CONCLUSION

There are a number of limitations in generalizing our results to all survey work. First, this experiment was conducted in the South Coast Air Basin where individuals have both an exceptionally well-defined regional pollution situation and a well-developed housing value market for clean air. The effect of clean air on housing values appears to be exceptionally well understood in the Los Angeles metropolitan area. Thus, the Los Angeles experiment may be a special case in which an informed populace with market experience for a particular public good allowed the successful application of the survey approach. In particular, situations where no well-developed hedonic market exists may not be amenable to survey valuation. Biases due to lack of experience must then be considered a possibility. However, existing studies by Randall et al. (1974) and Brookshire et al. (1976) and Rowe et al. (1980) of remote recreation areas certainly suggest that survey approaches provide replicable estimates of consumer's willingness to pay to prevent environmental deterioration, without prior valuation experience.

In summary, this paper set out to both theoretically and empirically examine the survey approach and to provide external validation for survey analysis. The theoretical model described in Section 2 predicts that survey responses will be bounded below by zero and above by rent differentials derived from the estimated hedonic rent gradient. In order to test the dual hypotheses a survey and a traditional analysis of the housing market were undertaken. Each was based upon a consistent but random sampling procedure in the Los Angeles Metropolitan area. The empirical results do not allow the rejection of either of the two hypotheses, thereby providing evidence towards the validity of survey methods as a means of determining the value of public goods .

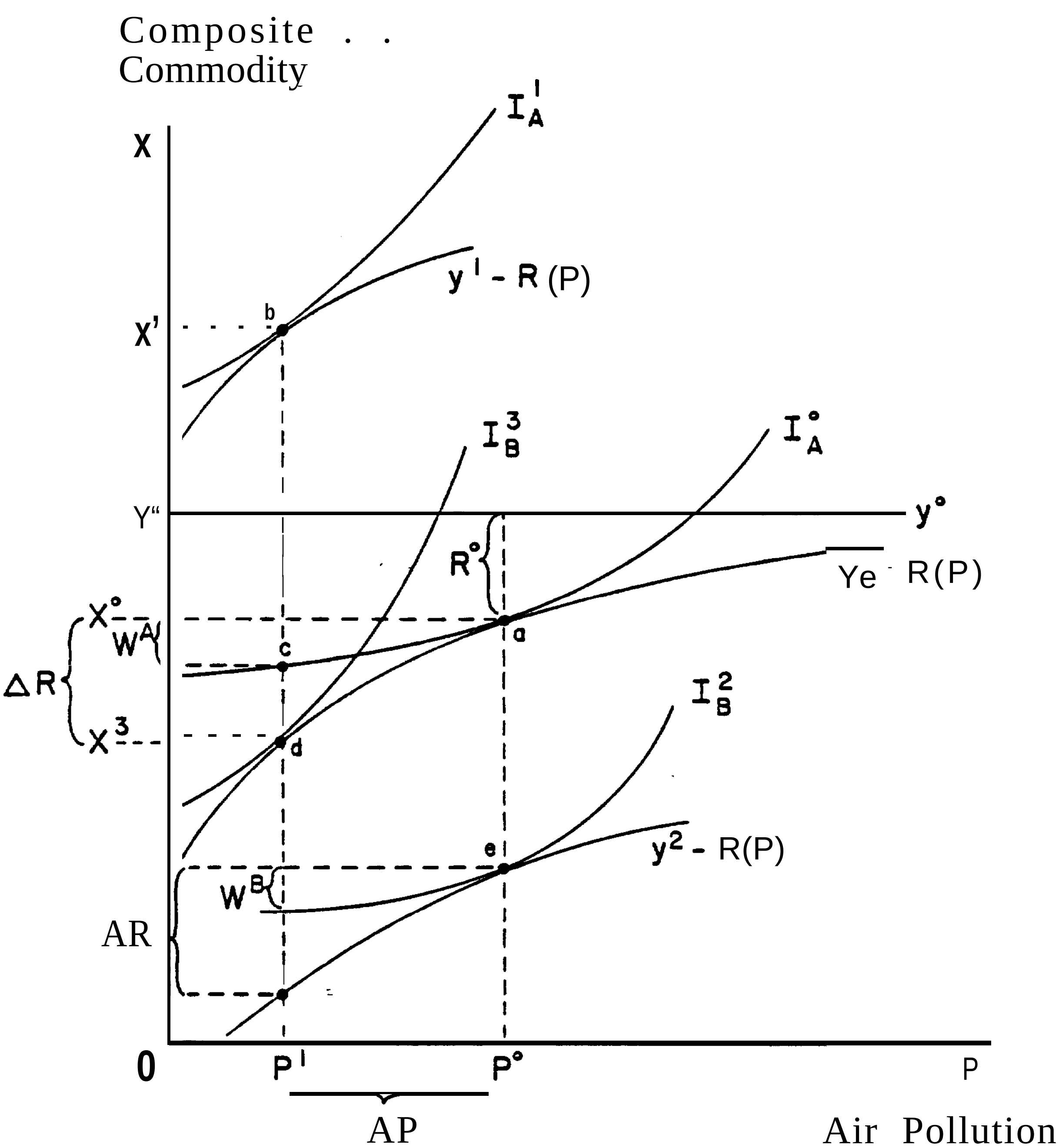

Figure 1

With identical housing attributes the identical rent differential, AR, exceeds individual willingness to pay, WA and W^B.

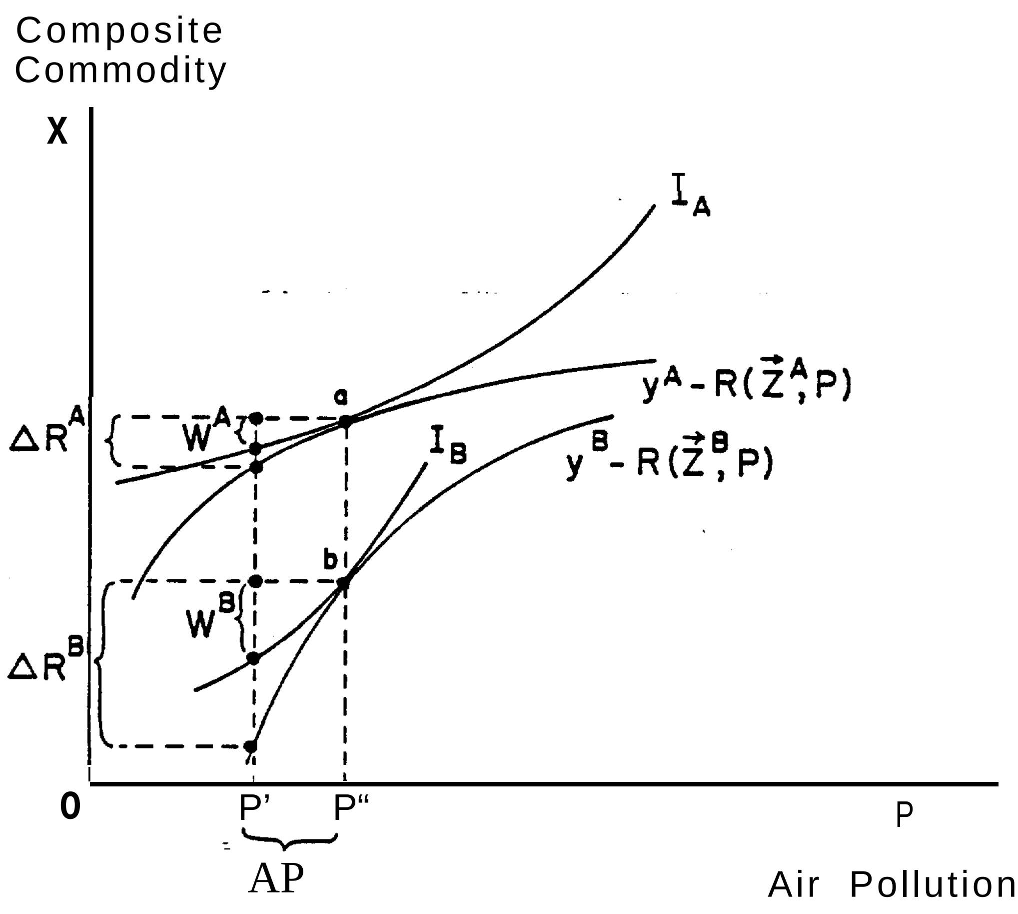

Figure 2

With differing housing attributes across households each individual rent differential exceeds that households willingness to pay.

TABLE 1

Estimated Hedonic Rent Gradient Equations[a]
Dependent Variable= Log (Home Sale Price in $1,000)

Independent Variable	NO_2 Equation	TSP Equation
Housing Structure Variables		
Sale Date	.01859?	.018654
	(9.7577)	(9.7727)
Age	-.018171	-.021411
	(2. 3385)	(-2.8147)
Living Area	.00017568	.00017507
	(12.126)	(12.069)
Bathrooms	.15602	.15703
	(9.609)	(9.66361
Pool	.058063	.058397
	(4.6301)	(4.6518)'
Fireplaces	.099577	.099927
	(7.1705)	(7.1866)
Neighborhood Variables		
Log (Crime)	-.08381	-.10401
	(-.5766)	(-1.9974'
School Quality	.0019826	.001771
	(3.9450)	(3.5769)
Ethnic L.opposition -(Pe cent White)	.027031	.043472
	(4.3915)	(6.2583)
Hous ng Density	-.000066926	-.000067613
	(9. 1277)	(-9.2359)
Publ c Safety Expenditures	.00026192	.00026143
	(4.7602)	(4.7418)
Accessibility Variables		
Distance to Beach	-.011586	-.011612
	(-7.8321)	(7.7822)
Distance to Employment	-.28514	-.26232
	(-14.786)	(14.15s)
Air Pollution Variables		
log (TSP)		-.22183
		(-3.8324)
log (No_2)	-.22407	
	(4.0324)	
Constant	2.2325	1.0527
	(2.9296)	(1.4537)
R^2	.8g	.89
Sum of Squared Residuals	18.92	18.97
Degrees of Freedom	619	619

at - Statistics in Parentheses

Table 2
Tests of Hypotheses

Community	roperty Value Results[a] $\overline{\Delta R}$ (Standard Deviation)	Number of observations	Survey Results $\overline{W}$ (Standard Deviation)	Number of observations	Tests of Hypotheses t-statistics $\mu_{\overline{W}} > 0$[b]	t-statistics $\mu_{\overline{\Delta R}} \geq \mu_{\overline{W}}$[c]
Poor - Fair						
El Monte	15,44 (2.88)	22	11.10 (13.13)	20	3.78	1.51
Montebel 10	30.62 (7.26)	49	11.42 (15.15)	19	3.28	7.07
La Cañada	73.78 (48.25)	51	22.06 (33.24)	17	2.74	4.10
Sample Population	45.92 (36.69)	122	14.54 (21.93)	56	4.94	5.54
Fair - Good						
Canoga Park	33.17 (3.88)	22	16.08 (15.46)	34	6.07	5.07
Huntington Beach	47.26 (10.66)	44	24.34 (25.46)	38	5.92.	5.47
Irvine	48.22 (8.90)	196	22.37 (19.13)	27	6.08	5.08
Culver City	54.44 (16.09)	64	28.18 (34.17)	30	5.42	11..85
Encino	128.46 (51 .95)	45	16.51 (13.38)	37	7.51	12.75
Newport Beach	77.02 (41 .25)	22	5.55 (6.83)	20	3.63	7.65
Sample Population	59.09 (34.29)	393	20.31 (23.0)	186	12.02	14.00

[a]Rent differentials for the hedonic housing equation in which log(NO_2) is the relevant pollution variable are presented here. Essentially identical results are obtained using NO_2, TSP or log(TSP).

[b]The hypotheses to be tested were $H_0: \mu_{\overline{W}} = 0; H_1: \mu_{\overline{W}} > 0$. All test statistics indicate rejection of the null hypothesis at the 1% significance level.

[c]The hypotheses to be tested were $H_0: \mu_{\overline{\Delta R}} \geq \mu_{\overline{W}}; H_1: \mu_{\overline{\Delta R}} < \mu_{\overline{W}}$ All Test statistics indicate that the null hypothesis could not he rejected even at the 10% significance level.

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1. David S. Brookshire, Mark A. Thayer, William D. Schulze and Ralph C. d'Arge (forthcoming in the American Economic Review).

2. Alternatively we could define the utility function U(-P, X) which would be an increasing quasi-concave function of both arguments.

3. Primes or subscripts denote derivatives or partial derivatives respectively throughout the paper.

4. The second expression is, of course, a vector of conditions, one for each attribute.

5. For a continuous model one could specify a taste parameter in the utility function and specify a distribution of households over that parameter. To complete a closed model one also needs the distribution of housing units over characteristics.

6. The paired areas with associated census tract marker and air quality level are respectively (1) Canoga Park - #1345 - fair/El Monte - #4334 poor, (2) Culver City - #2026 - fair/Montebello - #4301.02 and part of #5300.02 - poor, (3) Newport Beach - central #630.00 - fair/Pacific - northeast portion of #2627.02 and southwest intersection - good; (4) Irvine - part of #525 - fair/Pales Verdes - portion of good; (5) Encino - portion of #1326 - fair/La Canada - south-central portioof #4607 - poor; (6) Huntington Beach - central portion of #993.03 poor/Redondo Beach - eastern portion of #6205.01 and #6205.02 - good. For a map showing the monitoring station locations in relation to the paired sample areas and the air quality isopleths see Brookshire, et al. (1980).

7. The estimation of a hedonic rent gradient requires that rather restrictive assumptions are satisfied. For Example, Mäler (1977), has raised a number of objections to the hedonic property value approach for valuing environmental goods. These include the possibility that transaction costs (moving expenses and real estate commissions) might restrict transactions leaving real estate markets in near constant disequilibrium; and that markets other than those for property alone might capture part of the value of an environmental commodity. The first of these criticisms is mitigated by the extremely fluid and mobile real estate market of the late 1970's in Los Angeles, where rapidly escalating real property values increased homeowner' equity so quickly that "housejumping" became financially feasible. The second of Mäler's concerns, that other prices, e.g., golfclub fees and wages capture part of the willingness to pay can be addressed empirically. For example, attempts to test if wages from our survey data across the Los Angeles area reflected differences in pollution level produced negative results.

8. Note that we use sale price or the discounted present value of the flow of rents rather than actual rent as the dependent variable. Given the appropriate discount rate the two are interchangeable.

9. Housing characteristic data was obtained from the Market Data Center, a computerized appraisal service with central headquarters in Los Angeles, California.

10. Although" the nonlinear equations provide large t 'values on the air pollution coefficients, the coefficients on the pollution variables in the linear-equations possessed the expected relationship and were significant at the 1% level. Also, the calculated rent differentials associated with the linear specifications were larger than those from the nonlinear equations.

11. [t should be noted that the nonlinear estimated equations will give biased but consistent forecasts of rent differentials. However, the linear estimated equations in all cases forecast larger rent differentials than the nonlinear estimated equations presented here.

12. A capital recovery factor equal to .0995 which corresponds to the prevailing .0925 mortgage rate in the January, 1979 - March, 1978 period is used.

13. In developing photographs, two observational paths from Griffith Observatory in Los Angeles were chosen: (1) toward downtown Los Angeles, and (2) looking down Western Avenue. The approximate visibility (discernible objects in the distance, not visual range) for poor visibility was 2 miles, for fair visibility 12 miles, and for good visibility 28 miles.

14. Payment mechanisms are either of the lump sum variety, or well specified schemes such as tax increments or utility bill additions. The choice in the experimental setting varies according to the structure of the contingent market.

15. Questions have been raised as to problems of biases in the survey' approach. Strategic bias (i.e., free rider problems), hypothetical bias, instrument bias all have been explored. Generally speaking, problems of bias within the survey approach have not been prevalent. For a general review of the definition of various biases and results of different-experiments see Schulze et al. (forthcoming) and for investigations of strategic bias utilizing other demand revealing techniques see Scherr and Babb (1975) and Smith (1979).

16, Interviewer bias was not present. No records were kept that would enable the testing for non-respondent bias.

17. For instance, rejection of the null hypothesis ($\mu_{\overline{\Delta R}} \geq \mu_{\overline{W}}$) at the one percent level would require a calculated t-statistic less than -2.326 given a large number of observations. Since none of the calculated t-statistics are negative the null hypothesis cannot be rejected [See Guenther (1973)].

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APPENDIX C

VISIBILITY QUESTIONNAIRE

URBAN SURVEY: Economics Narrative

We are students at the University of Wyoming [New Mexico," Chicago] and are conducting this survey for a research project designed to help in valuing visibility in the national parks in the Southwestern United States.

The Clean Air Act, passed by Congress in 1970, declared a national goal of preserving the scenic beauty and pristine air quality of our national parks and wilderness areas.

Air quality, or the "cleanness" of the air, can be affected by either natural occurrences (e.g. dust and humidity) or by man-caused pollution (such as autc emissions or emissions released by industrial facilities). Consequently, visibility, which is the ability to see and appreciate distant objects, activities, scenes, or atmospheric phenomena, can be affected by either natural or man-caused pollution sources resulting in changes in the color and clarity of near and far distant vistas.

As you can see in these photographs taken at the Grand Canyon, air pollution can discolor a view to the point where its components cannot be clearly identified and its scenic beauty cannot be fully enjoyed by the viewer [SHOW GRAND CANYON PHOTOGRAPHS: SITUATION A-E].

These photographs represent five levels of visibility during morning and afternoon periods looking both east and west from Hopi Point at the Grand Canyon. Column A represents poor visibility, B below average, C average visibility, D above average, and E good visibility. Comparing the columns, we can see the variety of air quality conditions and resulting levels of visibility that can be observed in the Grand Canyon. The rows represent the different vistas while standing at Hopi Point. The first row represents the different visibility and air quality conditions looking east, in the morning from Hopi Point. The second row represents morning conditions looking west from Hopi Point. The third row shows the view from Hopi Point in the afternoon looking west.

PAST AND FUTURE USE

In the first part of our survey, we would like to ask a few questions about your use of the National Parklands.

El) How many days have you spent visiting the Grand Canyon National Park in the last 10 years? Please put an X by the number of days on your answer sheet for question El.

E2) How many days do you expect to spend visiting the Grand Canyon National Park in the next 10 years? Please put an X by the number of days on your answer sheet for question E2.

E3) How many days have you spent visiting National Parks in the Southwest (Arizona, Utah, New Mexico, and Colorado) in the last 10 years? Please circle the number of days by each National Park on your answer sheet for question E3.

E4) How many days for each National Park do you expect to visit in the next 10 years? Please circle the number of days by each National Park on your answer sheet for question E4.

[FOR EXISTENCE VALUE ANALYSIS, TURN TO PAGE 7 AND BEGIN WITH QUESTION E8. FOR uSER ANALYSIS (EVERY THIRD INTERVIEW), CONTINUE WITH QUESTION ES. NOTE: NUMBER OF VISITS MUST BE GREATER THAN ZERO IN QUESTIONS EI AND E2 TO CONDUCT USER ANALYSIS.]

GRAND CANYON ANALYSIS

. . . -User-

This part of the surveyis designed to determine how much you are willing to pay to improve visibility in the area of Grand Canyon National Park.

Although one does not usuallyplace a dollar value on scenery, sunsets, or visibility, such things are valuable to most people. Since it does *cost* money to clean up man-made pollution to improve visibility in our National Parks, we are interested in firiding out how much good visibility is worth to you .

First let's assume that visitors to Grand Canyon National Park are to pay for improvements in the air quality and therefore in the visibility, by paying an increase in daily entrance fees to be admitted into the park. Let'S also assume that all visitors to the park would pay the same total daily fee as you would. Then, all the additional money collected would be used to finance the air quality improvements represented in the photographs.

Again, let us look at the photographs representing the different levels of visibility and air quality ranging from very poor (A) to very good (E) for east and west views in the morning and afternoon from Hopi Point in the Grand Canyon. We would like to know how much you are willing to pay as a total daily park entrance fee for your household for air quality improvements and resulting visibility improvements shown in Columns B through E. When deciding how much you are willing to pay for each improvement, you will always be comparing the improved air quality to the lowest air quality conditions as represented in Column A. Also, when considering how much you are willing to pay for each improvement, assume each photograph represents the visibility on a day that you would be visiting the Grand Canyon National Parks.

[SHOW COLUMNS A-B]

E5) This is Column A, representing very poor air quality and visibility. Please indicate on your answer sheet how much of an increase above the total daily park fees of $2.00 per carload you would be willing to pay for your household to improve the visibility to that shown in Column B. Put a B next to the highest dollar amount you would pay per day if you were visiting the Grand Canyon in question E5 on your answer sheet.

[MOVE COLUMN C TO COVER B]

Now, for your household, how much of an increase above the total daily park entrance fees of $2.00 per carload for your household would you pay for cleaner air if the visibility was improved from that shown in Column A to. that shown in Column C? Please put the letter C next to the highest amount you would pay per day in question ES on your answer sheet.

[MOVE COLUMN D TO COVER C]

For your household, how much of an increase above the total daily park entrance fees of $2.00 per carload would YOU be willing to pay for an improvement from Column A to Column D? Please put the letter D next to the amount in question E5.

[MOVE COLUMN E TO COVER COLUMN D]

And finally, for your household, how much of an increase above the total daily park entrance fees of $2.00 per carload would you pay to have air quality and visibility conditions on a day of your visit to Grand Canyon be like Column E as compared to Column A? Put the letter E next to the amount you would pay as a daily park entrance fee in question E5 on your answer sheet.

REGIONAL ANALYSIS

.... -User-

Unless new and current industrial facilities in the Southwest are required to utilize air pollution controls for particulate and sulfur oxide emissions, visibility in the region will become less than the current average.

Let's look at some pictures representing regional visibility. Columns A-E again represent air quality conditions from very poor (A) to very good (E). The rows represent morning conditions for the Grand Canyon, Mesa Verde and Zion National Parks. Row 1 looks out from Hopi Point towards the east in the morning at the Grand Canyon. Row 2 represents the vista from Hess Verde at Far View overlook towards the south in the morning. Finally, Row 3 is at Lava Point in Zion National Park looking southeast in the morning.

If current emission standards are maintained, the average conditions will be as seen in Column C. If, however, current emission standards on existing and proposed industrial facilities are relaxed or not enforced, then average air quality and visibility in the region will be represented as in Column B. As shown in Column B a deterioration in visibility would occur in the Grand Canyon, Zion and Mesa Verde National Parks. As a result, conditions as represented in Columns C, D, and E will occur less frequently. Conditions in Columns A and B would occur more frequently. We would like to know how much the maintenance of average regional air quality and visibility is worth to you.

E6) How much would you be willing to pay per day in addition to existing park entrance fees for your household at the Grand Canyon, Mesa Verde, or Zion National Parks to prevent a deterioration in visibility in the region as represented in moving from Column C to Column B. [SHOW PHOTOGRAPHS AND POINT TO COLUMNS C AND B FOR GRAND CANYON, MESA VERDE AND ZION.] Assume that entrance fees would be raised throughout the National Parks in the Southwest. Please put an R next to the dollar amount closest to the highest increase in daily entrance fees you would be willing to pay for your household for a <u>region-wide</u> preservation in visibility for question E6.

E7) If you answered "$0" to any part of questions E5 or E6, please answer question E7 on your answer sheet.

[TURN TO PAGE 11, QUESTION E11 (PLUME USER ANALYSIS)]

EXISTENCE VALUE ANALYSIS

-Grand Canyon-

This part of the survey is designed to determine your' concern for preserving visibility levels in Grand Canyon National Park.

Although one does not usually place a dollar value on scenery, sunsets, or visibility, such things are valuable to most people. Since it does cost money to clean up man-made pollution to improve visibility in our National Parks, we are interested in finding out how much good visibility is worth to you .

Unless new and current industrial facilities in the Southwest are required to meet current emission standards for particulate and sulfur oxides, air quality in the Grand Canyon will become less than the current average.

Again, let us look at the photographs representing visual air quality ranging from very poor in Column A to very good in Column E for east and west views in the morning and afternoon from Hopi Point. If current emission standards are maintained the average conditions will be as seen in Column C. [f, however, the current emission standards for sulfur oxide are not enforced, then average air quality and visibility in the region will become like Column B. As a result, conditions are represented in Columns C, D and E will occur frequently in the Grand Canyon. Such emission controls will likely make electricity more expensive.

E8) We would like to know if you would be willing to pay higher electric utility bills if the extra money collected would be used for additional air pollution controls to preserve current air quality and visibility levels at the Grand Canyon. How much extra would you be willing to pay at most, per month as an increase in your electric utility bill to preserve current average visibility as represented in Column C rather than have the average deteriorate to that shown in Column B? Please put an X next to the highest amount you would be willing to pay per month for your household on your answer sheet for question E8. [EMPHASIZE THEY ARE ANSWERING E8.]

EXISTENCE VALUE

. . . -Regional Analysis-

Unless new and current industrial facilities in the Southwestern United States are required to utilize air pollution controls for particulate and sulfur oxide emissions, visibility in the region will become less than the current average.

Let's look at some pictures representing regional visibility. Columns A-E again represent air quality conditions from very poor (A) to very good (E). The rows represent morning conditions for the Grand Canyon, Mesa Verde and Zion National Parks. Row 1 looks out from Hopi Point towards the east in the morning at the Grand Canyon. Row 2 represents the vista from Mesa Verde at Far View overlook towards the south in the morning. Finally, Row 3 is at Lava Point in Zion National Park looking southeast in the morning.

If current emission standards are maintained the average conditions will be seen in Column C. If, however, current emission standards on existing and proposed industrial facilities are relaxed or not enforced, then average air quality and visibility in the region will be represented as in Column B. As shown in Column B a deterioration in visibility would occur in the Grand Canyon, Zion and Mesa Verde National Parks. As a result, conditions as represented in Columns C, D and E will occur less frequently. Conditions in Columns A and B would occur more frequently. We would like to know how much the maintenance of average regional visibility is worth to you.

E8) How much more than you have already offered to pay for the Grand Canyon would you be willing to pay in higher electric utility bills per month to preserve current average air quality and visibility levels throughout the Parklands of the Southwest? Visibility conditions as represented in the photographs in Column C would be maintained as opposed to allowing air quality and visibility to deteriorate to the new average levels shown in photographs in Column B. Please place an R by the increase in monthly electric utility bills you would be willing to pay for your household for question E8.

E9) If you answered "$0" to E8, please answer E9 on your answer sheet.

[TURN TO PAGE 11, QUESTION E12 (PLUME EXISTENCE VALUE)]

PLUME ANALYSIS (USER)

E1O) Problems other than regional haze can be associated with industrial development in the Southwest region. Plumes also can reduce visibility by disrupting a vista on the horizon. These photographs represent two situations whereby in picture A no plume can be seen looking west from Hopi Point in the Grand Canyon. Pciture B is identical, however, a plume is visible. We would like to know how much you are willing to pay in addition to the daily park entrance fees of $2.00 for your household for prevention of plume blight over the Grand Canyon. Please put the letter A next to the highest dollar amount you would pay per day if you were visiting the Grand Canyon for question E1O on your answer sheet.

[CONTINUE WITH SOCIO-ECONOMIC QUESTIONS ON THE LAST PAGE OF ANSWER SHEET]

PLUME ANALYSIs (EXISTENCE VALUE)

En) Problems other than regional haze can be associated with industrial development in the Southwest region. Plumes can reduce air quality and impair visibility by visually disrupting a vista on the horizon. We would like to know if you are concerned with preserving visibility in Grand Canyon National Park from plume blight.

These photographs represent two situations whereby in picture A no plume can be seen looking west from Hopi Point in the Grand Canyon. Picture B is identical, however, a plume is visible. Again focusing on the possibility of higher utility bills, how much extra would you be willing to pay at most, monthly, as an increase in your electric utility bill to preserve the vista as seen in picture A rather than have plume blight as represented in picture B? Please put the letter A next to the highest amount you would be willing to pay per year for your household on your answer sheet for question En.

[CONTINUE WITH SOCIO-ECONOMIC QUESTIONS ON LAST PAGE OF ANSWER SHEET]

ANSWER SHEET

E1)

_____ 1 Day	_____ 5 Days	_____ 9 Days	_____ 13 Days
_____ 2 Days	_____ 6 Days	_____ 10 Days	_____ 14 Days
_____ 3 Days	_____ 7 Days	_____ 11 Days	_____ 15 Days
_____ 4 Days	_____ 8 Days	_____ 12 Days	_____ More than 15 Days

E2)

_____ 1 Day	_____ 5 Days	_____ 9 Days	_____ 13 Days
_____ 2 Days	_____ 6 Days	_____ 10 Days	_____ 14 Days
_____ 3 Days	7 _____ Days	_____ 11 Days	_____ 15 Days
_____ 4 Days	_____ 8 Days	_____ 12 Days	_____ More than 15 Days

E3)

Zion Nat. Park	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 More than 15
Mesa Verde Nat. Park	1 2 3 4 5 6 7 8 9 10-11 12 13 14 15 More than 15
Bryce Canyon Nat. Park	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 More than 15
Canyonlands Nat. Park	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 More than 15

E4)

Zion Nat. Park	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 More than 15
Mesa Verde Nat. Park	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 More than 15
Bryce Canyon Nat. Park	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 More than 15

E5)

$ .00 _____/day	$ 4.00 _____/day	$ 15.00 _____/day
.50 _____/day	5.00 _____/day	20.00 _____/day
1.00 _____/day	6.00 _____/day	25.00 _____/day
1.50 _____/day	7.00 _____/day	50.00 _____/day
2.00 _____/day	8.00 _____/day	75.00 _____/day
2.50 _____/day	9.00 _____/day	100.00 _____/day
3.00 _____/day	10.00 _____/day	More than $100.00 _____/day

E6)

$ .00 _____/day	$ 4.00 _____/day	$ 15.00 _____/day
.50 _____/day	5.00 _____/day	20.00 _____/day
1.00 _____/day	6.00 _____/day	25.00 _____/day
1.50 _____/day	7.00 _____/day	50.00 _____/day
2.00 _____/day	8.00 _____/day	75.00 _____/day
2.50 _____/day	9.00 _____/day	100.00 _____/day
3.00 _____/day	10.00 _____/day	More than $100.00 _____/day

E7) Answer only if you answered $.00 to the above questions. Did you bid zero because you believe that:

_____ The air quality improvements represented in the columns are not significant.

_____ The source' of the air pollution should be required to pay the costs of improving the air quality.

_____ Other (specify) ____________________

E8)

$ .00 _____/year	$25.00 _____/year	$50.00 _____/year	$1OO.(X) _____/year
5.00 _____/year	30.00 _____/year	60.00 _____/year	125.00 _____/year
10.00 _____/year	35.00 _____/year	70.00 _____/year	150.00 _____/year
15.00 _____/year	40.00 _____/year	80.00 _____/year	175.00 _____/year
20.00 _____/year	45.00 _____/year	90.00 _____/year	200.00 _____/year
			More than $200.00 _____/year

E9)

$ .00 _____/year	$25.00 _____/year	$50.00 _____/year	$100.00 _____/year
5.00 _____/year	30.00 _____/year	60.00 _____/year	125.00 _____/year
10.00 _____/year	35.00 _____/year	70.00 _____/year	150.00 _____/year
15.00 _____/year	40.00 _____/year	80.00 _____/year	175.00 _____/year
20.00 _____/year	45.00 _____/year	90.00 _____/year	200.00 _____/year
			More than $200.00 _____/year

E1O) Answer only if you answered $.00 to the above questions. Did you bid zero because you believe that:

_____ The air quality improvements represented in the columns are not significant.

_____ The source of the air pollution should be required to pay the costs of improving the air quality.

_____ Other (specify) ____________________

En)

$ .00 _____/day	$ 4.00 _____/day	$ 15.00 _____/day
.50 _____/day	5.00 _____/day	20.00 _____/day
1.00 _____/day	6.00 _____/day	25.00 _____/day
1.50 _____/day	7.00 _____/day	50.00 _____/day
2.00 _____/day	8.00 _____/day	75.00 _____/day
2.50 _____/day	9.00 _____/day	100.00 _____/day
3.00 _____/day	10.00 _____/day	More than $100.00 _____/day

E12)

$ .00	____/day	$ 4.00	____/day	$ 15.00	____/day
.50	____/day	5.00	____/day	20.00	____/day
1.00	____/day	6.00	____/day	25.00	____/day
1.50	____/day	7.00	____/day	50.00	____/day
2.00	____/day	8.00	____/day	75.00	____/day
2.50	____/day	9.00	____/day	100.00	____/day
3.00	____/day	10.00	____/day	More than $100.00	____/day

E13)

____1 time	____4 times	____7 times	____10 times
____2 times	____5 times	____8 times	____11 times
____3 times	____6 times	____9 times	____12 times

E14)

____1 time	____4 times	____7 times	____10 times
____2 times	____5 times	____8 times	____11 times
____3 times	____6 times	____9 times	____12 times

E15)

$ .00	____/year	$25.00	____/year	$50.00	____/year	$100.00	____/year
5.00	____/year	30.00	____/year	60.00	____/year	125.00	____/year
10.00	____/year	35.00	____/year	70.00	____/year	150.00	____/year
15.00	____/year	40.00	____/year	80.00	____/year	175.00	____/year
20.00	____/year	45.00	____/year	90.00	____/year	200.00	____/year
						More than $200.00	____/year

E16) Home zip code ____________ E17) ____ Rural ____ Suburban ____ Urban

E18) Education:

- under 12 years ____
- High School ____
- College - no degree ____
- Bachelor's degree ____
- Post-graduate degree ____

E19) Age group:

- under 18 ____
- 18-24 ____
- 25-34 ____
- 35-44 ____
- 45-54 ____
- 55 & over ____

E20) Sex: ____Male ____Female

E21) How many members are there in your household? ____ persons

E22) Are you the primary income earner in your household? ____yes ____no

E23) Would you please indicate which of the following groups your annual household income falls in:

____ less than $5,000	____ $25,000-29,999	____ $55,000-59,999
____ $ 5,000-7,499	____ $30,000-34,999	____ $60,000-64,999
____ $ 7,500-9,999	____ $35,000-39,999	____ $65,000-69,999
____ $10,000-14,999	____ $40,000-44,999	____ $70,000-74,999
____ $15,000-19,999	____ $45,000-49,999	____ $75,000 and up
____ $20,000-24,999	____ $50,000-54,999	

INTERVIEWING SUPPLEMENT

[Additional information to be used by interview teams only if necessary. Please note on answer sheet if this material was used!]

Scientific Basis of Photographs

The photographs you have been shown have been produced in the following manner: Throughout the National Park System, photographs are being taken twice a day (morning and afternoon) every day of the year at major overlooks. Sophisticated electronic equipment, an instrument called a telephotometer, is used to get a physical measure of visibility at the same time the photos are being taken. This physical measure is called apparent contrast. Apparent contrast is a measure of visual air quality. This measure is based on the difference in light between a distant target (a mountain, for instance) and the background sky. Apparent contrast can also be measured directly in the photographs, which allows calibration between physical measurements and the photographs. As a result of this data collection effort, we know how often conditions shown as in columns A-E occur over a typical year.

What Causes Poor Visibility

Humidity (water in the air), dust (especially fine particulate), and the gasses making up the atmosphere themselves all reduce visibility. Man-caused pollution can contribute to poor visibility. Two types of fine particulate are partly caused by man: sulfates and nitrates. Emissions of nitrogen oxides (gasses formed from atmospheric gasses under high temperature and/or pressure) react in the atmosphere to form nitrates. Both automobiles and industry are major sources of nitrogen oxides. Emissions of sulfur oxides (gasses resulting from, for example, a combination of sulfur in fuels or ores with oxygen) also react in the atmosphere to form sulfates. Industry, especially power plants and smelters, is the primary source of sulfur oxide emissions. The contribution of sulfates and nitrates to poor visibility has been determined by taking air samples during known visibility conditions and running the air sample through a filter to capture particulate matter. Sulfates and nitrates have been :shown to make a significant contribution to the visibility problem. Records from airports in the Southwest show that visibility has declined from an average of about 100 miles to about 80 miles over the last twenty years.

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