AN EVALUATION OF ATTITUDES TOWARDS WILDLIFE

Thesis for the Degree of M. S.
MICHIGAN STATE UNIVERSITY
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1974

ABSTRACT

AN EVALUATION OF
ATTITUDES TOWARDS WILDLIFE

By

Wayne Arnold Schmidt

A technique for the economic evaluation of wildlife would be a useful tool in environmental analysis and in making decisions regarding natural resource allocations. This study attempted to quantify relative differences in human attitudes toward various bird and mammal species. It is intended as one step towards a complete method of evaluation of wildlife.

Surveys were used in which the respondents scored, on a 1 to 10 scale, a series of photographs of animal species, based on how much he/she would enjoy seeing that species. Group tests were given to 343 university students and to 84 children in a YWCA day-camp using projected color slide-transparencies. Individual interviews were given to 89 households, randomly selected from five neighborhoods in greater Detroit, using 5x7-inch color prints. Respondents also answered questions regarding their background and interests in nature.

Computer programs were written to analyze the data and perform certain statistical tests. Variances of the mean scores for most species were high, especially in the Detroit survey. Analyses of the scores and of characteristics of the species were based on a High-Medium-Low classification of the mean scores. This classification was determined by a method that was based on the proportion of the other mean scores which were significantly different from a particular score.

When asked "What bird species do you like or dislike?", most people in the Detroit survey named those species common to their neighborhoods. However, when respondents were shown photos of non-local species, these species were often scored higher than the "most-liked" species.

People who participated in outdoor activities scored all birds higher, on the average, and showed a much greater appreciation for raptors and waterfowl, as did those people with some environmental education.

Overall, colorful species, especially the cardinal, were the most-liked species. The ring-necked pheasant, bluebird, and Baltimore oriole were also highly preferred. The ruby-throated hummingbird was ranked "High" only by the Detroit survey. The robin was not scored, but was named third most often as the "most-liked" species in the Detroit survey.

The pigeon, starling, grackle, and crow were the least-liked bird species. Dull-colored species, such as

sparrows, were also among the least-liked species. Most respondents in the Detroit survey scored the red-tailed hawk, great horned owl, and herring gull "Low."

Preferences in mammals were highly variable. Of the ten mammals used in testing, the black bear, and in some groups the raccoon, were scored highest in the Detroit survey. The chipmunk was the only species consistently scored "Low." Children in the YWCA-camp sample preferred the whitetail deer and fox squirrel, and ranked the deer mouse "Low."

Causes of variances in the scores and weaknesses in the methodology are discussed. Preferences toward animal species seemed to depend on (1) background, (2) education, and (3) previous experiences with animals. The first two variables have fairly predictable influences on the scoring of certain species; the third is too individual to permit a predictive model for preferences toward most species.

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Wayne Arnold Schmidt

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE

Department of Fisheries and Wildlife

1974

"Oh pale and brittle pencils ever to try
One grass blade's curve, or the throat of one bird
That clings to twig, ruffled against white sky.
Oh cracked and twilight mirrors ever to catch
One color, one glinting flash, of the splendor of things."

Robinson Jeffers

ACKNOWLEDGMENTS

I wish to thank Dr. Leslie W. Gysel for his counsel throughout this project. This study would not have been possible without his invaluable encouragement and suggestions.

I would also like to thank Mr. Glenn R. Dudderar for his interest and encouragement. His assistance and direction were greatly appreciated. Dr. Rollin H. Baker was helpful in editing the text.

Sources of photographs included: Dr. Miles D. Pirnie, Dr. Harold H. Prince, Dr. Leslie W. Gysel, and Mr. Robert Bernard. Photographic copy-work was done by Mr. Paul J. Schneider.

I wish to especially thank Mr. James Longley for his excellent work in conducting the interviews for the Detroit survey.

This study was sponsored by Consumers Power Company, Jackson, Michigan, which has shown a continuing interest in developing techniques for defining and preserving environmental quality.

Lastly, thanks to Al, Jim, Dennis, Dick, Diane, and Levi.

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INTRODUCTION

Wildlife is an important resource which must be given major consideration in the preparation of environmental impact statements. Correlating the ecologic, economic, and esthetic values of wildlife in a new quantified approach is necessary in order to satisfy the intent of recently-enacted environmental laws. The National Environmental Policy Act of 1969, for example, calls on Federal agencies to "identify and develop methods and procedures ... which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations."

Past research on wildlife valuation has not been particularly fruitful, partly because wildlife resources have historically been treated as free goods outside of the market mechanism. Although a complete system of user fees has occasionally been advocated (Scott 1965, Crutchfield 1967), non-market conditions will probably persist for many years to come (Wennergren 1967). Without the usual market valuation of goods, a workable method for the pricing of wildlife or the satisfactions derived from wildlife, will be extremely complex. Research efforts are encouraged, in

spite of these difficulties, because of the demand for objective quantitative comparisons of resources in competing multiple land-use programming.

Many of the factors to be accounted for in a complete valuation of wildlife resources are discussed in Appendix D. Quantification of intangible values, such as esthetics, is perhaps the most challenging problem. However, it is only our inability to measure certain values which make them intangible; all consumer satisfactions are intrinsically derived from tangible objects or situations (Hines 1958:365). "Esthetics" is defined in this report as an individual's perception of beauty and from it his/her associated satisfactions, regardless of how the individual defines that perception. Beauty is a difficult concept to define; its measurement is even more elusive. For example, although most people would find greater satisfaction in viewing a flock of geese than a flock of blackbirds, measurement of that difference in satisfaction would be exceedingly difficult.

Attempts have been made to measure esthetic values. Some productive research has been done in attempting to quantify scenic beauty in natural landscapes using photographs (Shafer et al. 1969, Shafer and Mietz 1970). Photographs have also been used to determine preferences in forest esthetics (Rutherford and Shafer 1969). Methods of scenery classification based on on-site reconnaissance surveys have been developed (Sargent 1966 and 1967, Litton

1973, Craik 1973).

Related research into the psychology of the user of recreational resources, especially research dealing with wilderness users, is a growing field (Peterle 1967, Cicchetti 1973, McKinley 1963 and 1966, Shafer 1969, Taylor and Edwards 1960). The definition of quality, as it relates to various natural areas, also has direct bearing on the definition of esthetic valuation of wildlife (Stankey 1973, Webb 1968). Lime and Cushwa (1969) attempted to determine the importance of wildlife to visitors of a national forest Ninety-six percent of the auto campers questioned said that the opportunity to observe birds and mammals in their natural setting had added to their outdoor experience (1969:4). However, no attempt was made by the authors to quantify that appreciation.

Some have argued that the economic evaluation of wildlife resources is a fruitless exercise (Weeden 1969). However, as long as wildlife resources are treated as free goods, they will tend to be overused and abused (Hardin 1968). "The 'freeness' of the resource results in there being no incentive for the population to economize on the resource or to allocate it to the use of highest value" (Freeman and Haveman 1972:323). In order to retain any significant amount of wild America, wildife will increasingly be required to "pay its way" by some method of economic quantification. Gregory (1955:12) stated:

> There are many who feel that no attempt should be made

> to place dollar values on wildlife, scenic views, and the like, yet the troublesome fact persists that in an economy such as ours, things valued in dollar terms often have a distinct competitive advantage. A rocky, lonesome coastline may be 'priceless' to a lover of seascapes, but it has little liklihood of keeping its beauty if oil is known to lie beneath the rocks.

This report is an attempt to quantify relative differences in attitudes and preferences of certain groups of people toward various bird and mammal species through the use of color photographs, and to determine attributes of the variations in the attitudes of these different groups of people toward those species. It is intended as one step towards a complete method for economic valuation of wildlife.

METHODS

The methods used for the collection of data to determine relative preference values for different wildlife species were surveys in which the respondents were shown a series of photographs of birds and mammals. The respondents scored each species, based on how much he/she would enjoy seeing that species, using an interval scale; a score of one was lowest and ten was highest. Group testing was done using projected color slide-transparencies. Individual interviews were conducted using 5x7-inch color prints. Computer programs were written to analyze the data and perform certain statistical tests.

Collection of Survey Data

MSU STUDENT SURVEY

Description of classes.--Three classes of Michigan State University students were tested using color slides of different bird species. The first class consisted of 53 students in FW 427 (Wildlife Biology and Management), primarily seniors in Fisheries and Wildlife. The second consisted of 64 students in FW 301 (Fish and Wildlife of North America), primarily juniors in Fisheries and Wildlife. The third consisted of 226 students in IDC 200 (Resource Ecology

and Man), primarily underclassmen from various curricula.

Photographs.--Twenty-four projected 35-mm color transparencies were used in a randomly selected order to survey an entire class at the same time. These photos (Table 1) were selected to show the species in a natural habitat where they would typically be observed. Unfortunately, it was impossible to standardize the composition and quality of the photographs. In dimorphic species, photos of males in breeding plumage were used (e.g., male red-winged blackbird).

Tests.--The 24 photos were shown twice in succession--once at four seconds per photo for the purpose of showing the variety of species to be presented, and a second time at ten seconds per photo when numerical responses were made. Instructions to define the criteria for scoring stated: "The standard of judgement you use will be up to you--it might be based on esthetic appreciation, scarcity or abundance, appeal as an element of hunting, personal preference, familiarity, or any combinations of criteria" (Fig. A-1, p. 58).

The response sheet and questionnaire consisted of brief instructions explaining the procedure and an answer sheet (Figs. A-1 and A-2, pp. 58-59). Several questions were asked to obtain an indication of the respondents' interests in hunting and bird watching.

Table 1. Bird species used in the MSU-student, YWCA-camp, and County Fair surveys.

COMMON NAMES	SCIENTIFIC NAMES[a]
Pied-billed grebe[b]	Podilymbus podiceps
Great blue heron	Ardea herodias
Canada goose[c]	Branta canadensis
Mallard[b]	Anas platyrhynchos
Blue-winged teal	Anas discors
Wood duck	Aix sponsa
Red-tailed hawk[e]	Buteo jamaicensis
Rough-legged hawk[d]	Buteo lagopus
Bald eagle[e]	Haliæetus leucocephalus
Ring-necked pheasant	Phasianus colchicus
American coot[c]	Fulica americana
Killdeer	Charadrius vociferus
Herring gull	Larus argentatus
Mourning dove	Zenaidura macroura
Great horned owl[e]	Bubo virginianus
Whip-poor-will[b]	Caprimulgus vociferus
Common nighthawk[c]	Chordeiles minor
Ruby-throated hummingbird[c]	Archilochus colubris
Belted kingfisher[d]	Megaceryle alcyon
Downy woodpecker[e]	Dendrocopus pubescens
Eastern kingbird[d]	Tyrannus tyrannus
Blue jay	Cyanocitta cristata
Common crow[d]	Corvus brachyrhynchos
Black-capped chickadee[d]	Parus atricapillus
House wren	Troglodytes aëdon
Eastern bluebird[f]	Sialia sialis
Cedar waxwing	Bombycilla cedrorum
Starling	Sturnus vulgaris
Yellowthroat[e]	Geothlypis trichas
Eastern meadowlark[e]	Sturnella magna
Red-winged blackbird	Agelaius phoeniceus
Baltimore oriole[e]	Icterus galbula
Common grackle	Quiscalus quiscula
Scarlet tanager[d]	Piranga olivacea
Slate-colored junco[e]	Junco hyemalis
White-throated sparrow	Zonotrichia albicollis
Song sparrow	Melospiza melodia

[a] After Peterson (1947).
[b] Used only in FW 427.
[c] Used only in FW 301 and IDC 200.
[d] Used only in MSU-student samples.
[e] Not used in MSU-student samples.
[f] Not used in FW 427.

DETROIT SURVEY

Description of Neighborhoods.--Five neighborhoods in greater Detroit (Fig. 1) were surveyed during the summer of 1973. These areas were chosen for expediency and economics; Shinner (1974) was using them to study the use of urban areas by various wildlife species. The survey described in this report incorporated his study. Although these neighborhoods were not necessarily representative of any larger urban area, each neighborhood is fairly homogeneous. Each neighborhood is adjacent to a park-like area.

Neighborhood 1 is primarily composed of blue-collar workers, mostly factory employees. Houses are on small lots and are mostly in good repair. This neighborhood is adjajent to Clark Park, a typical big-city park. Workers in Neighborhood 2 are also mostly factory employees. Houses are on fairly small lots and the neighborhood is adjacent to a cemetery. Workers in Neighborhood 3 are mostly clerks or blue-collar workers. Houses are on medium-sized lots. The neighborhood is adjacent to Ford woodlot, a woods heavily used by local children. Neighborhood 4 is composed of white-collar, professional people. Houses are on moderately large lots. This neighborhood is adjacent to the Dearborn Country Club golf course. Neighborhood 5 is composed entirely of professional people (doctors, lawyers, etc.). Houses are located on large lots. This neighborhood is surrounded on three sides by River Rouge Park, a woods with light human activity.

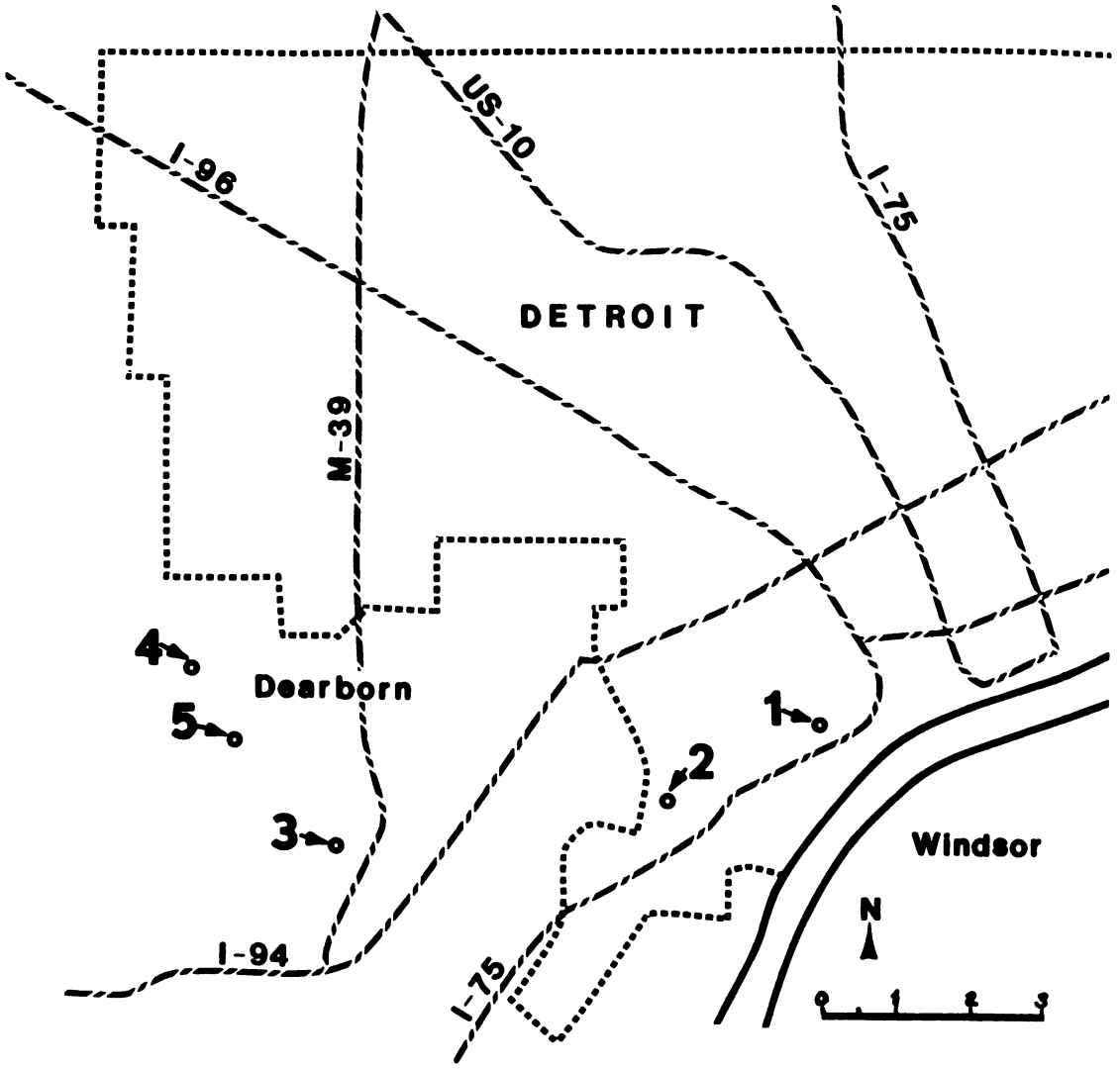

Figure 1. Map showing the location of the five Detroit-survey neighborhoods.

Selection of the Sample.--Fifteen to 20 houses in each neighborhood were to be sampled. Houses were numbered and were randomly selected within each neighborhood for interviewing. Lists of alternative houses in each neighborhood were also randomly selected. Interviews were not necessarily conducted in the order in which the houses were selected. The five neighborhoods were sampled one at a time using the sets of photos in a predetermined order. Twenty-two percent of the houses were sampled over the five neighborhoods (Table 2). Interviews were conducted at 89 houses.

Photographs.--The method of testing preferences was similar to that used with students but slightly modified. The photos used were 5x7-inch glossy color prints of bird and mammal species, mounted in a loose-leaf binder. Only ten bird photos and ten mammal photos were used at each house to minimize interviewing time.

In an attempt to minimize the problems associated with showing the same set of species in a prescribed order, the photos were shown in various combinations and permutations at different houses.[1] Eight subsets of ten bird photos and ten mammal photos were used; the bird photos were randomly selected from a set of 30 (Table 3). To insure that a few common species appeared in each subset, two common species were used in each subset. The cardinal was used in four randomly determined subsets, the blue jay in the

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[1]For example, the mean score for the starling would probably be different if it was shown following a bald eagle of following a grackle.

Table 2. Some key characteristics of neighborhoods in the Detroit-survey sample, and of the respondents that were interviewed as determined by the survey.

CHARACTERISTIC	NEIGHBORHOOD					
	1	2	3	4	5	Total[a]
Miles from down-town Detroit	2.9	4.8	9.3	10.6	10.5	7.3
Population/acre	23.7	40.6	21.9	12.4	6.8	21.1
Area (acres)	14.4	16.8	15.9	16.0	7.9	71.0
No. houses	97	163	95	43	13	411
Houses surveyed	19.6[b]	12.3	25.3	32.6	92.3	21.7
Caucasian[c]	73.7	95.0	100.0	100.0	100.0	93.3
Mexican-Amer.	26.3	5.0	0.0	0.0	0.0	6.7
Female	57.9	60.0	50.0	28.6	41.7	49.4
Male	42.1	40.0	50.0	71.4	58.3	50.6
Skilled	5.3	25.0	50.0	64.3	50.0	37.1
Unskilled	57.9	15.0	8.3	14.3	8.3	21.4
Housewives	57.9	15.0	8.3	14.3	8.3	21.4
Retired	15.8	5.0	4.2	0.0	0.0	5.6
"Out. activities"	36.8	70.0	62.5	50.0	41.7	36.0
"No out. act."	63.2	30.0	37.5	50.0	58.3	46.1
"Like birds"	79.9	80.0	83.3	71.4	100.0	82.0
"Indiff. to birds"	21.1	20.0	16.7	28.6	0.0	18.0
Feed birds	52.6	55.0	58.3	64.3	75.0	59.6
Don't feed birds	47.4	45.0	41.7	35.7	25.0	40.5
Garden	42.1	50.0	70.8	100.0	83.3	66.3
Don't garden	57.9	50.0	29.2	0.0	16.7	33.7

[a]Sum or average, whichever applicable.

[b]Units from here down are percentages.

[c]Categories from here down are from Fig. A-5, p. 62.

Table 3. Bird species used in the Detroit survey.

COMMON NAMES	SCIENTIFIC NAMES[a]
Common egret	Casmerodium albus
Canada goose	Branta canadensis
Blue-winged teal	Anas discors
Wood duck	Aix sponsa
Red-tailed hawk	Buteo jamaicensis
Bald eagle	Haliæetus leucocephalus
Ring-necked pheasant	Phasianus colchicus
Killdeer	Charadrius vociferus
Herring gull	Larus argentatus
Mourning dove	Zenaidura macroura
Great horned owl	Bubo virginianus
Ruby-throated hummingbird	Archilochus colubris
Downy woodpecker	Dendrocopus pubescens
Traill's flycatcher	Empidonax traillii
Blue jay	Cyanocitta cristata
Common crow	Corvus brachyrhynchos
House wren	Troglodytes aëdon
Eastern bluebird	Tyrannus tyrannus
Cedar waxwing	Bombycilla cedorum
Starling	Sturnus vulgaris
Yellowthroat	Geothlypis trichas
Eastern meadowlark	Sturnella magna
Red-winged blackbird	Agelaius phoeniceus
Baltimore oriole	Icterus galbula
Common grackle	Quiscalus quiscula
Cardinal	Richmondena cardinalis
American goldfinch	Spinus tristis
Slate-colored junco	Junco hyemalis
White-throated sparrow	Zonotrichia albicollis
Song sparrow	Melospiza melodia

[a]After Peterson (1947).

others. Likewise, the grackle and starling were each in four subsets. Each subset of bird photographs was used at 12 consecutive houses. The order in which each subset was shown was randomly determined for the first six houses and randomly reordered for the second six houses. The order in which the ten mammal photos (Table 4) were shown was randomly reordered after every 12 houses.

Interviews.--Interviews were usually conducted during evenings in an attempt to find both adult members of the households at home. The interviewer tried to alternate between questioning the man and woman of the house. When no one was home the interviewer tried on one other day; after a second failure an alternative house was used. The survey was conducted by a student from the Department of Fisheries and Wildlife at Michigan State University.

Interviews were preceeded by letters hand-delivered to the houses approximately two weeks before the time of the interviews (Fig. A-3, p. 60). The interview consisted of a short introduction describing the study (Fig. A-4, p. 61), a series of questions (Fig. A-5, p. 62), and the 20-photo test. The interviewer quickly showed the respondent the subset of ten bird photos to familiarize the respondent with the photos. This was followed by a second showing of the photos during which the respondent was given ten seconds per photo to record his/her own score on a response sheet (Fig. A-6, p. 63). This procedure was then repeated using the ten mammal photos.

Table 4. Mammal species used in the Detroit-survey, YWCA-camp, and County Fair surveys.

COMMON NAMES	SCIENTIFIC NAMES[a]
Black bear	*Ursus americanus*
Raccoon	*Procyon lotor*
Red fox	*Vulpes fulva*
Eastern chipmunk	*Tamias striatus*
Red squirrel	*Tamiasciurus hudsonicus*
Fox squirrel	*Sciurus niger*
Deer mouse	*Peromyscus maniculatus*
Muskrat	*Odonatra zibethicus*
Cottontail	*Sylvilagus floridanus*
Whitetail deer	*Odocoileus virginianus*

[a]After Burt (1972).

The response sheets were coded to indicate the particular subset of photos used, so that the score could later be matched to the correct species. Instructions to define the criteria for scoring were given by the interviewer: "What I would like you to do is give each bird (or animal) a score from one to ten, depending on how much you enjoy, or would enjoy, seeing the bird (or animal) shown." The respondent was left with a letter describing the general nature of the studies being conducted (Fig. A-7, p. 64).

YWCA-CAMP SURVEY

Tests were given to 84 elementary and junior high children at a YWCA day-camp near Charlotte, Michigan, during the summer of 1973. Slides were shown using the same procedure as in the MSU-student survey. Twenty-four bird and ten mammal slides were used (Tables 1 and 4). Instructions for defining the criteria for scoring stated: "Please give each bird or animal a score, from one to ten points, depending on how much you would enjoy seeing it in the wild" (Fig. A-7, p. 64). In addition to asking the children to score each species shown, they were asked to attempt to name each species. The tests were conducted by the camp-counselor in charge.

COUNTY FAIR SURVEY

An attempt was made to test visitors to the Eaton County Fair in August 1973. A booth with an exhibit titled "Wildlife Quiz" was set up in cooperation with the county agricultural extension-agent. The same 34 slides used in

the YWCA-camp survey (Tables 1 and 4) were shown in this exhibit in which the numbered slides were projected and advanced automatically at 15-second intervals. In order to generate interest and attract attention to the exhibit, respondents were encouraged to name each species, in addition to recording a score.

Analysis of Survey Data

COMPUTER PROGRAMS

Data from the answer forms were transferred to computer cards. Computer programs were written (in Fortran IV) and used on a CDC-6500 computer to analyze these data. Each program is briefly described in Appendix B.

STATISTICAL TESTS

An approximate t-test was used to determine significant differences between mean scores given to the photos. Stronger statistical tests, including partitioning of variances of the means, and cross-classification of characteristics of the species versus characteristics of the respondents, were not used due to limitations of resources, including time and my own statistical abilities. The statistical tests used in this report are described in detail in Appendix C.

GROUPING OF MEAN SCORES INTO HIGH, MEDIUM, AND LOW CATEGORIES

The species used in each sample and subsample were ordered by mean scores. Mean scores of species based on three or fewer scores were deleted. Each possible pair of

species was tested for significant differences between the means and a matrix was printed out by the computer showing the results (see Table B-3, p. 70).

Because of the large number of pairs of scores showing no significant differences between means, the species were somewhat arbitrarily grouped into High, Medium, and Low categories for each sample and subsample of respondents. The High category was determined by comparing each of the highest one-third of the scores and checking for significant differences with the scores below it. A score was classified "High" if it differed significantly from at least two-thirds of the scores below it. Similarly, Low scores were determined by comparing each of the lowest one-third scores with those above them. Scores not falling into the High or Low categories were classified "Medium."

COMPARING SPECIES CHARACTERISTICS

Each bird species used was somewhat arbitrarily classified by several characteristics (Table 5). The large-small characteristic was determined by an overall length greater or less then 14 inches (measurements from Peterson 1947). The dull-colorful characteristic was based on whether the bird was entirely colored with tones of grays, blacks, or browns (dull), or had other colors present (colorful). All-white species were placed in the colorful category. The terrestrial-water characteristic was based on the preferred habitat of the species (Peterson 1947). The game-nongame characteristic was based on whether the bird

Table 5. Designated characteristics of the bird species used in the surveys.

SPECIES	CHARACTERISTICS[a]									
	L	S	C	D	T	W	N	G	P	O
Pied-billed grebe		x		x		x	x		x	
Great blue heron	x		x			x	x		x	
Common egret	x		x			x	x		x	
Canada goose	x		x			x		x		x
Mallard	x		x			x		x		x
Blue-winged teal	x		x			x		x		x
Wood duck	x		x			x		x		x
Red-tailed hawk	x			x	x		x		x	
Rough-legged hawk	x			x	x		x		x	
Bald eagle	x			x	x		x		x	
Ring-necked pheasant	x		x		x			x		x
American coot		x		x		x		x		x
Killdeer		x		x	x		x			x
Herring gull	x		x			x		x	x	
Mourning dove		x		x	x		x			x
Great horned owl	x			x	x		x		x	
Whip-poor-will		x		x	x		x			x
Common nighthawk		x		x	x		x			x
Ruby-throated hummingb.		x	x		x		x			x
Belted kingfisher		x	x			x	x		x	
Downy woodpecker		x		x	x		x			x
Eastern kingbird		x		x	x		x			x
Blue jay		x	x		x		x			x
Common crow	x			x	x			x	x	
Black-capped chickadee		x		x	x		x			x
House wren		x		x	x		x			x
Eastern bluebird		x	x		x		x			x
Cedar waxwing		x	x		x		x			x
Starling		x		x	x		x			x
Yellowthroat		x	x		x		x			x
Eastern meadowlark		x	x		x		x			x
Red-winged blackbird		x	x		x		x			x
Baltimore oriole		x	x		x		x			x
Common grackle		x		x	x		x			x
Scarlet tanager		x	x		x		x			x
Cardinal		x	x		x		x			x
American goldfinch		x	x		x		x			x
Slate-colored junco		x		x	x		x			x
White-throated sparrow		x		x	x		x			x
Song sparrow		x		x	x		x			x

[a]L= large, S= small; C= colorful, D= dull; T= terrestrial, W= water; N= non-game, G= game; P= predatory, O= other.

can be hunted in Michigan (Michigan Dept. of Nat. Resources 1972). The predator-other characteristic was based on whether the bird fed primarily on vertebrates or not.

Within each sample and subsample of respondents, an index was determined for each of the characteristics for the High-, Medium-, and Low-category bird species, by the equation:

$$\frac{\frac{nc}{n}}{\frac{NC}{N}}$$

where, within a sample or subsample, nc= the number of species in the High, Medium, or Low category with the particular characteristic being tested, n= the number of species in the High, Medium, or Low category, NC= the number of species in the High, Medium, and Low categories which had the particular characteristic being tested, and N= the total number of species used.

An index value greater than 1.0 indicated a preference for the characteristic being compared. A value of 1.5 or greater was arbitrarily classified as a significant index value, and analysis was done only on those "significant" characteristics in the High and Low categories.

ANALYSES OF SAMPLES AND SUBSAMPLES

MSU-student Samples

Scores from the FW 427, FW 301, and IDC 200 samples, and four subsamples from IDC 200 (with the attributes of hunter--non-hunter and bird watcher--non-bird watcher) were

statistically analyzed.

Detroit-survey Sample

Statistical analysis was performed on the basis of the neighborhood, sex, occupational, "outdoor activity--no outdoor activity," and "like--indifferent to birds" subsamples.

The occupational subsample was determined by occupation of the respondent (i.e., skilled, unskilled, housewife, or retired). "Skilled" persons were those with a position requiring considerable training (e.g., engineer, carpenter, bank teller). If a housewife was also employed, she was classified according to her job. Since only six respondents were "retired," this category was deleted from the analysis.

The "outdoor activity--no outdoor activity" subsample was determined by answers to the question: "Do you participate in outdoor activities such as hunting, fishing, camping, etc.?"

The "like--indifferent to birds" subsample was determined by answers to the question: "Do you generally like, dislike, or are you indifferent to the birds in your yard?" No respondents said he/she disliked birds in his/her yard, so this category was not used.

YWCA-camp Sample

Scores for each species used in the YWCA-camp sample were divided into three groups, based on the ability of the respondents to identify the species shown (see Program YWCA, p. 68). The scores of species which were at least

identified to common generic name (L= 4) were compared with the entire group (L= 5). Scores of species not identified at all were not analyzed because it was not known how many respondents failed to name species simply from lack of interest in the survey. In addition, brief analysis was made of the ability of the children tested to identify the species shown them.

County Fair Sample

No analysis was made on the small amount of data collected in the County Fair sample.

RESULTS AND DISCUSSION

The overall mean scores given the species used in each sample and subsample ranged from approximately 5.4 to 7.5 (Table 6); grouped means ranged from 2.4 to 10.0 (Table 7). These differences were assumed to be real; that is, a lower overall mean score indicated an average lower level of appreciation than did a higher overall mean. Significantly different mean scores were assumed to be indicative of varying levels of appreciation of those species.

Preferred Bird Characteristics (Table 8)

MSU-student Samples.--Preferences of the Student samples were for large, water, and/or game birds; usually colorful birds were also preferred. Bird watchers and hunters in the MSU classes indicated preferences for predatory species; non-bird watchers and non-hunters did not. Hunters did not indicate preference for colorful species, apparantly giving priority to other characteristics. Bird watchers did not prefer water and/or game birds.

Detroit-survey Sample.--Colorful species were significantly preferred in all five neighborhoods. Neighborhood 2 also showed a preference for game birds. The female subsample showed preference for water birds; they ranked large

Table 6. Overall bird and mammal scores, from a range of 1 to 10, for each sample and subsample.

SAMPLE OR SUBSAMPLE	BIRD MEAN	MAMMAL MEAN	NUMBER
FW 301	6.09	a	64
FW 427	6.33	a	53
IDC 200	6.14	a	226
Hunters	6.23	a	37
Non-hunters	6.19	a	188
Bird watchers	6.98	a	57
Non-bird watchers	5.92	a	165
Detroit survey	7.17	6.56	89
Neighborhood 1	6.74	6.45	19
Neighborhood 2	6.83	6.60	20
Neighborhood 3	7.49	7.33	24
Neighborhood 4	7.28	5.40	14
Neighborhood 5	7.65	6.47	12
Females	7.12	6.47	44
Males	7.21	6.62	45
Skilled	7.33	6.77	33
Unskilled	6.87	6.66	19
Housewives	7.18	6.38	32
"Outdoor activities"	7.50	7.13	48
"No outdoor act."	6.78	5.89	41
"Indifferent to birds"	6.37	6.27	16
"Like birds"	7.34	6.62	73

[a]Not used.

Table 7. Average value of grouped bird and mammal mean scores, for High, Medium, and Low categories by sample and subsample.

SAMPLE OR SUBSAMPLE	BIRDS			MAMMALS		
	High	Med	Low	High	Med	Low
FW 301	8.2	6.3	4.5	a	a	a
FW 427	8.1	6.4	4.4	a	a	a
IDC 200	7.7	6.3	4.3	a	a	a
Hunters	8.3	6.5	4.3	a	a	a
Non-hunters	7.7	6.4	4.8	a	a	a
Bird watchers	8.4	7.1	5.3	a	a	a
Non-bird watchers	7.5	6.1	4.0	a	a	a
Detroit survey	9.1	7.5	4.1	8.5	6.6	4.5
Neighborhood 1	8.9	6.9	3.1	8.8	6.5	2.6
Neighborhood 2	9.5	7.5	3.3	9.5	6.8	2.5
Neighborhood 3	9.9	7.9	3.9	9.5	7.4	4.4
Neighborhood 4	9.9	7.4	2.4	8.3	5.4	2.6
Neighborhood 5	10.0	8.6	5.0	9.0	6.6	2.9
Females	9.5	7.4	3.6	8.5	6.4	2.8
Males	9.9	7.8	3.7	9.1	6.7	3.4
Skilled	10.0	7.9	3.9	9.2	6.8	3.8
Unskilled	9.3	6.8	3.2	9.3	6.5	2.5
Housewives	9.6	7.5	3.6	8.9	6.5	2.7
"Outdoor activities"	9.7	8.1	3.8	9.6	7.3	3.7
"No outdoor act."	10.0	7.2	3.0	8.0	5.8	2.4
"Indifferent to birds"	9.9	6.4	b	a	a	a
"Like birds"	9.2	7.6	4.0	a	a	a
YWCA-camp (total)	8.0	6.5	4.9	9.5	7.9	5.5
Partial I.D.[c]	8.7	6.9	4.3	9.5	8.1	6.2

[a] Not used.

[b] None.

[c] Subsample that could at least identify species to common generic name.

Table 8. Bird characteristics significant[a] in High and Low categories for each sample and subsample.

SAMPLE OR SUBSAMP.	HIGH										LOW									
	L[b]	S	D	C	T	W	N	G	O	P	L	S	D	C	T	W	N	G	O	P
FW 301	X					X		X				X	X							
FW 427	X			X		X		X												
IDC 200	X			X		X		X					X							
Hunters	X					X		X		X			X							
Non-hunters	X			X		X		X					X							
Bird watchers	X			X						X			X							
Non-bird watchers	X			X		X		X												
Detroit survey				X							X		X							X
Neighborhood 1				x[c]		x		x					x					x		
Neighborhood 2				X				X					X			X		X		X
Neighborhood 3				x							x		x					x		x
Neighborhood 4				x									x							
Neighborhood 5		x		x							X					X				X
Females				X		X		X					X					X		
Males		x		x							x		x							x
Skilled	X									X	X					X		X		X
Unskilled				X									X					X		X
Housewives		x		x			x													
"Outdoor activities"				X							X					X		X		X
"No outdoor act."		x																		
"Indifferent to birds"																				
"Like birds"						X		X												X
YWCA-camp (total)	X			X		X				X			X							
Partial I.D.[d]										X		X	X							

[a] See pp. 24-26 for explanation.

[b] L= large, S= small; D= dull, C= colorful; T= terrestrial, W= water; N= non-game, G= game; O= other, P= predator.

[c] Lower case "x": based on only one species.

[d] Subsample that could at least identify species to common generic name.

the game characteristic in the High and Low categories. The skilled subsample ranked large and/or predatory bird in the High and Low categories.

YWCA-camp Sample.--The YWCA-camp sample indicated a preference for large, colorful, water, and/or predatory birds. This response was more similar to the Student samples than to the Detroit-survey sample.

Non-preferred Bird Characteristics (Table 8)

MSU-student Samples.--The dull characteristic was the only feature consistently correlated to species ranked in the Low category.

Detroit-survey Sample.--The overall Detroit survey ranked birds "Low" which were large, dull, and/or predatory species. The female subsample did not rank large and/or predatory species in the Low category. The "outdoor activity" subsample indicated non-preference for large, water, game, and/or predatory birds; in the "non-outdoor activity" subsample, no characteristics of species were significant in the Low category.

YWCA-camp Sample.--The dull characteristic was the only one significantly non-preferred.

Preferred Bird Species (Table 9)

MSU-student Samples.--The species ranked "High" by every sample and subsample in the Student samples were: wood duck, blue-winged teal, Canada goose, great blue heron, and ring-necked pheasant. Most preferred the scarlet

Table 9. Bird species ranked in High category in each sample and subsample.

SAMPLE OR SUBSAMPLE	SPECIES																	
	G-b. heron	Can. goose	Mallard	B-w. teal	Wood duck	Hawk (Buteo)	Bald eagle	Pheasant	Killdeer	Herring gull	Mo. dove	Great h. owl	Hummingbird	Blue jay	Bluebird	Balt. oriole	Scarlet tana.	Cardinal
FW 301	x	x	.[a]	x	x	x	.	x				.			.	.	x	.
FW 427	x	.	x	x	x	x	.	x				.	.			.	x	.
IDC 200	x	x	.	x	x		.	x		x		.			.	.	x	.
Hunters	x	x	.	x	x	x	.	x				.			.	.		.
Non-hunters	x	x	.	x	x		.	x	x	x		.			.	.	x	.
Bird watchers	x	x	.	x	x	x	.	x		x		.			.	.	x	.
Non-bird watchers	x	x	.	x	x		.	x	x	x		.			.	.		.
Detroit survey	.		.					x					x		x	x	.	x
Neighborhood 1	.	.	.	x		.		.	.				.	.	x	.	.	.
Neighborhood 2	.	.	.	.		.		x			.		.		x	.	.	
Neighborhood 3	.		.		.	.	.			.		.			.	.	.	x
Neighborhood 4	.	.	.	.	.	.	.		.			.			.		.	x
Neighborhood 5	.		.	.	.		.		.		.	.	.		.	.	.	x
Females	.	x	.												x	.	.	x
Males	.		..														.	x
Skilled	.		.		.		x								.		.	x
Unskilled	.	.	.	x	.	.	.				.		x		x	.	.	x
Housewives	.		.													.	.	x
"Outdoor activities"	.		.										.		x		.	x
"No outdoor act."	.		.														.	x
"Indifferent to birds"	.	.	.			.			.		.						.	x
"Like birds"	.	x	.	x				x			x		x		x	x	.	x
YWCA-camp (total)	.	.	.	x			x			x		x	.	x	x	x	.	x
Partial I.D.[b]	.	.	.				x					x	.		x	x	.	x

[a]Period indicates species not shown to sample or subsample.

[b]Subsample that could at least identify species to common generic name.

tanager and rough-legged hawk.

Non-bird watchers and non-hunters ranked the killdeer "High;" they did not rank the rough-legged hawk "High." (These subsamples did not completely overlap; there were 57 bird watchers in the class of 226 and only 37 hunters.) There appears to be a greater appreciation for the hawk in groups with greater outdoor interests, and a greater appreciation for the killdeer in groups with a lesser outdoor interest.

Detroit-survey Sample.--The pheasant, hummingbird, bluebird, Baltimore oriole, and cardinal were ranked "High" by the overall Detroit survey. The bluebird and Canada goose were ranked "High" by the female subsample, but not by the male subsample; it is interesting to note that these species were not ranked "High" by the housewives. The order of scoring was roughly the same for female and housewife subsamples, but preferences between species were not as distinct in housewives.

The only subsample in the Detroit survey to rank the bald eagle "High" was the skilled subsample. The bluebird was ranked "High" by outdoor participants, but not by non-participants.

Respondents professing to "like birds" (n= 16) ranked more species "High" than any other subsample. Only one species, the cardinal, was ranked "High" by those professing to be "indifferent" to birds (n= 73). The list of species in the "like" subsample was similar to the preferred-species

list in the Student samples: Canada goose, blue-winged teal, ring-necked pheasant, mourning dove, hummingbird, bluebird, Baltimore oriole, and cardinal.

The wood duck, great blue heron, and rough-legged hawk were preferred species in the Student samples; however, the wood duck and common egret were not ranked "High" by any Detroit subsample, and the red-tailed hawk was actually ranked "Low" by many of the Detroit subsamples (see Table 13, p. 35).

Respondents were asked to name birds they liked and disliked, as well as to score certain species (Table 10). Shinner (1974) determined the most common summer species for the five neighborhoods surveyed.[1] The five species most often named as liked and disliked were compared with the High, Medium, or Low rank of those species named (if used in scoring), and with the five most common species in each neighborhood (Table 11).

Not all of the species named as "liked" were also ranked "High" in scoring. Some species, such as the blue jay and mourning dove, were only ranked "Medium." It appeared that respondents commonly named only those species they were familiar with in their neighborhood as "liked," but found other species more desirable when unfamiliar alternatives species were shown to them. Sixty percent of the

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[1]Shinner's neighborhood designations correlated to mine as: 1= 183, 2= 173, 3= 129, 4= 131a, 5= 131b.

Table 10. Bird species named more than one time (by the Detroit-survey sample) in answer to the questions: "Which birds do you enjoy seeing most?" and "Which birds do you least enjoy?"

RANK	"ENJOYED MOST"	TIMES NAMED	RANK	"ENJOYED LEAST"	TIMES NAMED
1	Cardinal	66	1	Pigeon	39
2	Blue jay	48	2	Grackle	33
3	Robin	43	3	Starling	22
4	"Sparrow"	24	4	"Sparrow"	19
5	Mourning dove	18	5	Blue jay	11
6	Pheasant	14	6	Crow	10
7	Goldfinch	13	7	"Blackbirds"	3
8	Hummingbird	10	8	Mourning dove	2
9	"Woodpeckers"	7			
10	Red-wing	6			
11	Grackle	5			
12	"Ducks"	4			
12	Downy woodp.	4			
12	Bluebird	4			
15	Canada goose	3			
15	Mallard	3			
15	Chickadee	3			
18	Pigeon	2			
18	Crow	2			
18	Great h. owl	2			
18	Red-t. hawk	2			

Table 11. The five bird species most often named as "enjoyed seeing most" and as "enjoyed seeing least," and the most common summer bird species in the Detroit survey neighborhoods.

RANK	NEIGHBORHOOD 1	2	3	4	5	TOTAL[a]
"Most-enjoyed"						
1	B. jay/robin	Card/robin	Cardinal	Cardinal	Cardinal	Cardinal
2	----	----	Blue jay	Blue jay	Goidfinch/Jay	Blue jay
3	Cardinal	Sparrow[b]	Robin	Robin/dove	----	Robin
4	Sparrow	Blue jay	Mo. dove	----	Pheas/Woodpec	Sparrow
5	Goldfinch	Pheasant	Sparrow	none	----	Mo. dove
"Least-enjoyed"						
1	Pigeon	Pigeon	Grackle	Starling	Grackle	Pigeon
2	Starling	Grackle	Blue jay	Grackle	Sparrow	Grackle
3	Grack/Star	Starling	Sparrow	Sparrow	Pigeon	Starling
4	----	Crow	Starl/Pigeon	none	none	Sparrow
5	Crow	----	----	none	none	Blue jay
Most common species						
1	Sparrow	Sparrow	Sparrow	Sparrow	Sparrow	Sparrow
2	Starling	Starling	Grackle	Grackle	Grackle	Grackle
3	Pigeon	Pigeon	Starling	Robin	Mo. dove	Robin
4	Robin	Grackle	Blue jay	Blue jay	Robin	Starling
5	Grackle	Robin	Mo. dove	Starling	Starling	Blue jay

[a] Five neighborhoods combined.

[b] *Passer domesticus.*

top five species named as "liked" were also in the top five most common species and 100 percent were in the top ten most common species (Table 12).

The cardinal was named as the favorite bird in every neighborhood except Neighborhood 1, the most "urbanized" area. The cardinal was listed first in Neighborhood 2, even though not a common species there. Only a few birds were named as the top five most-liked species which were not also common to the neighborhoods (i.e., goldfinch, ring-necked pheasant, and woodpeckers). Among the species that were scored, the cardinal and the bluebird appeared to be the most preferred species.

YWCA-camp Sample.--The YWCA-camp sample indicated strong preferences for eight species, showing some interesting differences from the Student and Detroit-survey samples: The blue jay, herring gull, great horned owl, and bald eagle were ranked "High" by few other samples. The cardinal, bluebird, Baltimore oriole, and blue-winged teal were also ranked "High."

In the subsample of respondents who could at least identify the particular species to common generic name, the blue jay, blue-winged teal, and herring gull were not ranked "High." Most respondents were familiar with the blue jay see Table 16, p. 44), so the differences in scoring were not apparent in this species. Few could identify the teal or gull correctly; it is possible that a common misidentification of these species caused the "High" ranking in the

Table 12. Comparison of the species named in Table 11.

COMPARISON[a]	NEIGHBORHOOD					
	1	2	3	4	5	TOTAL
Top 5 "most-enjoyed" species also in top 5 most common spp.	40[b]	40	50	60	20	60
Top 5 "most-enjoyed" spp. also in top 10 most common spp.	80	60	100	100	40	100
Top 5 "least-enjoyed" spp. also in top 5 most common spp.	80	60	80	100	67	80
Top 5 "least-enjoyed" spp. also in top 10 most common spp.	80	60	100	100	100	100
Top 5 "most- or least-enjoyed" spp. also in top 5 most common spp.	60	50	70	71	25	70
Top 5 "most- or least-enjoyed" spp. also in top 10 most common spp.	80	60	100	100	63	100
Top 5 "most-enjoyed" spp. also ranked "High" in scoring	c	33	33	50	33	33
Top 5 "most-enjoyed" spp. also ranked "High" or "Medium"	c	100	100	100	100	100
Top 5 "least-enjoyed" spp. also ranked "Low" in scoring	100	100	50	100	100	67
Top 5 "least-enjoyed" spp. also ranked "Low" or "Medium"	100	100	100	100	100	100

[a]From Tables 10 and 11.
[b]All figures are percentages.
[c]Species named were not scored.

entire sample. The subsample that correctly recognized the teal and gull ranked them lower. Most respondents confused the teal with the Canada goose (see Misidentification of species, pp. 49 - 50), and many confused the gull with a dove or pigeon.

Non-preferred Bird Species (Table 13)

MSU-student Samples.--Species scored "Low" by every sample and subsample were: crow, starling, grackle, song sparrow, and eastern kingbird. Hunters were the only subsample that did not rank the coot "Low," apparently showing greater preference for game species.

Detroit-survey Sample.--The pigeon, starling, and grackle were named most frequently as the least-liked birds (Table 10). The blue jay, sparrow, and crow were also in the five most-disliked species in some neighborhoods. All of these species, except the crow, were also in the top ten most common species in the respective neighborhoods (Table 12). It is apparent that most respondents named the birds they liked and disliked from the few species they were familiar with, usually species common to their own neighborhood. The blue jay and sparrow, for example, appear in the overall survey and in Neighborhood 3 in both the five most-liked and in the five most-disliked species. With the exception of the blue jay, all species listed in the top five "disliked" list were also ranked "Low" in scoring (Table 12). (Some of these species were not tested in a

Table 13. Bird species ranked in Low category in each sample and subsample.

SAMPLE OR SUBSAMPLE	SPECIES																
	Hawk (Buteo)	Coot	Killdeer	H. gull	Hummingbird	E. kingbird	Blue jay	Crow	Chickadee	Wren	Waxwing	Starling	Red-wing	Grackle	Junco	Wh-th. sparr.	Song sparrow
FW 301		x				x		x		x		x	x	x	.[b]	.	x
FW 427		.			.	x	x	x				x	x	x	.	.	x
IDC 200		x				x		x	x	x		x		x	.	.	x
Hunters					x	x		x	x	x		x		x	.	.	x
Non-hunters		x				x		x	x	x		x		x	.	.	x
Bird watchers		x				x		x	x	x		x		x	.	.	x
Non-bird watchers		x				x		x	x	x		x		x	.	.	x
Detroit survey	x	.		x		.		x	.			x		x	x		
Neighborhood 1	.	.	.		.	.		x	.		.	x		.		.	.
Neighborhood 2	.	.		x	.	.		x	.	.		x		x	.		.
Neighborhood 3	.	.		.		.		x	.	.		.	.	x	.	.	
Neighborhood 4	.	.	.			.		.	.			.	.	x	.	.	.
Neighoodhood 5	x	.	.	.	.	.		.	.	.	.	.	.	x	.		.
Females		.				.		x	.			x		x	x		
Males	x	.		x		.		x	.			x		x	.		
Skilled	x	.		x		.		x	.			.		x	.		
Unskilled	.	.				.		x	.			x			.		
Housewives		.				.		x	.			x		x	.		
"Outdoor activities"		.		x	.	.		x	.			x		x	.		
"No outdoor act."	x	.				.		x	.			x		x	.		.
"Indifferent to birds"	.	.	.			.			.						.	.	.
"Like birds"	x	.		x		.		x	.			x		x	x		
YWCA-camp (total)		.	x		.	.		.	.	x	x	x		x		x	x
Partial I.D.[a]		.			.	.		.	.	x		x		x			x

[a]Subsample that could at least identify species to common generic name.

[b]Period indicates species not shown to sample or subsample.

particular neighborhood.)

The crow, grackle, and starling were least-favored of the species shown for almost everyone in the Detroit survey. The slate-colored junco also was non-preferred in the neighborhoods which scored it. The gull was ranked "Low" in two of the four neighborhoods that scored it.

The male and skilled subsamples ranked the gull and red-tailed hawk "Low;" the female, unskilled, and housewife subsamples did not. The gull was ranked "Low" by the "outdoor activity" subsample and the red-tailed hawk "Low" by the "non-outdoor activity" subsample.

The gull, hawk, crow, starling, grackle, and slate-colored junco were ranked "Low" by the "like" subsample. The "indifferent" subsample did not rank any birds "Low."

YWCA-camp Sample.--The killdeer, house wren, cedar waxwing, starling, grackle, white-throated sparrow, and song sparrow were ranked "Low" by the YWCA-camp sample. However, among the respondents who could at least partially identify the particular species (L= 4), the killdeer, cedar waxwing, and white-throated sparrow were not ranked "Low," apparently indicating a greater appreciation for these species by the children familiar with them.

Discussion of Bird Scores by Species and Groups of Species

Raw mean scores, grouped means (High, Medium, and Low categories; Tables 9 and 13), and the list of "most-" and "least-enjoyed" species (Tables 10-12) are used in the

discussion below. In this discussion, 6/30, for example, means the score was 6th highest out of 30 species scored (Table 14).

The respondents surveyed were categorized into two general groups--those with some interest in nature, expressed in hunting, bird watching, or other outdoor activities; and those respondents with very little familiarity with or interest in birds or mammals. Persons who demonstrated some familiarity with nature seemed to be, in general, the better educated or more highly skilled respondents. Because of the nature of the MSU-student samples, those respondents had some interest in the environment and nature. Differences in scores of many species were quite distinct between the groups showing familiarity and unfamiliarity with nature.

Large Wading Birds.--The great blue heron and the common egret were ranked highest by persons indicating some interest in nature. All of the Student groups ranked the heron "High" (2/24 overall), but none of the other samples ranked the closely-related egret "High" (15/30 by the Detroit-survey sample). The Detroit-"outdoor activity" subsample ranked the egret significantly higher than the other respondents. The heron was the highest-scored species of the bird watchers in IDC 200, who scored it significantly higher than the non-bird watchers.

Waterfowl.--Ducks and geese were scored in the top-five species in the Student samples. Hunters and bird watchers scored waterfowl species significantly higher than

Table 14. Mean scores given bird species by the MSU-student samples (combined) and the Detroit-survey sample (total).

MSU-STUDENT SAMPLES			DETROIT-SURVEY SAMPLE		
Rank	Species	Mean	Rank	Species	Mean
1	Pheasant	8.29	1	Cardinal	9.80
2	Great b. heron	8.07	2	Bluebird	9.14
3	Wood duck	7.92	3	R-t. hummingb.	9.04
4	B-w. teal	7.81	4	Pheasant	8.80
5	Canada goose	7.70	5	Balt. oriole	8.67
6	Ro-legged hawk	7.53	6	B w. teal	8.54
7	Scar. tanager	7.31	6	Canada goose	8.54
8	Herring gull	7.19	8	Bald eagle	8.29
9	Killdeer	7.10	8	Mo. dove.	8.29
10	Nighthawk	6.69	10	Meadowlark	8.17
11	Cedar waxwing	6.40	11	Killdeer	7.96
12	Mo. dove	6.35	12	Goldfinch	7.88
13	Red-wing	6.03	13	Cedar waxwing	7.53
14	Blue jay	5.98	14	Red-wing	7.52
15	Kingfisher	5.79	15	Common egret	7.42
16	R-t. hummingb.	5.59	15	Blue jay	7.42
17	Chickadee	5.36	17	Wood duck	7.41
18	Coot	5.04	18	Song sparrow	7.33
19	E. kingbird	4.88	19	Yellowthroat	7.28
20	House wren	4.73	20	Downy woodpec.	7.06
21	Song sparrow	4.32	21	Wh-th. sparrow	6.96
22	Starling	3.60	22	Traill's flyc.	6.88
23	Crow	3.50	23	House wren	6.42
24	Grackle	3.34	24	Great h. owl	6.17
			25	Herring gull	5.56
			26	Red-t. hawk	4.58
			27	Junco	4.40
			28	Starling	3.69
			29	Grackle	3.47
			30	Crow	3.03

non-hunters and non-bird watchers, respectively (with the exception of no significant differences in hunter--non-hunter scores of teal and coot). Hunters were the only respondents that did not rank the coot "Low."

The Canada goose was a much-preferred species. It was ranked "High" by all the Student samples (5/24), and was scored significantly higher by bird watchers and hunters than by non-bird watchers and non-hunters, respectively. Although the Detroit-survey sample ranked the goose 6/30, preferences for other waterfowl species were not great. The wood duck, ranked 3/24 by the Student samples, was only ranked 17/30 in the Detroit survey.

Raptors.--Scores for the rough-legged hawk or the red-tailed hawk seemed to be directly correlated with the background of the respondents. In the Student samples, the hawk was ranked "High" by groups with the most biological training (i.e., FW 301, FW 427, and IDC 200 hunters and bird watchers). It was ranked 6/24 by the Student samples but only 26/30 in the Detroit survey. The hawk was ranked "Low" in all but the "outdoor activities" and female subsamples in the Detroit survey. In the YWCA-camp sample, the hawk was scored lowest by children from farms.

Ring-necked Pheasant.--The pheasant was one of the most popular species; it was ranked "High" by all the Student groups (1/24 overall) and in the Detroit survey (4/30). The hunter, bird watcher, and Detroit-"outdoor activity" subsample ranked the pheasant significantly higher than

their counterparts.

Herring Gull.--The gull was ranked 8/24 by the Student samples, but only 25/30 by the Detroit-survey sample. Children in the YWCA-camp sample ranked the gull "High." The Detroit-"outdoor activity" subsample scored the gull significantly higher than did the "non-outdoor activity" subsample.

Mourning Dove.--The dove was ranked about the same by all groups. It was named fifth most often as the bird "most-enjoyed" by the Detroit-survey sample. It was the only dull-colored bird scored relatively high, apparently because of its familiarity.

Ruby-throated Hummingbird.--The hummingbird was only ranked 16/24 by the Student samples; however, it was ranked 3/30 and named eighth most often as the "most-enjoyed" species by the Detroit-survey sample.

Downy Woodpecker.--The downy woodpecker was only shown to the Detroit-survey sample, which ranked it "Medium" (20/30). Woodpeckers were the ninth most-named species as "most-enjoyed" and were named fourth most often in Neighborhood 5, the most "rural" neighborhood.

Brightly-colored Songbirds.--The cardinal was the favorite of every group which scored it (except Neighborhood 2, which scored only the pheasant higher). It was named most often as the "most-liked" species by the Detroit-survey sample. The scarlet tanager was scored only by the Student samples; most ranked it "High" (7/24 overall).

The bluebird was ranked 2/30 by the Detroit-survey sample. It was, however, only named four times as the "most-liked" species. (The YWCA-camp sample also ranked it "High.") The blue jay, in contrast, was named second most-often as the "most-liked" species, but was only ranked 15/30 in the Detroit survey (and 14/24 by the Student samples).

The Baltimore oriole was ranked "High" (5/30) by the Detroit-survey sample. The goldfinch, named seventh most-often as the "most-liked" species, was only ranked 12/30 in the Detroit survey. The yellowthroat, a species with similar coloration, was ranked even lower--19/30.

Dull-colored Species.--The eastern kingbird was only scored by the Student samples and was ranked "Low" by every group (19/24 overall). The house wren was ranked "Low" by most Student groups (20/24 overall), and was ranked 23/30 by the Detroit-survey sample.

The song sparrow was ranked "Low" by the Student groups and by the YWCA-camp children, but neither it, nor the white-throated sparrow, was ranked "Low" by the Detroit-survey sample. The "sparrow" (house sparrow) was named as the fourth most-liked and fourth most-disliked species by the Detroit-survey sample.

Black-colored birds were especially disliked. The starling, grackle, and crow were the lowest-scored species in most groups. The red-winged blackbird scored somewhat higher (14/30 in the Detroit survey).

It appeared that birds showing only dull colors

(i.e., browns, blacks, and grays) were the least-liked species. Exceptions were those species which have dull colors but which exhibit contrast, such as the killdeer. The mourning dove was another exception noted above.

Preferred and Non-preferred Mammal Species (Table 15)

Detroit-survey Sample.--Of the ten mammal species used, the favorite in every subsample was the black bear. The Neighborhood 1, female, unskilled, and "non-outdoor activity" subsamples also ranked the raccoon "High."

The chipmunk was ranked "Low" by every subsample. The red fox was also ranked "Low" by the overall sample.

YWCA-camp Sample.--The whitetail deer was ranked "High" by the entire sample and the deer and fox squirrel were ranked "High" by the subsample that could at least identify the particular species to common generic name. The deer mouse was ranked "Low."

Ability of the YWCA-camp Sample to Identify Species

In the YWCA-camp sample, only 11 of the 24 bird species were identified to correct common generic name, and only three species (the cardinal, blue jay, and red-winged blackbird) were identified by correct common species names, by 50 percent or more of the children (Table 16). All of the mammal species were at least partially identified, but only the raccoon and chipmunk were completely identified by 50 percent or more of the children (Table 17).

Table 15. Mammal species ranked in High and Low categories in each sample and subsample.

SAMPLE OR SUBSAMPLE	HIGH SPECIES				LOW SPECIES		
	Black bear	Raccoon	Whitetail deer	Fox squirrel	Chipmunk	Deer mouse	Red fox
Detroit survey	x	x			x		x
Neighborhood 1	x	x			x		
Neighborhood 2	x				x		
Neighborhood 3	x				x		
Neighborhood 4	x				x		
Neighborhood 5	x				x		
Females	x	x			x		
Males	x				x		
Skilled	x				x		
Unskilled	x	x			x		
Housewives	x				x		
"Outdoor activities"	x				x		
"No outooor act."	x	x			x		
YWCA-camp (total)			x			x	
Partial I.D.[a]			x	x		x	

[a]Subsample that could at least identify species to common generic name.

Table 16. Percentages of respondents in the YWCA-camp sample that could identify bird species.

PARTIAL OR FULL IDENTIFIC.[a]			FULL IDENTIFICATION[b]		
Rank	Species	Percent	Rank	Species	Percent
1	Cardinal	89.2	1	Cardinal	81.9
1	Great h. owl	89.2	2	Blue jay	80.5
3	Bald eagle	85.4	3	Red-wing	65.0
4	Blue jay	80.5	4	Bluebird	29.5
5	Wood duck	78.6	5	Bald eagle	26.8
6	Pheasant	77.4	6	Killdeer	25.0
7	Downy wood.	73.5	7	M. dove	13.6
8	Red-wing	71.3	8	Balt. oriole	8.6
9	R-t. hawk	67.9	9	Pheasant	8.3
10	M. dove	55.6	10	Starling	7.7
11	Grackle	50.0	11	Wood duck	7.1
12	H. gull	48.8	12	Meadowlark	2.8
13	Bluebird	43.6	13	Song sp.	2.5
14	Killdeer	32.5	14	Grackle	2.4
15	Song sp.	29.6	14	Great h. owl	2.4
15	Balt. oriole	29.6	14	R-t. hawk	2.4
17	Wh-th. sp.	23.6	17	Downy wood.	0.0
18	Starling	23.1	17	H. gull	0.0
19	B-w. teal	20.7	17	B-w. teal	0.0
20	Junco	13.2	17	Wh-th. sp.	0.0
21	Wren	12.8	17	Junco	0.0
22	Meadowlark	2.8	17	Wren	0.0
23	Yellowth.	2.6	17	Yellowth.	0.0
24	Waxwing	0.0	17	Waxwing	0.0

[a] Identification at least to common generic name.

[b] Identification at least to common species name.

Table 17. Percentages of resondents in YWCA-camp sample that could identify mammal species.

PARTIAL OR FULL IDENTIFIC.[a]			FULL IDENTIFICATION[b]		
Rank	Species	Percent	Rank	Species	Percent
1	Black bear	90.4	1	Raccoon	84.0
2	Red fox	89.2	2	Chipmunk	81.9
2	Deer mouse	89.2	3	Red fox	22.9
4	Cottontail	85.5	4	Muskrat	15.9
5	Raccoon	85.2	5	Red squirrel	13.4
6	Fox squirrel	83.1	6	Black bear	10.8
7	Whitetail deer	81.9	7	Fox squirrel	3.6
7	Chipmunk	81.9	8	Deer mouse	2.4
9	Red squirrel	59.8	9	Whitetail deer	0.0
10	Muskrat	58.5	9	Cottontail	0.0

[a]Identification at least to common generic name.

[b]Identification at least to common species name.

Methodological Weaknesses

There are many reasons why the artificial testing situation using photographs failed to measure the true values of the attitudes or the esthetic appreciations of the respondents towards wildlife. The results presented in this report should be interpreted with the inherent weaknesses discussed below kept in mind.

Artificiality of Photographs.--It is obvious that viewing a static photograph of a living animal is a poor compromise to actually seeing the animal in the wild. It was not possible to determine the amount of error introduced into the scores because of this shortcoming. The method isolated the animal from other sensory variables which enter into esthetic appreciation, such as the habitat in which the animal is found, smells and noises associated with that environment, and, especially, the added quality of bird songs. However, these variables cannot be ignored in any final evaluation of species. The extent that these or other variables might be esthetically synergistic when added to the actual viewing of a specific animal could not be determined.

Non-standardization of Photographs.--The extent that respondents scored the quality of the photographic artistry in the various photos used, rather than the actual species pictured, is not known. Any method which would completely standardize the photographs (such as showing each animal against a blank background or using photographs of mounted

specimens) would introduce more problems regarding artificiality than it would solve. The photos used offered the best compromise available between showing the animals in a sterile background and seeing the animals in the wild.

Preconceived Ideas and Misidentifications.--An unknown amount of bias was introduced into the scoring method when respondents misidentified the species shown. Although the results of Tables 16 and 17 cannot be extended to adult samples, the data did point out four possible situations regarding a respondent's familiarity with a species, all of which affected scores.

1) Complete familiarity with the species shown: A respondent appeared to make a fully-informed decision in the scoring process of familiar species. However, scores could be influenced by whether previous familiarity with the species had been pleasant or unpleasant. It is impossible to divorce other influences from esthetic factors in measuring the appreciation of the species that a respondent is familiar with. One person may enjoy hunting rabbits; another may have rabbits girdle his/her shrubs. One person may enjoy feeding squirrels; another may be kept awake nights by squirrels nesting in his/her attic.

2) Partial familiarity with the species shown: The accuracy of the name a respondent gave a species would probably not be significant in some species--for example, "redbird" for cardinal, "sparrow" for house sparrow, "bunny" for cottontail. In other species, a partial identification

could be equivalent to a misidentification because of an unfamiliarity with the species--for example, "sparrow" for song sparrow, when the respondent thought the "sparrow" shown to be a house sparrow. A closer look at this "misidentification" shows the problem to be unimportant to testing visual appreciations. A respondent would probably score a song sparrow higher than a house sparrow if he/she was familiar with the differences in the species. But lacking that familiarity, a respondent seeing the two species in the same environment would probably not appreciate one more than the other. Bird songs complicate this appreciation, since a person could appreciate the music of a song sparrow without recognizing its source.

3) Unfamiliarity with the species shown: Complete objectivity, based only on esthetics, should have occurred in scoring species that were completely unfamiliar to a respondent. However, most species would be <u>similar</u> in appearance to familiar species, or would be misidentified as familiar species, except to a respondent completely ignorant of animals. Scores would be influenced by the familiar species, as in the song sparrow--house sparrow example above.

It is not possible to expect respondents to score animals completely on an esthetic basis (like abstract objects of art), since they would not react to animals in the wild that way.

4) Misidentification of species: The most serious problems involved in a measurement of preferences toward different species was a misidentification of the species pictured. Two causes of misidentification, with differing effects on the resulting scores, were possible. In one case the cause of misidentification was a result of using poor photographs in the testing. For example, almost every respondent in the YWCA-camp sample thought the blue-winged teal-photo pictured Canada geese, although few people would mistake teal for geese in nature. The problem was apparantly the lack of a relative scalar value in the photo. In this case the method was not testing what it was designed for, but was only testing an artifact of the photograph.

In the second case, the cause of misidentification was not poor photography, but a lack of knowledge by the respondent--for example, a muskrat called a beaver, a killdeer a quail, a junco a woodpecker, or a yellowthroat a goldfinch. In this case the method was still testing what it was designed for, that is, to determine the respondent's candid responses to species, regardless of his/her preconceived notions. In many cases, a person's observation of an animal, misidentified as a species more familiar to him/her, is as meaningful to him/her as if he/she had actually observed the animal (Krieger 1973). For example, a respondent who believes that a photo of a yellowthroat is a goldfinch (which he/she is familiar with) would probably not be able to tell the species apart in the wild. He/she would most

likely obtain the same degree of satisfaction from viewing either species. For example, a hawk mistakenly thought to be an eagle might elicit the same response in a person as if he/she had actually observed an eagle.

Possible exceptions would exist when the two confused species were greatly different in appearance (e.g., a deer misidentified as an elk), behavior, or singing ability (e.g., a house wren misidentified as a house sparrow). In these species the level of appreciation of the animals in the wild would probably be different.

Lack of Established Criteria for Scoring.--Although instructions were given regarding the general criteria which should be used to judge esthetic preferences, the definition was purposely left rather vague to permit a respondent to apply the factors he/she thought were involved in an esthetic valuation. A disadvantage to this approach is that it was not possible to directly determine what specific factors entered into the scoring process. Indirect methods of analysis of the data did permit some inferences to be made about what criteria were used.

Non-random Sampling Techniques.--The samples were not randomly selected from populations larger than the neighborhoods sampled so it is not possible to extend the conclusions reached in this report to a larger, more heterogeneous population. However, the data do represent trends to be expected within similar homogeneous samples of larger populations.

Small Sample Sizes.--The MSU-student samples appeared to be of adequate size to represent the relatively homogeneous populations found in a university environment. The Detroit-survey sample was limited by time and money to a small sampling of only a few neighborhoods. The data must be interpreted within those limitations.

County Fair Sample.--The County Fair survey failed in its purpose of collecting usable response sheets. The exhibit did succeed in attracting a great deal of attention, and many people seemed to enjoy looking at the slides and trying to identify the species pictured. Unfortunately, very few people bothered to fill out response sheets. Several reasons were apparent for the failure of this method.

1) No "reward" incentive: Since no one monitored the booth, and no "reward" was offered, people did not feel compelled to fill out written answers to the "quiz."

2) Embarrassment at lack of knowledge: The response sheets which were completed showed a higher than average familiarity with birds by those respondents. Many more sheets were only partially completed. Apparently, many people felt ill-at-ease in voluntarily writing down how little they knew about bird identification.

3) Too much trouble: Few people bothered to score the photos on the response sheets that were returned with species names filled in. Apparently, the "scoring" part of the test was not as much fun as trying to name the birds.

SUMMARY AND CONCLUSIONS

The data indicate that people like most species of birds. Many people, especially in the group surveys, gave all of the birds scores of 10. Several of these respondents commented that they "like all birds the same." Dagg (1970), in a survey of attitudes towards urban wildlife in a town in Ontario, discovered that all but two of the common local species of birds were liked by at least 93 percent of those surveyed (1970:209).

Samples of university students showed fairly consistent responses in scoring wildlife species. The urban-Detroit neighborhoods which were sampled showed much greater unconformity in scoring species; variances of the scores were much higher than in scores of the Student samples. Apparently, preferences toward species were highly individual in heterogeneous groups of people.

Distinctions between liked and disliked species were amorphous in heterogeneous groups. Scores were grouped into High, Medium, and Low categories because variances of scores in the Detroit survey were high, and mean scores for many species were not significantly different.

Respondents in all samples preferred colorful bird species. In addition, the Student samples indicated

preferences for large, water, and/or game birds. Black and dull-colored birds were generally the least preferred by all samples.

Bird species ranked "High," listed by decreasing order of mean scores, were: Student samples--ring-necked pheasant, great blue heron, wood duck, blue-winged teal, Canada goose, rough-legged hawk, and scarlet tanager; Detroit-survey sample--cardinal, bluebird, ruby-throated hummingbird, ring-necked pheasant, and Baltimore oriole; and children in the YWCA-camp sample--cardinal, great horned owl, bald eagle, Baltimore oriole, blue-winged teal, herring gull, bluebird, and blue jay.

Bird species ranked "Low," listed by increasing order of mean scores, were: Student samples--grackle, crow, starling, song sparrow, house wren, eastern kingbird; Deroit-survey sample--crow, grackle, starling, slate-colored junco, red-tailed hawk, and herring gull; and children in the YWCA-camp sample--starling, grackle, white-throated sparrow, house wren, slate-colored junco, song sparrow, cedar waxwing, and killdeer.

When asked "What species do you like or dislike?", most people in the Detroit survey named those species common to their neighborhoods. For example, the blue jay and the sparrow were, in the same neighborhoods, listed in the top five most-liked and top five most-disliked species. However, when respondents were shown photos of alternative non-local species, these species were often scored higher than

the "most-liked" species. The blue jay was named second-most often as the "most-liked" species, but the photo of the blue jay was only scored 15/30. The bluebird was only named four times as "most-liked," but the photo of the bluebird was scored 2/30. It appeared that most of the people surveyed in Detroit were familiar with the names of few species.

People who watched birds, hunted, or participated in other outdoor activities scored all birds higher, on the average. People with those outdoor interests or with some outdoor education, whowed a much greater appreciation for raptors and waterfowl.

Overall, the cardinal was the most-liked species. The ring-necked pheasant, bluebird, and Baltimore oriole were also highly preferred. The ruby-throated hummingbird was ranked "High" only by the Detroit-survey sample. The robin was not scored, but was named third most often as the "most-liked" species in the Detroit survey.

The pigeon, starling, grackle, and crow were the least-liked bird species. Drab-colored species, such as sparrows, were also in the least-liked species. Most respondents in the Detroit survey scored the red-tailed hawk, great horned owl, and herring gull "Low."

Preferences in mammals were highly variable. Of the ten mammals used in testing, the black bear, and in some groups the raccoon, were scored highest. The chipmunk was the only species consistently scored "Low." This was

surprising since Dagg (1970) determined that the chipmunk was the favorite mammal in his urban study area.

Variations in a respondent's familiarity with the species shown in the photos affected the scoring process. However, the only case of misidentification which introduced an undesirable bias into the respondent's candid response occurred when the photo was misleading in scale or perspective, and misrepresented the actual appearance of the animal in the wild. There were, however, many other weaknesses in the testing method. Photographs cannot capture the full range of sensory variables (such as sounds, smells, and movements) included in a true esthetic appreciation of animals.

In summary, some overall trends in attitudes toward birds are indicated by the data. People who have little zoological training exhibit some traditional prejudices toward predatory birds and "evil-appearing" birds. One can only speculate as to why black-colored birds are the least-liked species by almost everyone. Are people really familiar enough with crows and grackles to sincerely dislike their habits, do they find these birds sinister in appearance, or are there other reasons? There are some people, including this writer, who find the antics of crows and the iridescence of grackles to be very pleasing traits.

It is difficult to find a common denominator for the birds that people like the most. Based on the Detroit survey, the closest description that comes to mind is that

these birds somehow appear "friendlier." Nondescript species or species somehow appearing "aggressive" seem to be the least-preferred. (It is recognized that terms like "friendly" are subjective; these descriptions are based on impressions gathered during this research.)

The children who were surveyed exhibited different, perhaps healthier, attitudes towards wildlife than did adults. They seemed to accept birds at "face-value." Their only prejudices seemed to be for "pretty" or large species (e.g., owl, gull, hawk, ducks, and brightly-colored songbirds). Perhaps they had no previous negative connotations about the species to draw upon.

University students appeared to show more sophisticated attitudes towards wildlife, apparently indicating more ecological awareness of the roles of various species in the ecosystem. People in other samples who indicated strong outdoor interests showed similar responses.

Conclusions from the summarized data in this report cannot be extended to a general population. The increase in the variances of the scores from the Student samples to the more diverse Detroit-survey sample was marked; preferences in more heterogeneous groups (such as the entire city of Detroit) would probably be even more diverse. Preferences toward animal species seem to depend on (1) background of the respondent (e.g., urban, suburban, or rural home), (2) education (e.g., knowledge of a raptor's role in the ecosystem, and (3) previous experiences with animals. The

first two variables have fairly predictable influences on the scoring of certain species; the third is too individual to permit a predictive model for preferences toward most species.

This report has dealt only with the question of what species different groups of people would prefer to have available to observe. Although providing no definitive answers as to esthetic preferences of the "public," it does provide some quantitative data as to preferences of those samples of people who were interviewed.

APPENDICES

APPENDIX A: MATERIALS USED IN SURVEYS

SLIDE QUESTIONNAIRE

1. A set of 24 slides of birds will be shown.

2. You will be asked to rank each slide on a scale from 1 to 10 in a manner which indicates to you some measure of value of the species shown.

3. It would help to picture your favorite bird as 10 points; your least-favorite as 1 point. Ordinarily your responses should include the full range of numbers, from 1 to 10.

4. The standard of judgement you use will be up to you--it might be based on esthetic appreciation, scarcity or abundance, appeal as an element of hunting, personal preferences, familiarity, or any combinations of criteria.

5. It does not matter if you are not familiar with some of the species shown.

6. Obviously, the individual slides will vary in photographic artistry. Please try to base your evaluation on the birds shown, rather than on the quality of the slides.

Figure A-1. Questionnaire used in the MSU-student survey.

BIRD-SLIDE RESPONSE SHEET

1. _____	9. _____	17. _____
2. _____	10. _____	18. _____
3. _____	11. _____	19. _____
4. _____	12. _____	20. _____
5. _____	13. _____	21. _____
6. _____	14. _____	22. _____
7. _____	15. _____	23. _____
8. _____	16. _____	24. _____

---

1. How many of the species shown could you have identified by name?

   a. Over 75% b. 50-75% c. 25-50% d. Less than 25%

2. How many of the species shown have you personally observed in the wild?

   a. Over 75% b. 50-75% c. 25-50% d. Less than 25%

3. Are you a hunter? Yes_____ No_____

4. Are you a bird watcher? Yes_____ No_____

5. Comments (use reverse side):

Figure A-2. Response sheet used in the MSU-student survey.

Michigan State University
Department of Fisheries and Wildlife
Natural Resources Building
East Lansing, Michigan 48823

Dear Sir:

Many people are making guesses about the way people feel toward birds and other animals in the city - but we would like to find out by asking them directly. We are presently conducting a study at Michigan State University to determine which animals can be found in the Detroit area, some of their interrelationships, and the attitudes of people toward them.

A student from the Department of Fisheries and Wildlife at Michigan State University will contact you within the next few weeks. We would like to ask you to take 20 minutes of your time to answer a few questions about your attitudes toward the animals you see in your neighborhood and yard. We will also use photographs of 20 selected animals in order to determine which ones you enjoy seeing most. We are planning to contact about 25 percent of the households in your immediate neighborhood; the information will be statistically combined to give a total picture. Any information relating to you as an individual will be held in strictest confidence, and all data gathered will be limited solely to the present study.

Thank you for your assistance.

Sincerely,

James R. Schinner
Graduate Assistant

Darrell L. Cauley
Graduate Assistant

Wayne A. Schmidt
Graduate Assistant

Figure A-3. Introductory letter used in the Detroit survey.

Hello, I'm Jim Longley from Michigan State University. You recently received a letter from the Department of Fisheries and Wildlife at Michigan State which mentioned that I would be stopping to see if you would be willing to answer a few questions about the animals you see in the neighborhood. We would appreciate it if you could spare about 15 minutes to give me some of your opinions.

Survey questions asked here.

Thank you. Now I would like you to look at a set of 10 bird photographs and then 10 animal photos. We're trying to get an idea of what kind of wildlife you enjoy seeing the most and which the least.

1. I'll show each set to you once and then I'll go through them a second time when you will record your score.

2. What I would like you to do is to give each bird a score from 1 to 10, depending on how much you enjoy, or would enjoy, seeing the bird (or animal) shown.

3. 10 is the highest score, 1 is the lowest, but use any score more than once if you choose.

4. First we will look at the birds, then the animals.

Figure A-4. Introduction and instruction used in the Detroit survey.

QUESTIONNAIRE

Questions noted by the interviewer:

1. What is person's neighborhood and house code number?
2. What is person's sex?
3. What is person's race?

Questions directed to respondent:

4. What is your occupation?
5. Do you participate in outdoor activities such as hunting, fishing, camping, etc.?
6. Do you garden?
7. Do you use pesticides on your lawn or garden?
8. Do you have a cat that runs loose at least part of the time?
9. Do you have a dog?
10. How many adults (16 years and older) are living at your residence?
11. How many children (15 years and younger) are living at your residence?
12. Do you feed the birds in your yard on a regular basis during some season of the year?
13. Do you provide water for songbirds such as a birdbath or garden pool?
14. a. Do you seek to attract birds to your yard by providing nest boxes?
    b. How many nest boxes do you have?
15. a. Do you ever watch the birds in your yard?
    b. If so, how often? (Often, occasionally, rarely)
16. a. Do birds use any part of your house or garage for nesting or roosting (resting, sleeping)?
    b. If so, where do they nest?
    c. Where do they roost?
17. a. Do birds nest in other areas of your yard?
    b. If so, where?
18. Which birds do you enjoy seeing most?
19. Which birds do you least enjoy?
20. a. Do you actively discourage birds on your property?
    b. If so, how?
    c. Which ones do you discourage?
21. Do you generally like, dislike, or are you indifferent to the birds in your yard?

Figure A-5. Questionnaire used in the Detroit survey.

Code: _____

RESPONSE SHEET

BIRDS		ANIMALS	
1.	_____	1.	_____
2.	_____	2.	_____
3.	_____	3.	_____
4.	_____	4.	_____
5.	_____	5.	_____
6.	_____	6.	_____
7.	_____	7.	_____
8.	_____	8.	_____
9.	_____	9.	_____
10.	_____	10.	_____

Question A: How many of the 10 birds shown do you think you could have named?

1-3 _____ 4-7 _____ 8-10 _____

Question B: How many of the 10 animals shown do you think you could have named?

1-3 _____ 4-7 _____ 8-10 _____

Figure A-6. Response sheet used in the Detroit survey.

DETROIT WILDLIFE SURVEY

You may be interested in why we are collecting this information. There are many questions about the way people feel towards birds and animals in the city. We are trying to find some answers by directly asking city dwellers how they feel about the animals found in the Detroit area. This study, being conducted at Michigan State University, is to determine which animals are found in the urban area, some of their interrelationships, and the attitudes of people towards them.

In addition, we are striving to measure what value people place on different species. Since most construction projects are justified in terms of dollars and cents, wildlife usually has a difficult time competing with such projects. It would be desirable to find a way to place an economic value on various birds and animals. This survey is a first step towards that end.

Thank you very much for your time and help.

Darrell Cauley
James Schinner
Wayne Schmidt
Graduate Assistants
Department of Fisheries and Wildlife
Michigan State University

Figure A-7. Letter left with respondents following the Detroit-survey interviews.

ANSWER SHEET

(1) There are 24 birds and 10 mammals being shown on the slides.
(2) Please give each bird or animal a score, from 1 to 10 points, depending on how much you would enjoy seeing it in the wild.
(3) 1 is the lowest possible score, and 10 is the highest, with 2 through 9 being in-between.
(4) See how many of them you can name.

Slide No.	Score	Name	Slide No.	Score	Name
1.	_____	_____	18.	_____	_____
2.	_____	_____	19.	_____	_____
3.	_____	_____	20.	_____	_____
4.	_____	_____	21.	_____	_____
5.	_____	_____	22.	_____	_____
6.	_____	_____	23.	_____	_____
7.	_____	_____	24.	_____	_____
8.	_____	_____	25.	_____	_____
9.	_____	_____	26.	_____	_____
10.	_____	_____	27.	_____	_____
11.	_____	_____	28.	_____	_____
12.	_____	_____	29.	_____	_____
13.	_____	_____	30.	_____	_____
14.	_____	_____	31.	_____	_____
15.	_____	_____	32.	_____	_____
16.	_____	_____	33.	_____	_____
17.	_____	_____	34.	_____	_____

Your age:

Under 15 _____ 15-30 _____ Over 30 _____

Where do you live:

Farm _____ City (greater than 25,000 population ___

Other _____

Figure A-8. Response sheet used in the YWCA-camp and County Fair surveys.

APPENDIX B: COMPUTER PROGRAMS

APPENDIX B: COMPUTER PROGRAMS

Program BIRD.--Program BIRD was designed to analyze punched data from the MSU-student samples. The mean scores derived for each bird species were statistically analyzed in 13 subsamples (Table B-1) by a subroutine. A separate subroutine tested for significant differences between selected mean scores within each species. The statistical tests used are described in Appendix C.

Referring to Table B-1, the left headings refer to the subsamples being analyzed (see Fig. A-2 for the corresponding questions). The numerical columns correspond to: N= sample sizes, MEAN= computed mean scores, SD= standard deviations of the means, VAR= variances of the means, C.L. OF MEAN= 95 percent confidence intervals of the mean scores, T and TT= computed "t" values, SIG DIF= whether significant differences existed between the mean scores.

A separate subroutine printed out the list of bird species in the descending order of mean scores for each of the 13 subsamples. Overall mean scores for each of the 13 subsamples were also printed out.

Program LEVI.--Since the testing format differed considerably in the Detroit survey, a separate program (LEVI) was written to handle the more complex input data.

Table B-1. Sample printout of statistical analysis of program BIRD.

	N	MEAN	SD	VAR	SE	C.L. OF MEAN	T	TT	SIG DIF		
22 G-B HERON.											
TOTAL CLASS	64.	8.17	2.142	4.589	.268	7.64-- 8.70					
HUNTERS	30.	8.20	1.901	3.614	.347	7.49-- 8.91					
NON-HUNTERS	34.	8.15	2.363	5.584	.405	7.33-- 8.97	2.000	.098	NO.	30.	34.
BIRD-WATCHERS	28.	8.29	2.225	4.952	.421	7.42-- 9.15					
NON-BIRD-WATCHERS	36.	8.08	2.103	4.421	.350	7.38-- 8.79	2.000	.346	NO.	28.	36.
I.D. OVER 75	26.	8.50	1.881	3.540	.369	7.74-- 9.26					
I.D. 75-50	22.	8.00	2.410	5.810	.514	6.93-- 9.07					
I.D. 50-25	12.	7.83	2.250	5.061	.649	6.40-- 9.26	2.093	.859	NO.	26.	12.
I.D. UNDER 25	4.	8.00	2.449	6.000	1.225	4.10--11.90	3.182	.342	NO.	26.	4.
OBS OVER 75	22.	8.50	2.018	4.071	.430	7.61-- 9.39					
OB 75-50	21.	7.67	2.309	5.333	.504	6.62-- 8.72					
OB 50-25	10.	8.21	2.175	4.731	.499	7.16-- 9.26	2.042	.428	NO.	22.	19.
OB UNDER 25	2.	9.50	.707	.500	.500	3.15--15.85	3.182	1.200	NO.	22.	2.

	N	MEAN	SD	VAR	SE	C.L. OF MEAN	T	TT	SIG DIF		
23 GRACKLE .											
TOTAL CLASS	64.	3.00	2.350	5.524	.294	2.42-- 3.58					
HUNTERS	30.	3.20	2.552	6.510	.466	2.25-- 4.15					
NON-HUNTERS	34.	2.82	2.181	4.756	.374	2.07-- 3.58	2.021	.620	NO.	30.	34.
BIRD-WATCHERS	28.	3.07	2.356	5.550	.445	2.16-- 3.99					
NON-BIRD-WATCHERS	36.	2.94	2.378	5.654	.396	2.14-- 3.75	2.021	.217	NO.	28.	36.
I.D. OVER 75	26.	3.23	2.582	6.665	.506	2.19-- 4.27					
I.D. 75-50	22.	3.05	2.400	5.760	.512	1.98-- 4.11					
I.D. 50-25	12.	2.67	2.015	4.061	.582	1.39-- 3.95	2.048	.787	NO.	26.	12.
I.D. UNDER 25	4.	2.25	1.893	3.583	.946	.76-- 5.26	2.571	.811	NO.	26.	4.
OBS OVER 75	22.	2.59	2.175	4.729	.464	1.63-- 3.56					
OB 75-50	21.	4.19	2.639	6.962	.576	2.99-- 5.39					
OB 50-25	10.	1.95	1.268	1.608	.291	1.34-- 2.56	2.042	1.147	NO.	22.	19.
OB UNDER 25	2.	5.00	4.243	18.000	3.000	-33.12--43.12	12.706	.564	NO.	22.	2.

In addition to performing the same statistical tests as BIRD on selected survey questions (Table B-2), this program also decoded the scores given in different combinations and permutations to different species and matched them to the proper species.

A sorting subroutine listed each of the bird species and mammal species in descending orders of mean scores and also printed the sample size, mean, standard deviation, and variance for each species. Species names were coded by "characteristics" to facilitate comparisons performed manually. The same sorted data were automatically punched onto cards to be used in a separate program (SIGDIF) to test for significant differences in the mean scores within each subsample of bird or mammal scores.

Program SIGDIF.--SIGDIF was similar to subroutine MEAN, which tested for significant differences of means in program BIRD. SIGDIF performed a pair-wise test for significant differences between means, using mean scores of 30 species (or less) from a sample or subsample (Table B-3).

Program YWCA.--YWCA was similar to program BIRD. In addition to the scores given each photo shown, the respondents were asked to name each species in the YWCA survey. Scores were rated L= 1, 2, or 3; where L= 1 corresponded to a wrong identification by the respondent of the species shown, L= 2 corresponded to partial identification (colloquial or generic name; e.g., "redbird" for cardinal, "blackbird" for starling, "squirrel" for fox squirrel), and L= 3

Table B-2. Sample printout of statistical analysis of program LEVI.

1 FOX SQUIRR	N	MEAN	SD	VAR	SE	C.L. OF MEAN	SIG	SIG	SIG	SIG
TOTAL SURVEY	89.	6.75	3.167	10.029	.336	6.09-- 7.42				
NEIGH 1	19.	6.05	3.009	9.053	.690	4.60-- 7.50				
NEIGH 2	24.	7.63	2.763	7.636	.564	6.46-- 8.79	N			
NEIGH 3	12.	8.25	2.667	7.114	.770	6.56-- 9.94	N	N		
NEIGH 4	20.	6.70	3.246	10.537	.726	5.18-- 8.22	N	N	N	
NEIGH 5	14.	5.00	3.595	12.923	.961	2.92-- 7.08	N	Y	Y	N
MALE	45.	6.58	3.306	10.931	.493	5.59-- 7.56				
FEMALE	44.	6.93	3.045	9.274	.459	6.01-- 7.85	N			
CAUC	83.	6.81	3.149	9.914	.346	6.12-- 7.49				
MEX-AM	6.	6.00	3.633	13.200	1.483	2.19-- 9.81	N			
SKILLED	33.	6.79	3.489	12.172	.607	5.56-- 8.02				
UNSKILLED	19.	6.89	2.942	8.655	.675	5.48-- 8.31	N			
HOUSEWIFE	32.	6.66	3.220	10.371	.569	5.72-- 8.05	N	N		
RETIRED	5.	5.20	.837	.700	.374	4.16-- 6.24	Y	Y	Y	
OUT ACT	48.	7.21	3.235	10.466	.467	6.27-- 8.14				
NO OUT ACT	41.	6.22	3.037	9.226	.474	5.26-- 7.18	N			
ID 1-3	1.	1.00								
ID 3-7	13.	6.54	3.332	11.103	.924	4.52-- 8.55	X			
ID 8-10	75.	6.87	3.108	9.658	.359	6.16-- 7.58	X	N		

Table B-3. Sample printout of SIGDIF, also showing High-Medium-Low categories.

NO SPEC CHARA N MEAN NO PAIR-WISE TEST FOR SIGNIFICANT DIFFERENCES BETWEEN MEANS--Y=YES, N=NO SIG. DIFF. NB VAR

DETROIT TOTAL SURVEY--BIRDS

						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
1	CARD	SCLNO	60.	9.80	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.60
2	BLUB	SCLNO	29.	9.14	2	Y	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	2.91
3	WUMM	SCLNO	24.	9.04	3	Y	N	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	2.65
4	PHEA	LCLGO	60.	8.80	4	Y	N	N	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4	4.33
5	ORIO	SCLNO	12.	8.67	5	Y	N	N	N	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	5	2.06
6	YEAL	LCWGO	24.	8.54	6	Y	N	N	N	N	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6	4.75
7	GOOS	LCWGO	24.	8.54	7	Y	N	N	N	N	N	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	7	5.30
8	EAGL	LDLNP	17.	8.29	8	Y	N	N	N	N	N	N	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	8	8.47
9	DOVE	SDLNO	17.	8.29	9	Y	N	N	N	N	N	N	N	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	9	6.22
10	MEAD	SCLNO	36.	8.17	10	Y	Y	Y	N	N	N	N	N	N	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	5.06
11	KILL	SDLNO	24.	7.96	11	Y	Y	Y	N	N	N	N	N	N	N	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	11	4.65
12	GOLD	SCLNO	24.	7.88	12	Y	Y	Y	Y	N	N	N	N	N	N	N	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	12	4.98
13	WAXW	SDLNO	36.	7.53	13	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	13	6.89
14	RED-	SCLNO	29.	7.52	14	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	14	6.04
15	EGRT	LCWNP	36.	7.42	15	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	15	5.68
16	BLUJ	SCLNO	60.	7.42	16	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	16	9.23
17	WOOD	LCWGO	29.	7.41	17	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	.	.	.	.	.	.	.	.	.	.	.	.	.	.	17	7.39
18	SONG	SDLNO	12.	7.33	18	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	.	.	.	.	.	.	.	.	.	.	.	.	.	18	5.52
19	YELL	SCLNO	29.	7.28	19	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	.	.	.	.	.	.	.	.	.	.	.	.	19	4.85
20	DOWN	SDLNO	36.	7.06	20	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	N	N	N	N	N	N	N	.	.	.	.	.	.	.	.	.	.	.	20	8.05
21	WTSP	SDLNO	24.	6.96	21	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	N	N	N	N	N	N	N	N	.	.	.	.	.	.	.	.	.	.	21	7.78
22	YFLY	SDLNO	24.	6.88	22	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	.	.	.	.	.	.	.	.	.	22	6.83
23	WREN	SDLNO	24.	6.42	23	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	.	.	.	.	.	.	.	.	23	7.99
24	OWL	LDLNP	24.	6.17	24	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	.	.	.	.	.	.	.	24	12.32
25	GULL	LCWNP	41.	5.56	25	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	.	.	.	.	.	25	8.25
26	HAWK	LDLNP	12.	4.58	26	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	.	.	.	.	26	11.54
27	JUNC	SDLNO	5.	4.40	27	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	.	.	.	27	3.80
28	STAR	SDLNO	29.	3.69	28	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	.	.	28	7.87
29	GRAC	SDLNO	60.	3.47	29	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	.	.	29	8.05
30	CROW	LDLGP	29.	3.03	30	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	.	30	7.25

HIGH

MEDIUM

LOW

corresponded to a correct species identification. Scores were analyzed using subroutine STAT at the above three levels, at L= 4 (L= 2 + L= 3), and at L= 5 (total group). A sorting subroutine printed out the list of species by "L" category in order of descending mean scores.

APPENDIX C: STATISTICAL TESTS

APPENDIX C: STATISTICAL TESTS

Sample Size.--Blank scores on a usable response sheet were ignored in totaling the sample size for a particular category. A response sheet was discarded only if less than half of the photos were scored by the respondent, or if it was obvious that the respondent completely misunderstood the instructions (e.g., scores ranging from 1-24 rather than 1-10). All responses in the Detroit survey were usable. Approximately two percent of the response sheets in other samples were unusable.

Mean Scores of each Species.--Mean scores were computed by summing the usable scores for a species and dividing by the appropriate number of scores.

Variance and Standard Deviation of the Mean Scores.--Variance for any mean score was computed by the equation:

$$s^2 = \frac{\sum_{i=1}^{n} y_i^2 - ((\sum_{i=1}^{n} y_i)^2/n)}{n - 1} \qquad (1)^1$$

where s^2= variance, s= standard deviation, y^i= score of respondent "i," and n= sample size.

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[1]After Mendenhall (1971:42).

Standard Error of the Mean.--Standard errors were computed for calculation of confidence limits of the means. The equation used was:

$$s_{\bar{y}} = \frac{s}{\sqrt{n}} \qquad (2)^1$$

where $s_{\bar{y}}$= standard error, s= standard deviation, and n= sample size.

Confidence limits of the Mean.--Confidence limits were computed using the Student's t-test according to the equation:

$$CL = \bar{y} \pm z_{\alpha/2} \cdot s_{\bar{y}} \qquad (3)^2$$

where CL= upper and lower confidence limits of the mean, $\bar{y}$= mean score, z= "t" value, and $s_{\bar{y}}$= standard error of the mean.

Significant Difference Between Means.[3]--The null hypothesis, $\mu_1 = \mu_2$, where μ_1= population mean 1 and μ_2= population mean 2, was tested using an approximate t-test to determine whether there was a significant difference between two means. The test was used to determine significant differences between means of samples or subsamples within a species category (e.g., the mean scores given a bluebird by men and women), and also to test between species within a

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[1]After Mendenhall (1971:42).

[2]Ibid, p. 185.

[3]After Blalock (1972: chapt. 13).

group (e.g., the scores given to a bluebird and a cardinal by hunters).

A "t" value was determined for the combined means by the equation:

$$TT = \frac{(\bar{y}_1 - \bar{y}_2) - (\bar{\mu}_1 - \bar{\mu}_2)}{\hat{s}} \qquad (4)$$

where TT= computed "t" value, $\bar{y}_1$=and $\bar{y}_2$= sample mean scores, $\bar{\mu}_1$ and $\bar{\mu}_2$= population mean scores, and $\hat{s}$= estimated standard deviation of the difference between the scores. Since the null hypothesis assumed that $\mu_1 = \mu_2$, the above equation reduced to:

$$TT = \frac{(\bar{y}_1 - \bar{y}_2)}{\hat{s}} \qquad (5)$$

It was believed that it could not be assumed that the standard deviation of population 1 equaled the standard deviation of population 2, in most cases. Therefore, $\hat{s}$ was defined as:

$$\hat{s} = \left(\frac{s_1^2}{n_1 - 1} + \frac{s_2^2}{n_2 - 1}\right)^{\frac{1}{2}} \qquad (6)$$

where s_1^2=and s_2^2= sample variances, and n_1 and n_2= respective sample sizes.

The computed "t" values ("TT" in Table B-1) were compared against the "t" values ("T" in Table B-1) in the t-table at DF degrees of freedom where:

$$DF = \frac{\left(\frac{s_1^2}{n_1 - 1} - \frac{s_2^2}{n_2 - 1}\right)^{\frac{1}{2}}}{\left(\frac{s_i^2}{n_1 - 1}\right)^2 \left(\frac{1}{n_1 + 1}\right) + \left(\frac{s_2^2}{n_2 - 1}\right)^2 \left(\frac{1}{n_2 + 1}\right)} - 2 \quad . \tag{7}$$

All tests were made at the 90 percent level (alpha= 0.10).

APPENDIX D: TOWARDS AN ECONOMIC VALUATION OF WILDLIFE

APPENDIX D: TOWARDS AN ECONOMIC VALUATION OF WILDLIFE

INTRODUCTION

There is a myriad of factors involved in the quantification of the many benefits and costs of wildlife. Tying all those factors together into a workable technique is a formidable goal. It is the purpose of this report to try and determine what work has already been done towards solving this problem, and if, in fact, it even appears possible to develop a comprehensive technique for the economic valuation of wildlife.

METHODS

A comprehensive review of the literature was made to determine what has been done towards quantifying the many facets of wildlife values and also to determine attitudes regarding the philosophy of quantifying intangible values. Unfortunately, no single bibliography covers this diverse topic; the literature cited in this report is the distillation of a great many bibliographic sources.

All dollar values used in this report are updated to February 1974, for purposes of comparison, using the consumer price index ("all items" category; Economic Statistics Bureau 1974).

RESULTS AND DISCUSSION

Wildlife Values and the Law

LEGAL REQUIREMENTS

Environmental Impact Statements.--The requirements of Section 102(2)(c) of the National Environmental Policy Act of 1969 (NEPA) will not be dealt with at length here. NEPA gives statutory cause of action for suit if a governmental agency fails to make systematic analysis of potential environmental damages or fails to consider plausible alternatives to the proposed actions (Curlin 1972:373). Unfortunately, environmental impact statements are frequently considered as just another bureaucratic hurdle, often done at the completion of the planning process (1972:373), doing little to satisfy the intent of NEPA. It has been noted that the requirements of NEPA are often considered more procedural than substantive (Carter 1973:1208). As long as an agency complies with the procedural requirements of NEPA, its final decision cannot be challenged.

Many states, including Michigan, have requirements similar to NEPA. Michigan Executive Directive 1971-10 directs all State governemtnal agencies to "review all major activities within their jurisdiction to determine their effects on the environment." The review must include

the probable impact on "human life or other ecological systems such as wildlife, fish, and aquatic life...." (emphasis added). The intent of the Directive is to make environmental assessment a part of the decision-making process in State agencies (Mich. Advisory Council for Environmental Quality 1972).

Benefit-cost Analyses.--In a benefit-cost analysis (BCA), the physical benefits and costs of a project are quantified and compared, usually in dollars. Obvious weaknesses in such analyses include the difficulty of quantifying many intangible costs and benefits (such as wildlife values) and rejection of proposals which do not pay their way in terms of net economic efficiency.

Despite many inherent weaknesses, BCA has a long history of use in economic decision-making in this country. Recently the U.S. Citizens' Advisory Committee on Environmental Quality (1972:54) recommended that BCA be applied to a broad variety of programs and projects and be required to show all social and environmental costs.

BCA has generally been a useful concept. Ciriancy-Wantrup (1955:678) stated: "...The mere necessity of quantifying makes benefit-cost analysis worthwhile because of its stimulating effects in expanding scientific understanding of the physical as well as social problems involved in public resource development." He concluded that BCA was worthwhile in spite of all its shortcomings, including its relatively small direct influence on the actual course of

events (1955:677).

Other Legal Requirements.--The Fish and Wildlife Coordination Act of 1958 was enacted "to provide that wildlife conservation shall receive equal consideration and be coordinated with other features of water-resource development programs..." (16 USC 661). The Act requires that any project submitted to Congress supporting a recommendation for authorization of a new water use project include "...an estimation of the wildlife benefits or losses to be derived therefrom..." (16 USC 662(f); emphasis added).

The Federal Water Project Act of 1965 requires that in any Federal water resource project "...full consideration shall be given to the opportunities, if any, which the project affords for outdoor recreation and fish and wildlife enhancement..." (16 USC 460L-12).

Many other laws relating to wildlife are summarized in a U.S. Bureau of Sport Fisheries and Wildlife publication (USBSFW 1973).

SOME LEGAL PRECEDENTS

A few examples of pertinent environmental litigation will be mentioned to illustrate the extent to which the courts have gone in extending protection to environmental values.

In Calvert Cliffs[1] the U.S. Supreme Court ruled that

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[1]Calvert Cliffs Coordinating Committee, Inc., v. U.S. Atomic Energy Commission and U.S.A. (449 Fed. Rep., 2nd ser. 1109 (D.C. Cir. Ct. 1971)).

NEPA established environmental protection as an integral part of the Atomic Energy Commission's (AEC) basic mandate, and that the AEC must take the initiative of considering environmental values (see 40 LW 2067-2068).

In Scenic Hudson[1] the court observed that "...the Federal Power Act seeks to protect non-economic as well as economic interests..." and ruled that the Federal Power Commission (FPC) had not seriously weighed esthetic considerations or alternatives to the Storm King project. Although the project was not blocked, the important point is that conservationists were granted standing to sue even though no economic injury was claimed (Carter 1973:1206, 1209).

In High Mountain Sheep[2] the Supreme Court adopted much the same sentiment towards the obligations of the FPC. The court stated: "The importance of salmon and steelhead in our outdoor life as well as in commerce is so great that there certainly comes a time when their destruction might necessitate a halt in so-called 'improvement' or 'development' of waterways."

In Midland Nuclear Plant proceedings, Mapleton Intervenors were critical of the proposed site for a nuclear plant and cooling pond proposed by Consumers Power Company (Holcomb 1972). Criticism was directed toward the lack of cost estimates for lost wildife. Intervenors made their

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[1]Scenic Hudson Preservation Conference v. FPC, 354 F.2d 608 (C.A. 2, 1965), cert. den., 384 U.S. 941(1965)).

[2]Udall v. FPC, 387 US 428 (1967)).

own population survey estimates, based largely on textbook range maps, and concluded that due to loss of breeding habitat of numerous species of wildlife, the cost in lost wildlife would be over $1.0 million. Reaction to this estimate was strong. Gysel (1972:8) stated:

> The monetary values [they place] on each species is meaningless. The use of replacement cost to measure the loss of animals that no one will attempt to replace and in most cases which no one will have any interest in replacing is clearly unreasonable.

State fish and game laws have placed a de facto value on certain species by penalties for illegally killing birds and animals. In Michigan the minimum and maximum penalties per animal killed are: $200-$300--elk and moose; $100-$200--deer, bear, wild turkey, hawk, owl, and eagle; $5-$10--all other game animals, upland game birds, and waterfowl (Michigan DNR 1972:159).

Approaches to Wildlife Valuation

The need for a technique of wildlife valuation is evident, but only a limited amount of research has directly attacked this issue due to the complexity of the problem. Most proposed techniques have attempted to simulate a market valuation of a recreational site or of a recreational commodity; most require interview or questionnaire data obtained from the recreationist (Hammack 1969:10).

No practical method now exists for assigning values to wildlife species or to individual numbers of wildlife, either with relative values, rank orderings, or dollar

values, except for certain game species in specific locations.

Pot-luck Method.--According to Crutchfield (1967:3), this method consists of

> reaching deep into the hip pocket and pulling out a value. If somebody doesn't like it, you pull one out of another pocket.... You come out with a schedule of daily values for hunting, fishing, camping, hiking.... This seems to rest on the assumption that where a number is needed a bad number is better than no number at all.

Social Account Method.--This method, suggested by Davis and Bentley (1967), stops short of value judgements implicit in many benefit-cost analyses. The benefits and costs which can be priced or enumerated are quantitatively explained. Extra-market values are compared in the most appropriate of four categories:

> (1) Item capable of numerical description and enumeration. (2) Consequence of alternative P_1, as numerically or logically greater than (less than) the same item of alternative P_2. (3) A consequence can logically be said to have a positive, neutral, or negative effect with respect to some standard. (4) Effect of consequence can only be approximated or described by words (1967:616).

This approach does not seem to offer much over the system of subjective value judgements regarding wildlife values presently being made in the decision-making process.

Cost Method.--This method assumes that the value of outdoor recreation is equal to the cost of generating it, or to a multiple of that cost (Trice and Wood 1958:199, Clawson and Knetsch 1966:225-226). It is not applicable to wildlife.

Travel Costs Method.--This method uses the cost of overcoming distance as a measure of what people would be

willing to pay for the use of a particular kind of recreational facility. However, the value of a resource does not necessarily increase with remoteness. User-oriented resources, such as wildlife, may often be, in fact, more valuable when in close proximity to population centers.

Clawson Demand Curve Method.--This method uses travel and related cost considerations as a proxy for market transactions to establish a demand curve for particular recreation sites (Clawson and Knetsch 1966).

> This methodology concerns itself with the use of data on the numbers and place of origin of park visitors to construct a demand curve for a recreation area that relates prices to quantity, of number of visits, and uses this relationship to determine the economic worth of the park area. Cost data is used as an indirect means of determining appropriate prices (Knetch 1963: 388).
>
> The method of estimating the value of natural resources used for outdoor recreation areas flows directly out of the demand analysis... The relevant figure is the value to the users which in turn depends upon the willingness of the users to incur costs in order to enjoy the recreational experience. Demand curves conceptually link such willingness to pay with the estimated value of the resource when used for this purpose (Clawson and Knetsch 1966:216).

This may be a useful method for estimating demand for a particular recreational area; however, for determining the relative values of specific wildlife resources, this approach is limited. Much wildlife occurs in areas of nonrecreational use, making it impossible to find a sample of users of the area in question. And given alternative areas in which wildlife values are to be compared, it would be impractical to conduct surveys of sample-users of each area, due to the

costs in time and money necessary for such surveys.

Gross Expenditure Method.--This method attempts to measure the value of a particular recreational activity by the total amount of expenditures generated by that activity. However, Trice and Wood (1958:200) commented: "Dollars spent in pursuit of recreation appear to be more significant as indicators of secondary benefits to the business community than as measures of primary recreational benefits." Hines (1958:366) stated: "The value of a resource and the satisfactions derived from its employment may correspond closely or widely to the aggregate expenditures incurred in the use of the resource."

Wallace (1952) endorsed the value framework of the private market economy as a standard for appraising the economic benefits to individuals and the community of wildlife resources (also see Hines 1958:365). Wallace bases his evaluation of wildlife resources soley upon market measures.

> ...Expenditures which members of society make in the pursuit of wildlife as compared with the expenditures made for other goods or resources represent the only clear basis for comparing the contribution of each to society's happiness and welfare (1952:1-2).

This approach is not sufficient for a complete valuation of wildlife (Crutchfield 1967:3); wildlife may possibly have value with no expenditure present (Leopold 1966:214).

Market Value Method.--This method bases the value of public goods on a comparison with the same or similar goods offered at private areas. It is a possible approach to wildlife valuation for certain species when these animals

can be related to prices paid to see or hunt them on private areas. This approach is not a complete answer.

Market Value of Fish Method.--This is a method to estimate the recreational benefits of sport fishing by computing the commercial market value of fish caught (Clawson and Knetsch 1966:225). It can also be used to estimate the value of game by comparing the pounds of meat present with market prices of similar domestic animals, the marketable values of fur and hides, and so on. This method can only compute a fraction of the true resource value.

Rank-ordering Method.--Although not a method of absolute measurement, this method does permit some sort of objective comparison of similar alternatives. Preferences toward intangible values, determined by interviews, can be ranked on an ordinal scale. This method is being used to determine techniques for quantifying scenic beauty. Predictive models have been developed on the basis of consumer preferences for landscapes (Shafer et al. 1969, Shafer and Mietz 1970, Rutherford and Shafer 1969). Another method was described by Peterle (1961:263-264):

> A measure of the relative hunting success of those answering our questionnaire was obtained by assigning values of one to five to each of the game species. A one value was assigned to pheasants and rabbits; a two to squirrel, raccoon, and woodchuck; a three to quail, Hungarian partridge, and foxes; a four to grouse, ducks, woodcock, and geese; and [a five to deer].... According to our scoring system, raccoon, fox, and woodchuck hunters killed more game than any other group of hunters. Grouse, quail, and duck hunters had about the lowest scores of the group.

Matrix Analysis Method.--This method has certain merit in assessing environmental impact. The magnitude and the importance of various interactions between proposed actions and the existing environment are separately rated on a subjective scale from one to ten (Leopold et al. 1971). The final figures arrived at portray many value judgements (1971:1); these figures can be no better than the individual judgements comprising the total.

Subjective Rating Method.--This method uses the same approach as the matrix method by assigning numerical values to components of a specific valuation scheme. Using varying degrees of objective guidelines to assist in that valuation, a total numerical score is computed. Addy et al. (1971) have proposed this method to evaluate the impact of insects on forests. Sargent (1966 and 1967) proposed a similar method for scenery classification.

While not always completely objective, this method can have value in that it generates workable techniques which can be applied to immediate problems.

Direct Interview Method.--In this method a sample survey is taken among users of a particular resource directly asking them what value they place on the recreational experience.

> The 'direct' techniques attempt to establish a demand schedule by enquiring of the recreationists the most they would be prepared to pay for access to the recreation rather than be excluded. Alternatively they might be asked to declare the minimum amount they would have to be paid (bribed) to willingly abstain from the recreation. It should be noted that these two different

> kinds of questions would, if answered precisely, give estimates of value which are both defensible on theoretical grounds, but they are unlikely to be equal because they measure two different forms of consumer surplus (Pearse 1968b:88).

Davis (1964) attempted to quantify the benefits of big game hunting in Maine. He defined benefits as the sum of the maximum prices which hunters would pay rather than be deprived of hunting in the particular area studied.

Hammack (1969),,in studying the economics of migratory waterfowl, attempted to obtain an estimate of consumer surplus in hunters by asking: "What is the smallest amount you think you would take to give up your right to hunt waterfowl for a season...?" and "About how much greater do you think your costs would have had to have been before you would have decided not to have gone hunting at all during that season?" (1969:126-127).

A questionnaire survey of campers at New York State campgrounds revealed that campers vary so much--not only from campground to campground, but also at the same campground from month to month--that data from such studies cannot be lumped together in any meaningful way (Shafer 1969). "The same type of variation found among campers in this study probably exists also among fishermen, hunters, skiers, and other types of recreationists who use a wide variety of environments for their sport" (1969:27).

Previous Valuations of Wildlife

RECREATIONAL VALUES

Game Species.--Hunting and trapping perhaps come the closest of any use of wildlife to supplying a market value of the resource. The value of meat taken or of furs trapped have obvious economic worth. Taken with expenditures involved in the pursuit of such activities, figures at least provide a starting point for wildlife valuation.

Edminster (1947:328) suggested a value of $2.00 ($4.32)[1] for a ruffed grouse brought to bag, but added,

> ...it may be contended that $2 is too low for the value of a grouse. Well then, how much is a bird worth? If one values a bagged grouse much over $2 he is placing a high money value on the recreation enjoyed in pursuing it.

According to the Bureau of Sport Fisheries and Wildlife (1972), in 1970 hunters spent over $2.1 billion in pursuing their sport, averaging $10.52 ($12.80) for each recreation day. The average annual expenditure per hunter was $149 ($181): big game hunters--$122 ($148), small game hunters--$81 ($99), and waterfowl hunter--$84 ($102).

This compares favorably with figures reported by Wallace (1952:14-15). He reported that from the results of a survey of license holders in the state of Washington, the annual per capita expenditure was $88 ($157) for big game hunters, $74 ($132) for small game hunters, and $60 ($107) for waterfowl hunters. He also reported the results of an Ohio survey (1947) which showed the Ohio hunter annually

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[1]See p. 77.

spent $42 ($75) per capita.

In some isolated areas, especially in Canada, some people still rely on game for an important supplement to their income or for their livlihood.

> In 1962-63 Canadian wild fur sales totalled more than $12.1 [$18.7] million. Many Eskimos and Indians earn their livlihood from fur trapping and they need wildlife for food and clothing (Canadian Wildlife Service 1964:8).

Fur prices flucuate greatly from year to year, depending on demand and the availability of quality pelts. Top prices paid by one buyer in Michigan in the 1973-74 season (the best in Michigan in 20 years) were: red fox--$35, muskrats--$3.85, raccoon--$11.50, gray fox--$15, wild mink--$18, and opposum--$1.50 (Michigan Out-of-Doors, Feb. 1974:20).

In most parts of the United States, including Michigan, hunting is seldom an economical means for supplementing food supplies. "The economic loss experienced when hunting areas or wildlife habitats are [lost] is primarily the value of the recreational hunting no longer possible" (Holbrook 1970:8). The value of meat obtained from hunting is usually only a small bonus off-setting recreational costs of hunting (Miller and Powell 1942:12).

Pearse (1968b) studied the economic value of non-resident big game hunting in the east Kootenay in British Columbia. He computed the net economic gain to the province and the private profits of guiding. Both were found to be "surprisingly low," amounting to an annual profit of only $202 ($308) for the 54 guides involved, with a net worth to

the province in 1964 of $66,152 ($100,756). He found that the average hunter in 1964 spent $590 ($899) per hunter visit including an average guide fee of $389 ($592). Pearse noted that his analysis was not suitable for a rigorous benefit-cost analysis because certain intangible costs and benefits were not recognized in his study (1968b:110).

Holbrook (1970) tried to determine the economic value of natural areas for recreational hunting in Kentucky. His computations were based on such variables as the propensity of persons to hunt a particular game species based on survey data, population of and distance to population centers within 160 miles, and size of the area in question. From his formulation, he arrived at some dollar values for game species. For the particular 7.97 square-mile area he applied his model to, he computed an average economic value of $1.70 ($2.71) per hunter-day, and the average annual grand total hunting value over the project life in 1960 dollars of $2440 ($3892) (1970:121).

Holbrook computed average economic value per hunter per square-mile per year and the highest values by county he arrived at were: fox and gray squirrels--$2.58 ($4.11), rabbit--$2.88 ($4.59), bobwhite--$3.31 ($5.28), "farm menace" (groundhog, crow, raccoon, fox)--$1.72 ($2.74), deer--$7.45 ($11.88), and waterfowl (ducks, coot, geese)--$1.72 ($2.74). These figures are based on survey data indicative of attitudes and preferences of Kentucky resident hunters and are not directly applicable to Michigan or any other state;

nevertheless, they do provide an insight as to the general value of recreational hunting lands for various game species.

Hammack (1969) concluded that the marginal net economic value of waterfowl was positive under certain circumstances. He found that the average amount waterfowl hunters would hypothetically have sold their hunting rights for a season (1967) for was $1044 ($1477). (This does not include 12.4 percent who said they would not sell their right to hunt at any price, and 1.4 percent who named a very high figure such as $1 million.) When asked what minimum costs would have had to have risen before the individual would have decided not to have gone hunting at all during the season, assuming hunting conditions remained unchanged, the mean amount was $247 ($350). Using a multiple linear regression analysis on data collected from questionnaires, Hammack calculated a value of $3.29 ($4.65) as a "first approximation of the marginal value of a waterfowl to the hunter, and hence as an approximation of a 'market purchase price'" (1969:59). (See also Brown and Hammack 1973).

The expensive program of pothole preservation for waterfowl on this continent is tied directly to waterfowl hunters. Crissey (1969:171) believes that this program merely supports a large harvestable surplus and that even if the numbers of potholes on the continent were reduced by 75-80 percent, no species of waterfowl in North America would be reduced to the endangered level, although populations would be lowered. If the objective was producing and

distributing a waterfowl population to supply nonconsumptive users, it would not be necessary to spend millions of dollars preserving pothole habitat, in Crissey's opinion.

Non-game Species.--What are the recreational values of species of wildlife which are not harvested and of which the approximation of a market value is even more difficult than with harvestable game species? Trends in participation in nonconsumatory wildlife activities, such as bird watching, are increasing at a more rapid rate than national population growth (Naiional Research Council 1963:19). Membership in the National Audubon Society has grown faster than the sale of hunting and fishing licenses in the past decade (Leonard 1965:424). Although hunting has historically been an extremely important activity both as a pastime and as a means of obtaining food, its future does not appear promising. Hunting is one of the very few outdoor recreational activities involving wildlife in which projections of future use decline both in relative and absolute numbers (Ciccheti et al. 1965:207-208). Participation in small game hunting in Michigan has declined significantly over the past few years (Manthy and Tucker 1972:10). (This does not take into account the introduction of put-take pheasant hunting in Michigan in the last two years.) According to the Canadian Wildlife Service (1964:8):

> The economic value of Canada's wildlife resources in relation to other recreations such as photography, nature study, and casual sight seeing is difficult to estimate, but it probably exceeds that of fishing and hunting. For thousands of people it is a rare privelege to observe a

> wild animal in its natural surroundings and preserve that memory on film. Interest in wildlife for its beauty and grace and novelty alone is growing and is a factor that cannot be dismissed in any assessment of wildlife's value to our economy.

Unfortunately, no one has attempted a rigorous economic analysis of the values of non-game species.

OTHER VALUES

Endangered Species.--Benefit-cost analyses discussing acceptable damage levels and avoidance costs are not very appropriate regarding endangered species. A marginal trade-off analysis cannot be used to decide on the survival or extinction of rare species. Society has recognized the special importance of endangered species, as evidenced by certain protective legislation (e.g., the Endangered Species Conservation Act of 1969 (16 USC 668aa et seq.)).

The Kirtland's warbler (Dendroica kirtlandii) is an example in which great expense is being incurred to protect a species with no direct market value. Over 7600 acres of state forest land were set aside in Michigan as a preserve in 1955, where forest management practices would be directed primarily at maintaining ideal nesting habitat. Another 4000 acres were added by the U.S. Forest Service in 1962 (Leonard 1965:424).

The National Research Council (1963:19) cited the example of the large number of tourists who travel to Texas each year to see whooping cranes (Grus americana). They note the importance of wildlife as a component of tourism as a major attraction on many areas, such as Everglades and

Yellowstone National Parks. Wildlife is the raison d'être for some parks such as Point Pelee National Park in Canada. Much of the attraction stems from the presence of rare or endangered species found in these parks.

For some endangered species, such as the California condor (Gymnogyps californianus), tourism cannot be used as an economic justification for their continued maintenance. The condor exists in such delicate balance with its environment, that

> perhaps no amount of money spent on avoidance costs can bring the level of pollutants low enough to preserve the condor, given the concentration effects in the food chain where small parts of toxicity become lethal dosages through successive species ingestion.
> . . . . . .
> The growth of the condor depends more upon some general feeling about the quality of life, some emotional feeling that Schweitzer called a reverence for life, or some intellectual perception that diversity, comprehensiveness, or elegance of design, in man or nature, is inextricably bound to the quality of life.... The decision process governing life and death issues...is not determined in market places, real or simulated, but socially and politically (Edmunds and Letey 1973:335-336).

Predatory species and bounties.--The Michigan Dept. of Natural Resources (DNR) recommended in 1971 complete removal of the bounty system of predator control (Arnold 1971). The USBSFW (1967:11) has also expressed opposition to any bounty system. The DNR report stated that the animals on which bounties were paid have never caused shortages of any game species in Michgian. Predators, especially foxes and bobcats, are an excellent recreational asset in their own right. Arnold stated that since 1935 Michigan has paid out $4,470,365 in bounties on 624,080 animals (wolves, coyotes,

bobcats, and foxes). Michigan still has a coyote bounty program which in 1970 cost the state $52,945 for 3,021 dead coyotes.

These figures cannot be used as accurate estimates of predator damages, since, as Bachmura (1971:689) commented, many species-preserving costs are overstated, especially regarding the costs of predation upon domestic livestock "without calculation of esthetic and educational benefits nor for allowance for the economic contribution they make by managing species stocks of their prey." There is much sentiment today for the preservation of all predators, especially all birds of prey (National Research Council 1970:260).

Wildlife, Agriculture, and Forestry.--Wildlife's impact on the cultural activities of agriculture and forestry is part of a complex ecologial interrelationship. Even the monoculture as generally practiced in this country is still dependent on a host of natural complexities. Taylor (1935) discussed the appreciable influence of animals on soils in general.

Although it is impossible to assess accurately the role that wildlife plays in control of insects and small mammals which damage crops, that role must certainly be considerable.

> The coyote preys on the field mouse and the extent of his control is only being properly appreciated now that he has been killed off in western agricultural areas by an extensive poisoning program. Birds feed on a great many insects that harm agricultural production and damage and kill commercial timber stands and shade trees (Canadian Wildlife Service 1964:8).

Many of the beneficial effects of wildlife may, however, have historically been grossly overestimated. For example, Hornaday (1913:213) made the following statement:

> In view of the known value of the remaining trees in our country, each woodpecker in the United States is worth $20 in cash. Each nuthatch, creeper, and chickadee is worth from $5 to $10, according to local circumstances...

(Twenty dollars of 1913 buying power would be about $95 in 1974 dollars.)

A rather famous bit of folklore concerns the purple martin which supposedly eats several thousand mosquitoes per day: hence, its desirability around homes. Kale (1968:659-660) found that mosquitoes are a neglible item in the diet of the purple martin. He stated that there is no evidence that any single bird species can control any insect species when that insect is near its peak abundance. He added that the esthetic qualities alone should recommend the purple martin as a valuable species to man.

Birds and mammals do, of course, reach pest proportions and cause considerable damage to some crops. Millions of dollars are lost annually from bird depredations, especially from blackbirds on the southern rice crop (Meanley 1971: 42). Rabbits can cause severe damage to orchards by girdling trees. These are only two of a multitude of examples.

Meadow mice and similar small mammals are the most destructive animals on the average farm. Allen (1949:18) discussed a grazing experiment in a Michigan hay meadow. In a fenced-in area where meadow mice were protected from

skunk predation, mice consumed more hay inside the enclosure than the flock of sheep grazing outside. He also reported that mice took almost half of a corn crop left standing over the winter in the shock.

To at least partially offset such destructive traits, small mammals may be a potent force in controlling any undue increase in insects in a forest environment. Hamilton and Cook (1940:470) found that with an assumed population of 100 small mammals of the six most constant species per acre, those mammals would consume 266 pounds of insects per year. They concluded that the role of small mammals in controlling forest insects has been underestimated and that mice and shrews, especially, are valuable in working the soil and destroying the larval and pupal stages of many insects. In addition they act as food for valuable fur-bearers and as buffer species for valuable game birds and mammals.

The role of reptiles and amphibians in the forest community is probably much less significant than mammals. Birds and mammals operating on a homiothermic budget are potentially heavy forest-insect predators. Reptiles and amphibians, on the other hand, operate on a relatively meager metabolic budget so the potential consumption per predator is not likely to be high (Buckner 1966:449). Amphibians and reptiles do, however, play an ecological role in the food-chain.

Bolle and Taber (1962) discussed the problem of the loss of game habitat for hunting, emphasizing the growing

dichotomy between the business unit and the household unit on the farm.

> [Even] if every hunter asked permission, closed gates, cleaned up trash, avoided frightening livestock and gave the landowner a nice Christmas present, wildlife habitat would continue to dwindle as the landowner improved his economic position (with government help) by making his fields larger, filling brushy draws, cleaning up his fencerows, silting or draining his potholes and straightening his stream channels (1962:260).

Today the trends in agriculture often make it necessary to subsidize farmers to get them to raise forests or wildlife (Leopold 1966:293). Apparently, few American farmers find pleasure in, or economic incentive for, wildlife husbandry.

Other Wildlife Costs.--There are, of course, many other costs which must be attributed to wildlife, especially with vermin species such as Norway rats, house mice, pigeons, starlings, and house sparrows. Many common species are potential transmitters of wildlife-born diseases (e.g., rabies and tularemia). Not readily apparent are the problems associated with some innocuous species which become pests in certain situations or under unusually large concentrations. Concentrations of blackbirds during the winter of 1973-74 were severe enough to have parts of Kentucky placed in a state of emergency (Detroit Free Press, Feb. 15, 1974:10-A). The USBSFW (1967:2) recognized that whether an animal can be categorized as either beneficial or injurious depends not on the species but upon the circumstances at a given time and place. The hazards that birds pose to modern aircraft, for example, are well documented (Graham 1972).

INCOMMENSURABLES AND ECONOMIC VALUE

Most of the techniques described in this report which approach the problem of wildlife valuation attempt to simulate an economic market valuation in one way or another. But what constitutes economic value in our society? When can an item be priced with a market value? How can wildlife, normally considered an incommensurable, be included in any kind of economic analysis?

Lacking a common unit of measurement, incommensurables cannot normally be compared. Hardin (1968) discussed the problem of maximizing "good per person" and asked:

> But what is good? To one person it is wilderness, to another it is ski lodges for thousands. To one it is estuaries to nourish ducks for hunters to shoot; to another it is factory land. Comparing one good with another is, we usually say, impossible because goods are incommensurable (1968:1244).

Barlow (1972:309) defined economic value as "a subjective concept that is dependent on the desire of people to possess and use property objects and upon their ability and willingness to offer money or other considerations in exchange for the privilege of ownership or possession." Economic worth does not necessarily imply any commercialization of the good in question, but rather a measure of what the consumer has been willing to give up in choosing to purchase or use a particular item (Clawson and Knetsch 1966: 214-215).

Economic value implies scarcity of the item in

question. Scarcity is a relative concept which implies that the quantity demanded is more than would be supplied at zero price (Davidson 1967:125). With wildlife, an animal may be scarce in an absolute sense, as for example, the Kirtland's warbler, or scarce in a relative sense, as for example, the timber wolf, which is scarce in Michigan but common in some places.

Economic value implies utility, but such is not necessarily the case (Barlow 1972:310). What is the utility of the timber wolf in Michigan or the California condor in California? These species serve very little tangible function, and yet as evidenced by the resources devoted to many endangered species such as these, very great economic value is imputed to them.

The economic value of an item can be considered to be measurable by market values when it has an acceptable market price set under market conditions approximating the results of perfect competition. Goods or services of this type have dollar prices that are considered socially acceptable as guides for policy decisions (Davis and Bentley 1967: 613). However, wildlife has been traditionally treated as a free good, especially on public lands, so perfect market competition does not exist (Pearse 1968a:87). According to the National Research Council (1970:47):

> A proper judgement of values or a choice among resource allocations must rest on a broader expertise than that of market economics. It must recognize the social and behavioral needs of man--parameters not adequately represented, for example, in the gross national product.

At such a point we define goods as having extra-market values--"those values for which no acceptable market price exists. Such values can be expressed numerically or verbally, but not in monetary terms" (Davis and Bentley 1967:613).

WILDLIFE, ECONOMIC ANALYSIS, AND DECISION-MAKING

There are some who believe that because of the far-reaching significance and importance of wildlife to our society it should be given an assumed priority over more materialistic claims on competing resources (National Research Council 1970:259). Looking at our history of resource allocation to date, with the failure of the present system of economic analysis of resources, such sentiment is understandable.

> We must be willing to stand up and assert that there are some things which we as a nation want, but which in purely economic terms would be described as valueless or sheer luxury. To preserve such values it may be necessary to decide a-priori that we want them and assign to them high priority without attempting to put a price tag on the benefit received. If we want a particular canyon, a rare species of bird, or a particular valley preserved because of its scenic beauty when threatened by some other use, strictly economic comparisons will seldom result in its preservation. The reason for this is that we have not found, and in my opinion we should stop looking for, ways of placing dollar values on scenery, on recreation, and on that intangible mental well-being which we associate with beauty... (Luna D. Leopold, "Water and the Conservation Movement," an address (1957), in Barnett and Morse (1963:28-29)).

Expressing a similar attitude, Dana (1951:37-38) stated:

> I don't think there is any possibility of developing an economic formula that will be satisfactory from our point of view and I think we are lost if we accept a challenge to do it. We have to justify what we want in this field on other grounds, the same as we develop

> public archives, museums, or art galleries that have values beyond their economic significance. Unless we take that position and put it on that ground, I think we will be lost. The economist is the only one who determines what we do with our land and resources in general, and I think we are fighting a losing battle.

If the only place we want to observe wildlife is in "ecological archives" then such an attitude may be acceptable. But has been emphasized in this report, wildlife has to compete with other uses of valuable resources at every turn, on almost every major construction project. Resource allocation decisions will be made with or without an acceptable method for the quantitative evaluation of wildlife, often to the detriment of our wildlife resources. Ciriancy-Wantrup (1955:680) stated:

> Whether the economist likes it or not, evaluation of [extra-market values] (and also dismissal of such evaluation) is already a part of the political process.... One may have professional doubts about some of the procedures used. Still, these attempts should be encouraged. Otherwise, the arguments of well-organized groups interested in market values alone, who dismiss these resources as 'intangible,' might receive disproportionate attention in policy decision.

No resource taken in an individual sense in priceless. Someone will put a price tag on any resource while environmentalists and ecologist argue about the ethics of such as approach. Davis (1963:241) observed:

> No goods are priceless in the sense of having an individual price. There is a limit individually and collectively [as] to how much real and personal wealth we would sacrifice to obtain any recreational experience or preserve any scenic resource.

A superior decision-making or policy-formation process is one in which the infusion of value judgements into

the analysis is minimized (Davis and Bentley 1967:614), but there is obviously no way in which those value judgements can be entirely eliminated. The complexities of such managerial problem-solving decisions can never become totally objective. Those vital decisions will ultimately depend on public values and their expression in the political system (Train 1972:121).

Economic analyses, such as benefit-cost analysis, will never be precision tools for obtaining general economic efficiency.

> In the last analysis, the responsibility for decisions must not, because it properly cannot, be shifted from the administrator dealing with the individual case to a departmental economist operating a prescribed formula. In a country where mistrust of government is rife, the temptation to substitute supposedly impersonal calculation for personal, responsible decision and to rely on the expert rather than size up the situation by oneself, cannot but be exceedingly strong; in a country where experts abound, there will always be plenty who will advocate that course.... One must never forget that though pure economics is a matter of logic, applied economics is a matter of informed common sense (Hammond 1966:221-222).

The problem at hand is to minimize value judgements in the best way possible. Even a rough method of quantifying wildlife values would be a step in that direction, for in the end, the only substitute for informed value judgements in the evaluation of public goods is uninformed value judgements (Davidson 1967:154).

RECOMMENDATIONS AND CONCLUSIONS

A Suggested Proposal for Quantifying Relative Values of Wildlife Resources

A suggested proposal for a technique to quantify relative values of wildlife resources is presented in this section in outline form. It incorporates ideas discussed in this report regarding human attitudes towards, and the many values of, wildlife. It is offered only as a starting point to generate further discussion and refinements towards a workable technique.

Requirements of the technique. A technique which can be used to quantify relative values of wildlife resources, in terms suitable for environmental impact statements, must meet the following requirements:

1) It must permit objective systematic comparisons of the wildlife resources on alternative sites.

2) It must be reasonably inexpensive to execute in terms of time and money.

3) It must not require exact wildlife population censuses (since exact census figures are usually impossible to determine, especially for mammals, reptiles, and amphibians). A species list and a fairly good estimate of the abundance levels of species would be needed.

4) It should yield a single numerical value for total wildife resources on the site.

The final value should:

5) Be specific to the site in question.

6) Be directly comparable to other values of that site.

7) Be based primarily, but not exclusively, on consumer preferences towards that wildlife.

8) Reflect primary benefits and costs to the public, including values for which no expenditures are made.

9) Account for levels of relative and absolute scarcity and/or abundance of different species.

10) Account for the variations in the general ecological quality at different sites.

11) Be in terms of some standard unit of time (e.g., dollars per year).

12) Be reasonable in amount (if in dollar units), and subject to justification.

Proposed Technique.--The following is a general outline of a possible technique that is proposed could meet most of the above requirements. It is patterned after an experimental-rating scheme for insect damage to forests proposed by Addy et al. (1971). It would incorporate the multiple values of wildlife discussed in this report, including preferences towards species by consumers. It would recognize that wildlife has positive as well as negative values. It would not, however, permit a valuation in dollar terms. The final value would have no absolute meaning; it would be useful only as a comparative value relative to other sites.

A separate value is computed for each species found on the site. The final index value for the site is the sum

of those values. Each species can obtain a total of up to 500 points, made up of five subtotals, each with a possible 100 points. These five subtotals are based on (1) abundance levels of the species, (2) esthetic or intangible values of the species, (3) ecological value of the species, (4) recreation values of the species, and (5) tha habitat suitability of the site for the species.

Each of these five categories are discussed below. Questions which would have to be considered for each category are suggested. Each answer would correspond to a certain numerical value. The 100 points making up each category would be some function of those scores. The answers are listed in a proposed order of decreasing value, but no attempt is made to place values on the various suggested answers. No attempt is made to define the mathematical function (e.g., some combination of summation and/or products of the answers). The questions and answers are offered only to suggest an approach to designing a workable technique.

I. Abundance Levels

1. On a continental scale, this species is considered:
   Ans: endangered,[1] rare, uncommon, common, abundant

2. This species is predominately a:
   Ans: permanent resident, summer resident, transient, winter visitant

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[1]This technique of evaluation is not really applicable to endangered species (see Endangered Species, pp. 94-95).

3. On site (and in season) this species is considered:

   Ans: rare, uncommon, common, abundant

II. Intangible Values

4. This species has _____ esthetic value (according to methods proposed in this report):

   Ans: High, Medium, Low

5. Other intangible characteristics of this species (such as behavioral traits, songs, etc.) have _____ value:

   Ans: High, Medium, Low

III. Ecological Values

6. On the site, or on surrounding areas, this species is:

   Ans: rarely offensive to humans in any way; repugnant because of habit; is occasionally offensive, as during population outbreaks; causes noticable economic damage; causes considerable widespread economic damage

7. As a predator, the potential economic impact[1] on its prey species is:

   Ans: positive, neutral, does not apply, negative

8. As a prey species, this species:

   Ans: is an important source of food for desirable predators; acts as an important buffer species for more valuable prey species; has neutral value; does not apply

IV. Recreation Values

9. Hunting pressure on this species on the site, or on surrounding areas, is:

   Ans: extremely heavy, heavy, average, light, negligible, not hunted

10. What is the degree of special local appeal above a statewide "norm" that this species has:

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[1]Negative: destroys desirable species; Positive: destroys undesirable species.

Ans: high degree above average, somewhat above average, average, somewhat below average, much below average

11. The importance of this species as an element of non-consumptive recreation is:

Ans: extremely important, very important, important, of little importance, of no importance, a hinderance

V. Habitat Suitability

12. How many acres of habitat suitable for nesting by this species are on the site:

Ans: number of acres

Research Needs

This techniques is proposed only as a very general outline of a possible approach to the quantification of wildlife values. It suggests the many topics for continued research which are needed.

I. Abundance Levels

1) How does the scarcity or abundance of a species affect its desirability to the consumer? Are rare species intrinsically more desirable?

2) How do you obtain accurate estimates of mammal, reptile, and amphibian populations on a site?

II. Intangible Values

3) Which consumer groups should be used in applying the High, Medium, or Low rankings (according to the methods proposed in this report) to species (i.e., those people who actually use the site or a more general population)?

4) What is a measure of the intangible values of animals, other than the appearance of the species (e.g., behavior, bird song, etc.), and how can that value be determined?

5) What is the nature of the characteristics of people which cause high variances in attitudes towards various species (e.g., age, education, etc.)?

III. Ecological Values

6) What roles do different species play in the food chain? What is the effect of the loss of species on the food chain?

7) How does the loss of breeding habitat effect different animals; do they displace to other, perhaps marginal, habitats, or are these animals lost to the breeding population?

IV. Recreational Values

8) How important are different species to non-consumptive forms of recreation, such as hiking, bird watching, snow-mobiling, etc.?

V. Habitat Suitability

9) Is it possible to predict the reprocuctive potential of species given only the habitat types?

VI. General Considerations

10) What is the effect of different types of developments on different wildlife species?

11) How can the impact on wildlife species be minimized in development projects?

Conclusions

It is my conclusion that it is not possible to develop a method of quantification of wildlife values, either in numerical or dollar terms, at this time. There are too many factors which are unquantifiable with our present knowledge of the role various species play in the ecosystem and in recreational activities.

It should be possible to eventually develop a workable model, such as the method outlined above, which will permit systematic objective comparisons of the wildlife values on various sites. Such a method will require much

more research into the areas suggested above. Research into the hazy field of consumer preferences of intangible values does force us to deal directly with the questions: "What wildlife species are we going to save, why are we saving them, how large a population do we need to save, and who are we saving them for?"

Although a complete method of economic analysis, which produces results suitable for rigorous benefit-cost analysis, may never be possible, research efforts in that direction are certain to aid in the decision-making process regarding resource allocations. Problems in decision-making can arise, however, when too much faith is placed on quantification based on unrefined techniques or based only on experimental research (such as this report). Administrators should not look for objective "equations" to solve questions of resource allocations where no such equations exist. However, any quantification of the values of wildlife species is useful as an additional tool which can be used to make what are essentially political decisions about resource allocations.

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