Indiana	507	946	168	540	1.9
Iowa	420	297	112	125	0.7
Kansas	436	209	126	144	0.5
Kentucky	506	216	252	75	0.4
Louisiana	677	363	252	225	0.5
Maryland	253	388	67	225	1.5
Massachusetts	470	317	224	125	0.7
Mississippi	596	207	181	150	0.3
Missouri	1,261	516	280	150	0.4
Nebraska	799	754	196	262	0.9
North Carolina	382	381	168	264	1.0
Oklahoma	487	413	196	60	0.8
Rhode Island	364	168	140	70	0.5
South Carolina	529	619	196	75	1.2
Tennessee	397	175	157	12	0.4
Texas	378	404	168	225	1.1
Virginia	654	421	224	150	0.6
West Virginia	817	374	235	210	0.5

Table B-5. State Resident Trout Fishing Economic Values per Year: 2006 and 2011
(In 2011 dollars. State resident values for in-state fishing)

	Means		*Medians*		*2011/2006*
	2006	*2011*	*2006*	*2011*	*Means Ratio*
Aggregate	**377**	**331**	**146**	**160**	**0.9**
Alaska	515	246	126	150	0.5
Arizona	532	282	224	150	0.5
California	342	302	196	200	0.9
Colorado	332	316	157	188	1.0
Connecticut	312	252	84	80	0.8
Idaho	353	281	123	100	0.8
Maine	277	436	86	56	1.6
Montana	390	397	134	200	1.0
Nevada	375	343	202	125	0.9
New Hampshire	318	458	84	300	1.4
New Jersey	404	189	84	40	0.5
New Mexico	319	409	112	300	1.3
New York	271	414	126	100	1.5
Oregon	358	486	140	152	1.4
Pennsylvania	343	<<<	84	<<<	N.A.
Utah	625	386	168	250	0.6
Vermont	342	190	210	40	0.6
Washington	459	259	126	125	0.6
Wyoming	521	646	151	175	1.2

<<< 95% confidence interval includes zero.

Table B-6. State Resident Walleye Fishing Economic Values per Year: 2006 and 2011
(In 2011 dollars. State resident values for in-state fishing)

	Means		*Medians*		*2011/2006*
	2006	*2011*	*2006*	*2011*	*Means Ratio*
Aggregate	**647**	**478**	**224**	**200**	**0.7**
Michigan	290	120	210	60	0.4
Minnesota	614	578	224	200	0.9
North Dakota	N.A.	N.A.	N.A.	N.A.	N.A.
Ohio	1,021	1,031	179	600	1.0
South Dakota	700	255	308	90	0.4
Wisconsin	712	494	420	200	0.7

N.A. Not available

Table B-7. State Resident Wildlife Watching Economic Values per Year: 2006 and 2011
(In 2011 dollars. State resident values for wildlife watching in-state)

	Means		*Medians*		*2011/2006*
	2006	*2011*	*2006*	*2011*	*Means Ratio*
U.S. Total	**456**	**318**	**108**	**110**	**0.7**
Alabama	<<<	…	<<<	…	N.A.
Alaska	367	581	204	160	1.6
Arizona	652	551	196	172	0.8
Arkansas	277	262	90	202	0.9
California	587	265	168	119	0.5
Colorado	395	144	112	35	0.4
Connecticut	539	406	155	100	0.8
Delaware	311	213	43	100	0.7
Florida	299	234	103	46	0.8
Georgia	353	1,307	84	22	3.7
Hawaii	333	209	112	87	0.6
Idaho	296	249	202	65	0.8
Illinois	269	306	104	130	1.1
Indiana	244	157	84	88	0.6
Iowa	276	<<<	90	<<<	N.A.
Kansas	348	127	94	30	0.4
Kentucky	304	118	52	123	0.4
Louisiana	<<<	…	<<<	…	N.A.
Maine	320	354	101	111	1.1
Maryland	119	628	39	85	5.3
Massachusetts	363	396	81	88	1.1
Michigan	<<<	236	<<<	195	N.A.
Minnesota	232	138	81	51	0.6
Mississippi	396	278	124	240	0.7
Missouri	214	248	55	86	1.2
Montana	118	207	71	78	1.8
Nebraska	328	<<<	45	<<<	N.A.
Nevada	362	184	56	35	0.5
New Hampshire	405	1,100	119	322	2.7
New Jersey	215	200	84	86	0.9
New Mexico	368	167	112	90	0.5
New York	495	226	177	145	0.5
North Carolina	273	294	74	171	1.1
North Dakota	…	…	…	…	N.A.
Ohio	263	193	101	150	0.7
Oklahoma	491	258	235	98	0.5
Oregon	374	364	62	149	1.0
Pennsylvania	489	<<<	194	<<<	N.A.
Rhode Island	141	164	45	40	1.2
South Carolina	235	130	56	75	0.6
South Dakota	368	…	134	…	N.A.
Tennessee	258	164	106	60	0.6
Texas	523	264	93	264	0.5
Utah	253	330	57	75	1.3
Vermont	<<<	283	<<<	120	N.A.
Virginia	141	211	74	90	1.5
Washington	460	255	84	140	0.6
West Virginia	220	278	168	278	1.3
Wisconsin	727	284	155	26	0.4
Wyoming	296	451	146	292	1.5

<<< 95% confidence interval includes zero.
… Sample size less than 10

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