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thesis entitled
SURVEYS OF ATTITUDES AND OPINIONS
AS AN INPUT INTO PUBLIC POLICY DECISIONS
presented by
REBECCA L. JOHNSON
has been accepted towards fulfillment
of the requirements for
Master's degree in Agricultural Economics

For Dr. J. Manderheid for
A. Allen Schmid
Major professor

Date Nov. 8, 1979

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SURVEYS OF ATTITUDES AND OPINIONS
AS AN INPUT INTO PUBLIC POLICY DECISIONS

By
Rebecca L. Johnson

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

MASTER OF SCIENCE

Department of Agricultural Economics

1979

ABSTRACT

SURVEYS OF ATTITUDES AND OPINIONS AS AN INPUT INTO PUBLIC POLICY DECISIONS

By

Rebecca L. Johnson

Public input is increasingly being seen as a necessary component of the public policy making process. For various reasons, some representation of what the public wants is sought after by bureaucratic and legislative decision-makers. However, when opinion polls and attitude surveys are conducted, the rules of representation are unclear and inconsistent. To whatever extent the polls and surveys represent the various publics in our society, they do so at the discretion of the survey designer. This thesis looks at various ways that a survey design necessarily selects a particular public to represent.

In the arena of public policy making, budgets are finite and trade-offs must be made between competing programs. This awareness of competition between programs for scarce dollars is often lacking in the setting of a poll or survey. It is questionable whether surveys which do not force respondents to consider trade-offs can be useful guides for policy makers.

A State Forest planning effort which is currently using a survey as part of its planning process is analyzed as a case study in the final section of the thesis. The various points in the survey process which involve judgments determining whose preferences are to count, are identified and analyzed.

ACKNOWLEDGEMENTS

I would like to thank the following people who contributed in many ways to the completion of this thesis.

Special thanks go to Dr. Al Schmid, who served as thesis supervisor and inspired the research on this topic. His insights and thoughtful comments have been instrumental and invaluable.

I am also grateful to Dr. Larry Libby and Dr. Don Holocek who served on my committee and provided meaningful comments on the draft copy.

I wish to thank Jerry Thiede of the Department of Natural Resources who was continually willing to provide information on the management of the Pigeon River Country.

I am also grateful to my friend, Cindy Cordes, for all of her editorial and typing assistance.

A final word of appreciation goes to my colleague and friend, Steve Davies, for providing insightful dialogue and moral support throughout the research process.

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PART I
Chapter I

Statement of the Problem

Increasing numbers of attitude surveys and public opinion polls have been conducted in recent years. These polls and surveys have become important guides for public policy makers. In some cases, a measure of public input is mandated by law for an agency. For example, the National Environmental Policy Act of 1969 (NEPA) requires public involvement on all major federal actions and Executive Order 11514 requires agencies to develop procedures to assure understanding of proposed actions and to solicit public views (Erickson and Davis, 1975).

Such input might be accomplished through public hearings, workshops, referendums or public opinion polls. The choice of technique is usually left up to the agency. Those agencies choosing to use a poll or survey are also free to choose the type of survey to be administered. In many cases the agency contracts with a polling organization to do the survey for them. It is then up to the agency to clearly state the purpose and need for the survey. Since the polling organization will design the survey to meet the needs of its customer (the agency), the communication link between the two is important.

Even in cases where public input is not mandated, there is an ideological argument which says that in a democratic society, the public decision-makers should be responsive to expressions of demand by members

of society. When making decisions which involve resource allocation, these public representatives must attempt to reflect the "public's preferences." Many of the polls and surveys purport to be measures of "what the public wants" and are therefore useful to those people making public choices.

Political survival is another motivation in use of surveys. This involves finding out what the preferences of the politically powerful people are, not necessarily what the majority's preferences are. As Bartlett (1973) points out, politicians are vote-maximizers, but bureaucrats are security maximizers. Their security depends not on satisfying the majority of voters, since they are not directly accountable to the voters. Rather, they must satisfy those interest groups which have the power to terminate the bureaucrat's position. For example, an agent of a natural resources department may be very interested in the opinions of hunters in a particular area where the agent is proposing a land management plan. If the agent fails to satisfy the hunters, it is possible that the powerful conservation groups could force a transfer of that agent. At the same time, the agent may fail to satisfy a majority of the residents in that area, and yet it is unlikely that the majority will be well organized or will have intense enough interest in the issue to cause any trouble for the agent. In such a case, the agent may take a survey of hunters only to determine their preferences for alternative land management plans. The public agent is choosing which public is relevant to the purposes and interests of that agent.

Examples of public surveys with relevance to public decision-making are numerous. Carlson (1976) surveyed residents of Idaho to obtain "public preferences toward natural resources use." Since decisions have

to be made by the State which will allow and exclude various land uses, an expression of "public preferences" would be useful for making politically favorable decisions. The Congressional Record (12/13/69) includes results of environmental surveys which are supposed to represent "public attitudes regarding environmental improvement." A Congressman from Michigan used surveys in his newsletters to his constituents. He told them, "As Your Man in Washington, you may be sure that this "grass roots" expression of opinion from home will be of much assistance in my effort to represent our District in the Congress." (Chamberlain, 1972). Representatives for five major polling organizations were invited to a hearing before the Subcommittee on Economic Growth and Stabilization of the Joint Economic Committee (U.S. Congress, 1977). Senator Humphrey stated that "a better grasp of public attitudes, opinions and expectations is crucial to the work of this and all the other committees of Congress." The value of these pollsters' testimony to Congress was summed up in the following way by Senator Humphrey:

(This is) a rare opportunity to obtain a comprehensive assessment from leading experts about the views and expectations of the American people regarding some of the Nation's major economic problems and what the Government is doing about them. Specifically, I expect that you gentlemen will be able to give us a better understanding of how the public views the energy crisis and how it is responding to the proposals of the administration and Congress to deal with it in terms of conservation and taxing measures. By the same token, I hope that you will be able to bring into sharp focus the attitude of the public regarding the current state of the economy with its still intolerable level of unemployment and what effect this is having on consumer spending and saving plans. Moreover, I hope that we will get a solid reading on what the public thinks the Government is doing right and what it is doing wrong concerning these important economic issues.

A survey of the Dartmouth community (Community Resource Development, A Massachusetts Heritage, 1973) claimed it was "an aid to selectmen in

making wise decisions and to assist them in setting priorities for spending." The Indiana Survey (Gordon, Brooks and Ryan, 1973) was undertaken to assess preferences for community living. The results were to be "of use to public and private decision-makers who are trying to improve Indiana's communities." The survey is supposed to show what characteristics and services are preferred by residents. A survey by Marans and Wellman (1978) looked at the thoughts, expectations and activities of permanent and seasonal residents of the two northernmost counties in Michigan's lower peninsula. The survey was intended to "aid in the planning and environmental management necessary to protect regional natural attractions."

Massay (1978) did a study entitled "Attitudes of Nearby Residents Toward Establishing Sanitary Landfills" (1978). By investigating factors which may be influencing attitudes he hoped to offer suggestions that may be helpful in reducing citizen opposition toward selecting sites for sanitary landfills. Thus, the author was using the survey to find reasons why people either favored or opposed landfills and then these reasons could be thought of as targets for changing attitudes. For example, if people responded that they opposed sanitary landfill sites because they were concerned with possible odor, then the author proposes to politicians that they should convince constituents that the landfill will not produce odors and then opposition to the site will be eliminated.

The Michigan Public Opinion Survey (1977) was conducted to determine how Michigan residents prioritize community issues and spending of tax funds. The major purpose was to "provide county, regional and state leaders with information that could help them make decisions about community services." The authors concluded that this survey was useful

because "as public officials decide upon alternative uses of scarce tax funds for public services, they are interested in the needs felt by the people."

The Michigan State University Experiment Station did a longitudinal study in the Upper Peninsula to measure "satisfaction with Rural Communities" (1978). It stated that "county planners, legislators, Cooperative Extension Service Personnel, educators and others concerned with developing policies and programs related to rural areas like Ontonagon County must not only be aware of the value systems, goals and attitudes of the residents, but also base planning on them."

The Christian Science Monitor (1972) reported on a poll by 22 Representatives who surveyed their constituents on the question, "Should the Federal government expand efforts to control air and water pollution, even if this costs you more in taxes and prices?" They also reported that the "Congressmen receiving a loud-and-clear message from the voters include some lawmakers well positioned to shape federal policy accordingly." These included Gerald Ford who was the House Republican leader, John J. Rhodes who was chairman of the House Republican Policy Committee and a high ranking member of the Appropriations Committee, Wendall Wyatt, also on the Appropriations Committee, and M.C. Snyder on the public works subcommittee which writes much of the environmental legislation.

Referring to the National Wildlife Federation's environmental survey (1969), the Conservation News (1969) has said, "It's difficult to fathom why officials in both Executive and Legislative branches of the Government do not recognize this demand on the part of the people." Thus, it is expected that public officials will use the results of these surveys in their decision-making. The National Waterways Conference, Inc.

felt this same way. (They are a group for toll-free navigation.) They propose that a massive rural renewal program be started, utilizing water resource development and other economic tolls to revitalize rural areas (Newsletter, 1969). They cite support for this position from the results of two polls: one by International Research Associates of New York which shows 91 percent of Americans support water resource development programs. This poll was sponsored by the National Rural Electric Cooperative Association and used "methods proven to produce valid results as to public attitudes." The other survey, conducted by Gallup, shows that most Americans think rural areas and small cities are the most pleasant places to live. To say that these two results provide justification for spending on a massive water resource development program requires a long step in logic. Nevertheless, this is what the group was advocating.

The Randall, et al. (1974), Sinden (1973), Walsh (1978), and Brookshire, et al. studies are all examples of "bidding games" which are used to estimate values of non-market goods. These estimates could then be used in benefit-cost analyses when making decisions on public spending priorities.

The Tri-County Regional Planning Commission (TCRPC) used a survey along with a public hearing to get public reaction to proposed alternatives. The TCRPC was trying to avoid making politically unfavorable decisions since they stated, "Without public commitment, the clean water plan will be difficult to implement."

Finally, there are polls taken literally every day by Gallup, Harris and other major polling organizations which seek to get the public's assessment of present government decisions, as well as public

preferences regarding what decisions the government should make in the future. These polls include questions regarding new and proposed laws (e.g., "Do you favor a proposed law requiring drivers and passengers in cars to use both shoulder and seat belts?", Detroit Free Press, 1972); questions regarding public spending (e.g., "How serious a loss would it be if federal programs in certain areas were cut by one-third?", Harris poll, 1977); and questions regarding tax issues (e.g., "Do you favor cutting or limiting property taxes in the State of California?", Gallup poll, 1978).

All of these surveys claim to be useful for public officials in discerning what the public's opinion actually is. Unfortunately, there is no single "public" for which all policies are relevant. The public may mean all U.S. citizens or it may mean all U.S. citizens over 18. It may mean only those registered to vote. It is also true that the boundaries of "the public" will change as the level of government involved changes (i.e., the meaning of "the public" to the federal government is not the same as the meaning of "the public" to a state government.) To be useful, "the public" which any survey instrument actually selects must be the same public which is of interest to a particular policy maker.

In addition to this concern of who "the public" is for any policy maker, there is the problem of how these people should be represented in any policy making process. In our system of voting in the U.S., each qualified person (registered voter) is allowed one vote. In a survey this would be analogous to presenting the response choices "Yes or No," "Agree or Disagree," etc. However, a bureaucratic policy maker is not restricted to using this type of representation when doing a survey. Instead, the policy maker may be interested in allowing those people with

intense preference or opinions the opportunity to express them. The survey might then have the response choices "Very Strongly Agree, Strongly Agree, Agree, Disagree, Strongly Disagree, Very Strongly Disagree." This example shows how a policy maker can decide issues of representation while seemingly undertaking the "technical" task of designing a survey.

Two difficulties have been distinguished that the policy maker using surveys can encounter. One is the problem of doing a technically valid survey. This involves such things as choosing a truly random sample, using unambiguous questions, making proper statistical computations, etc. (See Birch and Schmid, 1978, for a discussion of internal and construct validity of survey designs.) However, even if a given survey is technically valid, it may be invalid or ambiguous for the purposes of a given policy maker. There may be two different surveys, each done technically correctly, which measure different aspects of a public's opinion, and the policy maker would then have to make a normative judgment as to which one (if either) is best for his/her purposes. For example, a survey might accurately discover that a majority of a city's population favors a clean air program, while another equally valid survey finds that air pollution is tenth on a list of the city's "most pressing problems," and crime prevention is number one. If only the first survey was done (perhaps funded by the "Citizens for Clean Air"), the mayor may use the results as justification for more spending on air pollution controls. In reality, the majority of the residents of the city might rather have that money spent on crime prevention. Therefore, by choosing who to survey and what type of survey design to use, an analyst is making a political choice. As a result, some people's preferences will count and others' will be neglected. Too often this choice of survey design is approached

as a technical question, rather than a process involving political choice. Unless it is recognized that political choices are being made, there will not be public awareness and debate on the choices and uses of survey techniques. If people realize that there are winners and losers in the polling process, they might become more interested and involved in it.

Purpose of the Paper

This paper will analyze the different aspects of survey design which can have an effect on the results of any survey. An attempt will be made to look at some of the ways a survey technique can be altered which may lead to different measures of "public opinion." Again, there is no search for a "correct" survey technique since there is no unambiguous "public opinion" which exists and merely needs to be accurately measured.* Instead, an analysis can show which public has its preferences promoted by a particular survey design. Thus, the paper will look at a number of different polls and surveys and classify them into major types of survey designs. The policy validity (Schmid and Birch, 1978) of different types of designs will be explored. This refers to the application of survey results to policy and the implicit choices that are being made of whose preferences count.

Finally, a case study will be analyzed where a citizen advisory council was given two different types of surveys covering the same topic. This experiment was done with the cooperation of the Pigeon River Advisory Council (PRAC) which provides public input into decision-making regarding the Pigeon River Country State Forest (PRCSF). The members of this

*There are, however, many technically incorrect survey techniques and some of these will be mentioned along with possible remedies for them.

Council had been the respondents of a previous survey done by the Department of Natural Resources (DNR). This was an actual case where surveys were being used as a way of measuring "what the public wants" before land use decisions were made. The results of these surveys and their different implications for policy will be discussed.

PART II

There are three major areas within survey design which can have an effect on the final results of any survey or poll. The first is the choice of who to survey. The analyst has a particular group in mind as the target of the survey. It may be the "general public" or it may be a political, socio-economic or other subgroup of the general population. The second area of survey design is the choice of how to survey. This involves different methods of asking questions and different techniques for measuring responses. The third area is the choice of aggregation technique. Individual responses must be compiled and summed into a reasonable number of categories for meaningful analysis. The number and types of categories and their weights must be decided upon by the analyst. Each of these three areas will be discussed in more detail below.

Chapter II

Choosing Who to Survey

This problem is analagous to choosing political boundaries for voting. Those within the boundaries will have representation while those outside the boundaries are not represented, even though they may be affected by political decisions made by the group within. However, survey boundaries differ in many ways from political boundaries used for voting. The survey boundary can be changed as the group of interest to the analyst changes. For example, a congressman may survey his constituents for their attitudes on issues which are before Congress (Congressman Chamberlain Reports, 1972). In this case the survey boundary coincides with the political boundary of the congressman. But the Governor of the same state (Michigan) may turn to the Michigan Public Opinion Survey (1977) to find out what "his public" wants. The major polling organizations (Gallup and Harris) conduct numerous national surveys which are intended to reflect what "the American public wants" (Washington Post, April 28, 1969; Louis Harris, September 20, 1978; State of the Nation, 1974; Wyoming Eagle, June 20, 1978).

Many surveys don't conform to political boundaries at all, but rather attempt to address a particular geographic or interest group. Thus, an agency proposing a clean-up effort on a particular river may survey residents of the river basin (Tri-County Regional Planning Commission, 1978). An agency which is attempting to measure recreational

benefits from a particular river may survey the people engaged in recreation on that river (Sinden, 1973). If a recreation planner does a survey to try and determine recreational "needs" for a given area, the planner must consider particular client groups that recreation has.

Hatry, et al. (1976, p. 46) include in these groups:

- individuals in different neighborhoods or regions,
- male vs. female, since the recreational interests often differ between the two,
- age groups--the very young and very old have special needs in terms of recreational facilities,
- individuals with handicaps,
- individuals without access to an automobile,
- low income families,
- users of specific types of recreation (e.g., golf, tennis, hiking).

If the planner does not make an effort to include and identify these groups when deciding who to survey, then the results may lead to inappropriate recreational facilities being planned.

It can be seen that the boundaries of the survey can be changed in an infinite number of ways. Therefore, it is important that the analyst realizes the political choices that are being made through this process and whether these implicit choices coincide with the explicit statements of who the analyst represents.

Another way in which survey rules differ from voting rules is that surveys don't attempt to get a response from everyone within the boundaries. Voting rules state that a person must be over 18, must be a citizen, and must be registered, and then anyone within these limits is allowed to express their preferences in an election. With a survey,

limits are also set. Usually only people over 18 are considered and they often must reside within a relevant geographic area. But within these limits, the analyst must use some selection technique to reduce the number of respondents to a workable number. Randomization is almost always used in these cases. Thus a check is usually made on the characteristics of the sample population to see if they coincide with the characteristics of the latest census taken in the area. If there are discrepancies these are usually reported, but the survey is seldom redone to try to correct for a "non-representative" population (see for example, Walsh, et al., 1978).

Regardless of the randomization technique that is used, there are ways in which the selection of respondents will result in a selection of whose preferences are to count. In some cases, the voter register is used, which means that people who are most likely to register to vote (higher income, higher education) will also be the people represented in the poll. There are certain areas where a voter register may not be at all appropriate for getting a representative sample. Such would be the case in a small college town where students make up 80 percent of the population, but where most of the students vote in their home towns. Another example might be a seasonal tourist area where population doubles during the peak season with second home owners. Whether the analyst wishes to include these temporary residents should depend on the purposes of the survey. But these temporary residents should not be excluded merely because the analyst found the voter register to be the most available information.

In other cases a city or other type of official directory is used. Depending on when the survey is done, however, these directories may be

out of date since they are only compiled periodically. The periodic nature of this process might result in more permanent residents being represented more than transient ones. Another method that is used is the random selection of names from phone books. While it is true that most households have telephones (Walsh, et al. found approximately 93 percent of the Ft. Collins and Denver area households had telephones), the people who are not listed in the phone book are most likely either very rich or very poor. Therefore, it is not just a random group of diverse people that are being left out by this method.

A seemingly impartial rule which is used in some surveys is to take only one response from a household. However, at least one survey has found that this leads to under-representation of females in the survey. Walsh, et al., found that a number of female family members requested that their spouse provide information for the survey. "In most of these cases the husband was the traditional family spokesman and the wife requested that he provide the necessary data" (p. 22). Thus, a rule which appears to exclude people at random, actually excludes a particular subgroup of the population.

In any of these general population type of surveys it may be useful to check the characteristics of the sample with those from a previous census as was mentioned earlier. Care must be taken to ensure that the relevant geographic areas of the two studies are the same and that the census is not too far out of date. However, since the characteristics of the respondents are not known until after the survey is completed, it is difficult to go back and repeat the survey using a different group of respondents.

Chapter III

Choosing a Survey Method

There are many elements of the actual administration of a survey which can have an effect on the results. The most important is probably the type of question which is used. But also a factor is the manner in which the questions are asked. The three techniques most often used are mail, telephone and personal surveys. Often there is a combination of these where an advance contact is made by mail or telephone and then the actual survey is done in person.

Telephone Surveys

The telephone survey has the previously mentioned characteristic of only reaching those segments of the population which have telephones. If a phone book is used to obtain the numbers to be called, then there will also be the problem of only surveying those people with listed numbers.* Furthermore, a telephone survey will tend to represent more heavily those people who spend time at home than those with irregular home schedules. It is also possible that a particular member of the household (i.e., the housewife) will be the more frequent respondent to telephone surveys, since they are more often at home.

*However, this can be avoided by simply finding out what telephone exchanges are used in any area and then dialing the last four digits randomly. Then no phone book need be used.

Mailed Questionnaire

The mailed questionnaire can also result in unanticipated problems for the analyst. As Moser and Kalton (1972) point out, the responses on the returned questionnaire have to be accepted as final. It can't be discerned if more than one person actually filled in the answers or if the respondent discussed the questions with someone else before answering. It can't be known whether the respondent was unclear as to the meaning of certain questions and therefore answered randomly just to fill in the blanks. Any additional reactions to questions, outside of what is written down, will not be known (Moser and Kalton, pp. 260-261). These limitations would be especially relevant for respondents with low levels of education or when a survey is unusually complicated.

Possibly the most important problem with mailed surveys is not getting an adequate return rate. But of more interest here is not just the return rate, but whether certain groups within the population are more likely to return mailed surveys than other groups. Heberlein and Baumgartner (1978) have done a comprehensive study on the factors which affect response rates to mailed questionnaires. The number of contacts that the analyst made with the respondents was the overwhelmingly important factor. Contacts include introductory or lead letters, the actual questionnaire, and any follow-up letters. The second important factor was issue saliency, i.e., whether the respondents were interested or concerned about the issues in the questionnaire. It is not surprising that people who feel they have the most to gain or lose on a particular issue will be the most willing to express their opinion on that issue. Heberlein and Baumgartner also point out that "attitude questions often involve a response choice in which the individual may be ambivalent or

undecided about the alternatives. Such cognitive exertion may be sufficient cost to the respondents to deter some from completing the questionnaire" (p. 460). However, this means that the analyst must be careful when interpreting the results from a survey. To take a hypothetical example, suppose a questionnaire asks, "How concerned are you about water pollution? Very concerned; Somewhat concerned; Not very concerned; Not concerned at all." If 80 percent of the questionnaires are returned, the results might be that 30 percent said "very concerned," 30 percent said "somewhat concerned," 20 percent said "not very concerned" and 20 percent said "not concerned at all." These results could be reported as "a majority of the public is concerned about water pollution." However, suppose that the 20 percent of the respondents who did not return the questionnaires were people who were not concerned at all and therefore did not bother to fill out the survey. Then what "the public" actually feels will have been misrepresented. Of course, there is no way of knowing what the non-respondents actually feel on an issue, but Heberlein and Baumgartner's findings on issue saliency should be considered if a survey has a very low return rate. In particular, gross statements about "what the public feels" should be avoided.

Other factors were also found to be significant in affecting response rates of mailed surveys. Government sponsored research which was labeled as such got higher response rates. This apparently increased the perceived importance of the survey and made respondents feel more "obligated" to return it. Techniques such as using special delivery or registered mail had the same effect. In general, if the survey can make the respondent feel that her/his opinion matters, then there is a greater chance that the survey will be returned. Walsh, et al., took advantage of this technique

in their survey on recreational benefits of improved water quality. An introductory letter was sent which said that there was no obligation to participate in the survey, but that those who did may influence future water quality decisions (p. 22). While this may be effective in getting responses from those who are interested in future water quality decisions, it does not make the issue any more salient to those who are unconcerned. Perhaps saying that the respondents may influence future government spending on water quality would make the issue salient to more people.

Heberlein and Baumgartner also found that students, employees and military personnel are more likely to return a questionnaire. ("Employees" refers to questionnaires sent out by a company to its employees.) Again, there are the factors of issue saliency and feelings of obligation which probably contribute to this finding.

In general, the study found that to increase returns, the analyst could either lower the costs involved in completing and returning a questionnaire (e.g., postpaid return envelopes, forms which are easy to fill out), or increase the motivation of the respondent to overcome the cost barrier. It was found that a monetary incentive was significant in increasing the initial response rate (as opposed to increasing the response rate after follow-ups). This incentive may be effective for getting returns from low income respondents, especially if the incentive is high enough. If it is only a small amount of money offered, it may just make the survey appear more important if someone is willing to pay for responses.

The important point from these findings is that certain subgroups of the population may be more likely not to return questionnaires, which could lead to under-representation of these groups in the sample. Depending on what the results are used for, this lack of representation can lead to

poor political choices. A survey of Dartmouth, a fast growing college town, was done to get an expression of "community opinion" (Community Resource Development, A Massachusetts Heritage, 1973). The report stated, "As an aid to selectmen in making wise decisions and to assist them in setting priorities for spending, here are some of the indications as to how residents of Dartmouth responded to the questionnaire." The survey was to find out what the most adequate and inadequate community services and facilities were. However, only 15 percent of those surveyed returned the questionnaire. Male responses almost doubled female responses and about half of the respondents were 40-64 years of age. A great majority had 12 or more years of education and almost all owned their own home (which seems rare for a college town). Yet, the report called this "a fine sampling basis for obtaining local opinions." Based on the characteristics of the respondents, it is doubtful that college students are represented at all. If these results are used to guide public spending on new community facilities and services, then a political choice has surely been made as to who will have influence on those public decisions. It is very possible that the "selectmen" feel that property owners should have more weight in deciding where public money should be spent, but then such a political value judgment should be stated rather than implying that decisions will be made based on the "community's opinion."

While a survey which includes questions on demographic characteristics can provide a check on the representativeness of the sample, it is still a normative decision that must be made by the analyst as to what constitutes "representativeness" for his/her purposes.

Personal Interview

The personal interview is the preferred method of most analysts for doing a survey. Of course, there are trade-offs in the convenience and lower costs of telephone and mailed surveys which have to be considered before deciding to use personal interviews.

In a one-to-one situation the interviewer is able to interact with the respondent and help to make the questions more clear or understandable. (This can also be the case with telephone interviews.) Additional comments that are made by respondents can also be noted. In Mitchell's (1978) environmental survey, he used a lengthy "debriefing" of the interviewers afterward to get additional information about how the respondents answered questions, which ones they had trouble with, and any additional responses that weren't written down. This additional information can give the analyst good clues about the construct validity of the questionnaire (i.e., whether the questions are asking what they are intended to ask).

The personal element of the direct interview has a different impact than the impersonal nature of a mailed questionnaire. When standing face-to-face with someone there is a subtle pressure not to appear uneducated or naive. Thus, many people will answer questions that they either don't know about or don't have an opinion about the subject matter, just to avoid saying "I don't know." The respondent may also feel a pressure to be polite to the interviewer and therefore try to answer questions that really haven't been thought about. The opposite may also be true. A person may feel that someone who comes to their door asking questions is nosey and rude and therefore doesn't deserve to get any straight answers. The respondent may answer in whatever way she/he thinks will get rid of

the interviewer the fastest. Certainly the appearance of the interviewer will have an effect on how the respondent feels about being questioned. It has been suggested that middle-aged, slightly overweight women are mostly likely to get true responses when doing a survey. Apparently people do not want to feel inferior or threatened by the person who is asking them personal questions. It would follow that people in lower socio-economic groups would more often feel threatened by an interviewer and would therefore be less likely to give their true responses. Systematic biases of this type should be watched for.

Timing of Surveys

Another aspect of survey methodology which can have an effect on the results is the timing of the survey. There are two timing effects that should be considered as factors. The first is the timing of the survey in relation to the entire decision-making process. It will make a difference in the final policy whether the public is included in the beginning when alternatives are first being suggested, or in the end when a final alternative is being approved (Erickson and Davis, 1975).

The second effect involves the timing of the survey in relation to the state of current events. The numerous Gallup and Harris polls are usually done in response to some controversial issue which is currently in the news. Examples are the polls on Proposition 13 and related tax issues in mid-1978 (Newsweek, June 19, 1978; Wyoming Eagle, June 20, 1978) and environmental attitude polls in the late sixties and early seventies (National Wildlife Federation, 1969; Christian Science Monitor, 1972). It is not so much a question of whether these polls are measuring the public's attitudes correctly as it is a question of whether government representatives should be basing policy decisions on the results of such

surveys. Earl Shorris (1978), in his short article entitled "Market Democracy, The World According to Gallup," has pointed out that constant reactions by politicians to opinion polls will lead to instability in government. The continuity that was provided for in the constitution is being undermined by this new wave of single-issue politics. While this is one person's opinion, it does point out the important impacts that polls and surveys are having, and especially the importance of the timing of the survey. Schmid and Birch (1978) have also asked "whether the survey question can ever approach the political reality where choices are grouped, compromised and traded off. The usual survey question presents choices as if each were to be decided on its own merits." (p. 5) This is one aspect of the policy validity of surveys. The factor of timing has to be considered as crucial when surveys are used in the political arena.

Construction of the Questionnaire

It was stated previously that the most important factor which influences survey results may be the actual construction of the questionnaire. This includes question wording, the order of the questions, additional information which is included with the questionnaire, and the type of question being used. These variables will affect the internal and construct validity of a survey, but here the relationship to policy validity will be explored, i.e., how different survey constructions result in different expressions of the "public's opinion."

Question Wording

Question wording here means the type of words that are used in a question. The most obvious problem occurs when words are unfamiliar to

the respondent. If a question is asked which uses large, uncommon words, the respondents with lower education levels will have difficulty understanding what is being asked and accurately expressing their opinions. Such questions may lead to a large number of "don't know" responses which would leave only the higher educated group being represented.

Problems can also arise with ambiguous, misleading or slang words. Words have different meanings and connotations to different people. The analyst must be sure that the intended meaning is conveyed to the respondents or the results won't be meaningful. The National Rural Electric Cooperative Association did a survey to find "the public's attitudes toward rural electric cooperatives" (1968). One question asked whether people preferred to have:

- (a) Electric cooperatives owned by the consumers,
- (b) Private electric companies,
- (c) City-owned electric companies.

The result was 31 percent, 29 percent, and 25 percent respectively. However, the authors recognize the importance of using the word "cooperative." They state, "the term "cooperative" in itself is a major positive element. (People feel it) is a more "human" supplier, more concerned about the consumer, more accessible to him." The question that must be asked is whether people have these feelings about electric cooperatives because of their past experiences with them, or because of past associations with the word "cooperative." Do the results of such a survey tell a city whether it should turn its public utility over to the consumers?

Many of the environmental surveys use words whose meanings are insufficiently clear. "Pollution" will have a different meaning for someone living in a rural environment than for someone living in a city.

There will also be differences between people's ideas of what it means to "fight pollution." A Harris poll in 1971 (Christian Science Monitor, 1972) asked if Americans would pay \$15 per year in added taxes to fight pollution. Although 59 percent said yes, this doesn't really say how people want their taxes spent. One person may envision the extra taxes being spent to clean up a local river while another might see the money being spent on auto emissions control. The results of such a survey don't help public officials decide where to spend public money. The issue of trade-offs in public spending priorities will be discussed more in a later section.

Another environmental survey, sponsored by the National Wildlife Federation (1969), asked questions regarding "our natural surroundings." Again, an urban resident will have a different concept of our natural surroundings than a rural resident. An environmentalist will have a different concept than an industrialist. Therefore, when asking "how much would you be willing to pay each year in additional taxes earmarked to improve our natural surroundings?", the answers will be ambiguous. What are people really saying they are willing to pay for? It isn't clear from the question being asked. It is also true that words like "natural surroundings" carry some connotation of intrinsic worth. People feel that they should be willing to pay to improve their natural surroundings regardless of what those surroundings are made up of. Whether people are really willing to pay for a water pollution program or for an urban renewal project has not been addressed.

Another example of ambiguous question wording was found in the Congressional Record (1969). Mr. Mondale had entered into the record a series of articles from the Minneapolis Tribune by Richard P. Kleeman. It had been stated that 82 percent of the public was interested in

conservation based on the responses to the question, "Conservation refers to conserving our natural resources. How much interest do you have in conservation?" This "definition" of conservation which is included in the question really doesn't help to clarify the meaning of the term. Conserving our natural resources may mean absolute preservation to some people and prolonging the life of natural resources to others. It is difficult to see what directions for public policy such a survey result could give to the members of Congress.

The Order of Questions

It has been documented that the order in which questions are presented is a factor in determining the responses. This is especially true for telephone or personal interviews since the respondent cannot see all the questions before answering any one of them. In a mailed survey, Moser and Kalton (1972) have pointed out that information provided in a later question may be used in answering an earlier one (p. 260). This may or may not be a problem depending on the purpose of the survey. It is certainly true that information from earlier questions will be used in answering later ones also. More important than just additional information from other questions is the influence that this information has on the respondent. If the additional information just adds more "facts" so that the respondent can make a more informed judgment, this probably wouldn't interfere with the purpose of the survey. However, if the additional information persuades the respondent into thinking that a "correct" answer exists which is different from his/her own, then the analyst would not be getting a true measure of the respondent's preference or opinion. An example may be the National Wildlife Federation's survey (1969) where the first question was, "You may have heard or read claims

that our national surroundings are being spoiled by air pollution, water pollution, soil erosion, destruction of wildlife and so forth. How concerned are you about this? -- Deeply concerned, somewhat concerned, or not very concerned." The respondent is immediately alerted that this is an environment survey and has been informed that "Our natural surroundings are being spoiled." Rather than trying to honestly answer each following question, the respondent may identify her/himself as either an environmentalist or an anti-environmentalist and then answer the remaining question on that basis.

Other ways that question order can have an effect have been demonstrated by Carpenter and Blackwood (1977). They did an analysis of variance on the results from varied question ordering on each of four different types of surveys. The ANOVA results "showed persuasive position effects for three of the four scaling metrics" (p.ii). The most variation resulted from criterion effects, which are the effects of rating any given item on the scores for subsequent items (i.e., the criterion for evaluation of an item would be influenced by the foregoing item or items, either by the specific content of the item or merely its presence or absence).

The study that the authors used was a nationwide survey of attitudes of adults toward wild and domestic animals and their treatment by man. On a "scale 0 - 10 certain items" type of survey, they found that when an item is first in the list, the lack of evaluative reference points results in the assignment of extreme values (either high or low). As the item's position was varied down the list, the scores progressed to the alternate extreme. With a "modified magnitude estimation" technique the respondents were asked to rate 16 animals on a scale from 0 - 100 points,

according to how much they liked them. They were to assume that a deer was worth 50 points. The authors found that animals received their lowest score when in the first four positions and the highest score in the last eight positions. This suggests that it took at least three to six animals before a criterion for evaluation was established. Perhaps the first few animals were evaluated with reference to the deer, but then these first items become the references for later items. Overall, the order effects resulted in a great deal of variation in the ordinal ranking. Carpenter and Blackwood say that the criterion effect could probably be overcome by acquainting respondents with full or partial lists of the items before evaluations are to be made. The surveyor could also provide three or four "throw away" items at the beginning of the list. Another suggestion is to randomize the order or presentation among surveys so that the position effects are also randomized.

The findings of Carpenter and Blackwood clearly show that two different surveys dealing with the same issue can result in two different measures of "public preferences." It is not possible to say that a particular question ordering is the "correct" one. As with the other factors which influence survey results, the analyst must be aware that these problems exist and that by choosing a particular survey design, the analyst is choosing to weigh certain people's preferences more than others (e.g. choosing to give greater weight to the first four items in a ranking survey). If the analyst is making these types of political choices, then those choices should be open to review and debate by the public, just as any political choice should be.

The Type of Question Used

The type of question refers to the form of the question and what responses are available for the respondent to choose from. Moser and Kalton have said, "for virtually every conceivable question, there are several possible, and theoretically acceptable forms; in choosing between them, knowledge of the survey population and subject matter, common sense, past experience and pilot work are at present the surveyor's main tools" (p. 308). Using these tools should lead the analyst to a choice of questions form which is most appropriate for the analyst's purpose. But these tools will not lead to a choice of a "correct" measure of the "public's opinion." Rather, they will lead to different aspects of the opinions of different publics. Preferences and opinions are multi-dimensional and any particular question will serve to bring out just one dimension of those preferences. The different question forms can be analyzed as to which dimensions each form serves to emphasize.

Open-Ended Questions

If the respondent is free to answer a question in his/her own words, then the question is open-ended. Allowing a respondent to choose his/her own method of expression is felt to lead to truer representation of opinion or preference. Countering this argument is the one which says that people are not good at expressing their preferences unless they are allowed to choose among various responses. Polls of the type which ask "What do you feel is the most pressing problem facing our society?" and allow the respondent to answer freely often get different results than a survey which asks, "Which of the following problems facing our society do you feel is the most pressing? Inflation, Crime, Unemployment, Pollution, etc." (e.g. Harris & Assoc., 1971). There may be a problem

listed which the respondent didn't think of when answering freely, yet may be very concerned about. It might be hypothesized that people with lower education levels would have more difficulty answering the open-ended questions. Schuman and Presser (1977) have found that question form does make the least difference in responses for the most educated groups. The authors were testing the assumption of "form resistant correlations" which says that even if marginals cannot be trusted due to question form uncertainties, associations between variables are not subject to this same instability. They found that the assumption of form resistant correlations must be rejected when open and closed versions of the same basic item are considered. Since they found that form affects the less-educated groups more, the form becomes a self-selection procedure-- i.e., it is not a random experiment anymore.

It is also likely that issues which receive the most media attention will most often be cited in open-ended questions. Thus, the timing of the survey would be extremely important in these cases. Also, special interest groups with the resources to make the public aware of their issues will have their issue cited more often in these types of polls. Therefore, those groups with the most money and influence on the media may receive more weight in a political decision which uses open-ended polls as a basis for "what the public wants."

Even if open-ended questions were better ways of getting people to state their true opinions, there are trade-offs in convenience which the analyst must consider between open-ended and forced choice questions. It is very difficult to aggregate diverse responses to a question into a reasonable number of categories. A set of rules must be developed which will determine what "type" of response goes into what category.

For example, problems dealing with air and water pollution, nuclear wastes, congestion, land use and overpopulation might all be categorized as environmental problems as opposed to other categories such as crime, drug abuse, inflation, etc. Such a gross categorization scheme could be misleading with respect to where public spending should be directed. Members of Congress could use such results as "justification" for spending on whatever types of environmental problems they were interested in. If people want to be represented in public decision-making they should be concerned about the survey techniques which are used to measure their opinions.

Forced Choice Questions

As mentioned earlier, forced choice questions have the advantage of convenience over open-ended questions. They are more convenient for respondents, which should lead to higher return rates, and they are also more convenient for the analyst in terms of aggregating results. Obvious problems with the forced choice questions include not offering a wide enough array of questions and "leading" people to respond in certain ways by the choices which are available.

While the list of responses should not be so long as to deter the respondent from reading all of them or to confuse the respondent, it must be long enough to cover most choices that are actually available. For example, a hypothetical question might ask how much people would be willing to pay in additional taxes each year for improvement of the environment. If the responses to choose from were "a small amount such as \$10 or less, a moderate amount such as \$50, or a large amount such as \$100 or more?", the only way for a respondent to answer "none at all" would be to choose "a small amount such as \$10 or less." If

half of the "small amount" responses were actually "none at all" responses, then the government might raise taxes by much more than people were actually willing to have them raised.

Surveys should also include the possible responses of "No Opinion," "Don't Know," or "Not Relevant." This would keep people from answering questions that really do not measure their true opinions. People may still be reluctant to say "I don't know" or "I have no opinion on that" but these choices should at least be available.

The Rural Electric Cooperative Association did a survey (1968) in which the available responses to choose from may have "led" people into responding in a particular way. The survey listed "virtues" of different communities and asked people to indicate whether "Big City" or "Rural" communities were more likely to have those characteristics. "No Difference" and "No Opinion" were also offered. However, their "virtues," along with the labels "Big City" and "Rural" were very stereotypical in terms of what we have all been led to believe big cities and rural communities are like. Their "virtues" included, "To be in good health," "To be very honest in their business dealings," "To have a lot of tension and pressure in their daily lives." This type of survey tends to confirm whether certain stereotypes exist with respect to big city and urban living. For example, most people felt that more poverty is found in the cities than in rural areas and that housing conditions are worse in the cities. In fact, the poorest of the poor live in rural areas. While it may be useful to know that people have misinformation about different communities, this shows how responses can be influenced by factors other than people's attitudes. Attitudes are certainly a function of the knowledge that people have, but attitudes based on

misinformation may not be relevant as guides to public decision-making. A decision is always made by an analyst as to whether people are informed enough to offer useful opinions. If the analyst uses an attitude survey which does not supply preliminary information, then it has been implicitly decided that people's attitudes (based on whatever information they already have) are relevant in the policy process. Alternatively, the analyst may wish to educate the respondents in some manner by supplying preliminary information with the survey. The amount and content of this information will have an effect on survey results, but the decision to include or not to include information must be made.

A problem can occur when a policy maker uses an independent attitude survey as input to the decision making process. If a decision is to be made on whether additional health care facilities should be constructed, then a question such as, "Do you feel rural health care facilities are adequate?" would be more appropriate than using the results of someone else's survey regarding attitudes about rural health. For example, a survey in which people identify "rural" with "being in good health" does not mean that these same people feel that rural health facilities are adequate or any better than those in big cities.

Ordinal Ranking Surveys

The ordinal system involves presenting the respondent with a list of items and then asking for a ranking of the items according to some specified criteria. The criteria may be how much the respondent likes each item, how important each item is (to the respondent, to the nation, to the region, etc.), or perhaps how deserving each item is for additional public spending. By definition, the ordinal ranking can only reveal the

order of preference, it can say nothing about the interval between successively ranked items.

As mentioned before (Carpenter and Blackwood), the results of a ranking survey can vary depending on the order that the items are presented. Randomization of the presentation order among the respondents should serve to randomize the bias. This will add to the costs of doing the survey, however.

Carpenter and Blackwood also found that if a ranking survey is combined with a "distribute 100 points" among alternatives survey, that the ranking of the results will no longer change with different orders of presentation. The respondents were first asked to rank three alternatives and then were asked to distribute 100 points between the three alternatives. It was felt that the ranking which was done first might give the respondents a chance to crystallize their ideas about the subject.

The results of most ranking surveys will show how important the respondents feel different items are. But as with the force-choice questions which ask "how concerned" people are with various items, these surveys are not necessarily useful for directing public spending. While people may feel a public program is very important, they may not feel that any more money needs to be directed to it. There are few people who would say that national defense is not important, but there are many who feel we should not spend any more money on it. (Chamberlain, 1975; State of the Nation, 1974) Therefore, it may well be that the fifth or tenth most "important program" is where people would like to see more government spending (e.g. Michigan Public Opinion Survey, 1977).

To try to overcome this problem, the analyst can include a second type of question which asks the respondent to indicate whether "more,

less or the same" amount of money should be spent on each item. There are two potential problems which should be noted with respect to this type of question. First, there is no constraint on the amount of money which can possibly be spent. The respondent is free to answer "more" for every item. There is no explicit warning that doing so would lead to increased taxes. Thus, the tendency is for people to allocate more money to programs than they would actually be willing to pay for. In the Michigan Public Opinion Survey (1977), statewide there was no item which a majority of people said should receive less public spending. Perhaps there is no desire for cuts, but other evidence of tax revolts question this.

The second problem is that knowledge or lack of knowledge of what is currently being spent on each item can affect whether people answer "more, less or the same."

In one environmental survey (Congressional Record, December 20, 1969) the sample was divided in two, and half of the respondents were given a card showing the percentage of the federal budget now being spent for various purposes. The card included: Defense--44%; Health, Labor and Welfare--28%; Agriculture--2%; Education--2%; Natural Resources--1%. The effect of supplying this information as to current federal budget allocations was to increase by six percentage points the support for spending on natural resources. It could be expected then that environmentalists would like to have this information supplied on such a survey. If they have the resources to do so, they have an access to a form of political power. It would result in extra "weight of public opinion" for the environmental issues.

Ratio Scale Surveys

If more information is desired than just the ordinal ranking of public issues, a ratio system can be developed which can give some indication of the size of intervals between successively ranked items. A ratio scale measures relative values, not absolute values. Thus, it can say how many times more or less one item is preferred than another. A ratio scale requires that some initial value be assigned to one of the items. Then the other items are compared to that benchmark.

In the survey reported on later in this paper, it was found that the ranking obtained by an ordinal survey differed from the ranking which was obtained from the results of a ratio scale method. The item which moved the most places in the order was the item which was used as a benchmark.

Carpenter and Blackwood have also found that the order in which the items are presented will affect the values that the items are given. The first and last few items were given extreme values (either high or low) in all cases. The change in order for the benchmark may be explained if the first items were evaluated with reference to the benchmark, while after that, the first items became references. As the list of items gets longer, it is less likely that the results of an ordinal scale will produce the same rankings as the results of a ratio scale. This does not, however, mean that the results of either method are more "correct" than the other. The ratio method can supply more information to the analyst than the ordinal method, but there is more chance that people will become confused when trying to state their preferences on a ratio scale. Hamblin (1976) includes the following suggestions for experiments using magnitude scaling in order to increase construct validity:

- 1) Use a standard (benchmark) whose level or value does not impress the respondent as being either extremely low or extremely high.
- 2) Present alternative items which are likely to be both above and below the standard.
- 3) Call the standard a number like "10" that is easily multiplied and divided.
- 4) Assign a number to the standard only and leave the respondent free to decide what he/she will call the other items. Don't label the minimum and maximum for the respondent.
- 5) If possible, vary the standard among respondents or repeat the survey using a different standard, for it is risky to decide the form of a magnitude function on the basis of data obtained with only one standard.
- 6) Randomize the order of presentation, although it is usually helpful to start with items which are not likely to be extreme and thus are easier to judge.
- 7) Use a group of respondents large enough to produce a stable median. Twenty to thirty will be large enough to obtain parameters which vary plus or minus five percentage points.

It can be seen that there are many ways that a ratio scale survey can be done which would result in misleading measures of preferences. Therefore, the person designing the survey has the power to influence the results. This is true with regard to any type of survey. The analyst can only strive for internal and construct validity within any survey technique. Further normative choices still must be made.

Explicit and Implicit Trade-Off Questions

Many surveys ask for people's preferences for government spending on various programs. Since government budgets are finite, more spending in one area requires a trade-off for less spending in some other area. While these trade-offs are always present implicitly, they are not usually considered by the respondents to surveys unless the question requires them to do so. Failure to consider budget constraints and explicit trade-offs among spending categories can create problems of interpretation for a public decision-maker.

Surveys which have implicit trade-offs can be of many types. They may be open-ended or forced choice questionnaires which ask for people's preferences for community or government services. In these cases, even the fact that government spending must occur is implicit rather than explicit. The consequences and trade-offs resulting from that government spending are also implicit. For example, the Indiana Survey (1973) presented a list of community services and asked which ones were desirable to the respondents. Yet, it was never specified how these services were to be supplied, nor how they were to be paid for. Also from this survey, the results showed that within a community, the most preferred residence location is outside the city limits but within a 15 minute drive. However, the problems of urban sprawl that would accompany any program which catered to this preference were not included in the survey. The analysts stated that this preference "has obvious implications for land and energy use" but they have no idea whether people would still prefer to live 15 minutes outside the city limits if the energy and land use problems were considered. It is difficult to see how such a survey can provide "useful information for decision-makers" as the analysts claim it will.

The survey sponsored by the National Rural Electric Cooperative Association asked the question, "In some areas the government has developed rivers for various purposes--such as water supply, recreation, flood control and pollution control. Do you think the government should continue to develop rivers in this way or not? Should continue--91%, Should not--7%, Don't know and no opinion--2%." These results were interpreted as showing great "support for government involvement in the development of rivers" (p. 12). However, the respondents have not been asked to compare government spending in this area with any alternatives. These results don't say anything about what budget levels for water development should be. Yet, as Birch and Schmid pointed out, when results such as these are used for political influence, "there is often a suggestion that the named item should continue or increase while some unnamed item is reduced. Political choice of budget allocations may be influenced by who has the resources to do a single item survey and call attention to a particular item" (p. 9).

In some surveys, the trade-offs are explicitly stated. When asking for opinions on Proposition 13, the Gallup Poll asked if people favored tax cuts even if it meant a reduction in certain government services. (Newsweek) Although the exact amount and nature of the trade-off involved was still unknown, the respondent had to at least recognize that trade-offs were necessary.

"Budget pie" surveys are sometimes used to measure people's preferences for areas of public spending. Asking people to budget a finite amount of money among alternative public programs is one way to force people to consider the trade-offs which are implicit in public spending decisions. The budget pie may be presented graphically as an

actual "pie" and then respondents are asked to divide the pie into pieces which represent the allocations of the budget to some set of goods or services (McIver and Ostrom, 1976). Alternatively, the respondent can be asked to distribute the budget in terms of percentages. The various goods and services would be listed, and the respondents would be asked to state what percentage of the budget should be spent on each item. The requirement that the responses add up to 100 percent must also be included.

It is very possible that people with lower education levels would find the graphic presentation much easier to understand than the numerical presentation. Working with percentages and making sure they all add up to 100 percent might keep some people from ever completing the questionnaire.

In general, the budget pie survey will be an easier task for those people who are familiar with the budgeting concept and with government budgets especially (e.g., more educated; males more than females, perhaps). These people will be able to better express their preferences on such a survey. Additional information can be included with the survey which can assist those people unfamiliar with budgets. As learning occurs, however, a different set of preferences will be counted than if the additional information had not been included.

It was noted earlier that when people are told what the current federal budget is and then asked to alter it, different results are obtained than when this information is not available (Congressional Record, December 20, 1962). This was true across education and income levels. The major effect was for people to allocate more money to those categories which received the smallest part of the budget. In that

particular survey, however, respondents were allowed to say "more spending" for all categories rather than forcing respondents to reallocate a finite budget. By presenting a budget pie with the current government budget represented and then asking respondents to alter it as they like, the finite budget concept can be used along with additional information for the respondents to use.

Implicit in the budget pie survey is the assumption that people understand how public spending results in actual outputs of goods and services, i.e. they understand the production functions and how money is converted to performance in the public sector. The categories of the budget that are presented to the respondent are also relevant here. A person may allocate extra money to the "health care" category in order to increase aid to elderly people, while in fact health programs for the aged are included under the "welfare" category (Birch and Schmid, 1978). Again, those people with greater understanding of public programs will be better able to have their preferences counted. Since there is a substantial knowledge assumption in most budget pie surveys, McIver and Ostrom point out that for certain populations under certain conditions, the budget pie is ideal, but for others it is improper.

Another type of survey where trade-offs are implicit is the willingness-to-pay survey. In this case the analyst is asking the respondent to allocate personal finances rather than government monies. The characteristics of a finite budget and therefore trade-offs among areas of spending are also present in the individual's case. Therefore, if the "budget pie" concept is missing from the survey there is likely to be misrepresentation of preferences.

By asking people what they would be willing to pay for a particular public program, the analyst may hope to "justify" an increased tax for that purpose. People may say they "favor" certain programs or are "concerned" about certain problems, but this does not mean that they would be willing to pay for the support of the program. Therefore, it is hoped that through asking willingness-to-pay, a truer measure of preferences for areas of public spending can be obtained.

Willingness-to-pay surveys are also used to derive values for non-market goods. Unfortunately, there are some problems inherent in using a willingness-to-pay survey. The most obvious is that what people say they are willing to pay may not correspond at all to what they would pay if they had to.

A Louis Harris survey (1971) points out that just changing the question from "what would you be willing to pay" to "what would you pay" can make a difference in the results. This problem may stem from putting people in a hypothetical situation that they are not familiar with. For example, never having paid for a good such as environmental quality, people have no past experience on which to base their response.

Also, many respondents may not be familiar with the good being considered. If a survey is asking for willingness to pay for wilderness recreation, those respondents who have never participated in wilderness recreation have no basis to compare this good with other goods they may be familiar with. If a particular good is not familiar to a socio-economic group (e.g. wilderness recreation and low-income urban residents), then members of that group may have a particularly difficult time articulating their preferences.

The results of this type of survey may also be misleading because the respondents are only asked to consider one area where they would be willing to spend more money. A single item survey which asks people if they would be willing to pay a small amount, such as 50 cents per year for that item, is likely to result in a large "yes" response. But if many items were included in the survey, all asking for 50 cents per year, people would begin to consider trade-offs and less "yes" responses would be recorded. Unless these trade-offs are measured, items will be over-valued as a result of a single item survey. Analysts at the Westwater Research Centre (Westwater, 1973) commented on the results of a poll which showed that about half of the respondents would be willing to pay an additional fee for cleaning up the river. They stated, "This may be an expression of concern reflecting current popularity of environmental issues more than a careful appreciation of the goals of public spending."

Many of the questions surrounding the validity of the consumer's surplus concept apply to the validity of the willingness-to-pay survey. If people actually had to pay for items which they currently receive free, then each consumer of that item would have to reallocate spending across all the items in his/her budget. How such reallocations would affect price levels and quantities of goods sold, cannot be predicted in advance. Thus, there is no way of telling whether each person would actually end up paying what they said they were willing to pay for a particular item. This may be particularly true when they see what others are actually paying. While there is probably some amount that people would pay, it is impossible to predict in advance what that value is.

Another factor in the willingness-to-pay survey which can affect the results is the method of payment that is specified in the question. In Sinden's 1973 study on valuation of water-based recreation, he asked both the willingness to pay an entrance fee to an area and the willingness to travel an extra distance to a particular area. He found that people were more willing to travel extra distances than they were willing to pay entrance fees. The author suspected that respondents did not give true responses to the entrance fee game, maybe because respondents felt that true responses would lead to an extra fee being charged the next year.

Walsh, et al. (1978) used a survey to measure benefits for improved water quality. Two different methods of payment were used which were through increasing sales tax and through increasing the water bill. The results showed that respondents were willing to pay more for improved water quality when the method of hypothetical payment was an increase in sales tax. The authors felt this may have resulted from perceived inequities between the two methods of payment. Everyone, including tourists, must pay a sales tax whereas only property owners pay the water bills.

Randall, et al. (1974) used four different methods of payment in deriving "benefits of abating aesthetic environmental damage." These were a sales tax game, an electricity bill game, a monthly payment game, and a user fees game. It was felt that different subgroups of the population would be familiar with different methods of paying for environmental improvement and therefore the different groups should be surveyed using the vehicle of payment most familiar to them. For example, residents of the area were asked to play the sales tax and electricity bill games, while tourists and recreationists were given the user fees survey.

A third subgroup, the residents of Indian reservations in the area, were asked to play the monthly payment game, which was based on a single monthly payment with no particular vehicle for payment specified. The total bid from the sales tax game was on the order of four times greater than the total bid from any other game. The importance of choosing an appropriate method of payment can be seen from this study. Recreationists coming to this area may overstate their bids if asked to play the electricity bill game. They would be assured that regardless of their bid, they would never actually have to pay it. Thus, the weight of their preferences would be "inflated" by this technique.

The above discussion also relates to the problems of respondents deliberately lying to influence the results of the survey. If a person feels that there is something to be gained by misrepresentation of preferences, then there is an incentive to lie. Sometimes the survey will be designed to try and keep the respondent from knowing the actual purposes of the survey. For example, a survey tried to find how much compensation people would accept for the coming of the Third London Airport (Paul, 1971). To try and avoid questioning people who would have incentives to lie, those questioned were people from areas thought to resemble Third London Airport sites, but far away from any proposed site. The subject was then asked to imagine that he/she was moving and had found a house which satisfied all the main requirements, including price. The subject was then told that this satisfactory house was not available, but the agent had eight more possible others within his price range. Each of the eight differed in one respect from the satisfactory house. Along with defects such as being too far from shopping areas and having no place for a car, the following three items occur:

- i) One is close to a major airport so that you often find that conversation is interrupted.
- ii) One is very close to a motorway. There is no danger, but the heavy traffic goes on night and day.
- iii) One is a few miles from a major airport. Conversation is never interrupted but on some occasions you may have to concentrate to hear what people are saying (p. 315).

The subject is then asked of each of these eight imaginary houses, "How much cheaper than the original one would each of these have to be before you would consider taking it?" This lengthy process was designed to conceal for respondents the true nature of the inquiry, and thus reduce incentives for lying. However, Paul contends that this very process results in unreliable responses. He says, "It is difficult to see how reliable answers can be obtained to questions whose assumptions contradict reality because their purpose is being sedulously concealed from those questioned." (p. 316) That is, respondents are supposed to assume that houses are available for any price which they wish to pay for them. A respondent may answer with a very low price thinking that she/he could resell for much more soon after buying it and still avoid aircraft noise.

Thus, the analyst faces the problem of doing a realistic survey which gives people a motive for lying, or doing an unrealistic survey whose results are difficult to interpret. One suggestion to avoid these problems is to specify to respondents that the only way to obtain the item (whether it be environmental quality, recreational areas, educational systems, etc.) is through the bids of respondents. Further, it should be specified that each "consumer" of the good would pay for it on a similar basis (Randall, et al., 1974). This should reduce the effect

that the free rider characteristic of public goods has on understatement of willingness to pay. However, it also incorporates a particular political value judgment.

The degree of aggregation of the categories of choice can also be a factor in willingness-to-pay surveys. If a broad category such as "environmental quality" is used, the people who would only be willing to pay for some part of environmental quality (e.g., clean air, but not clean water) will be lumped with people willing to pay for many aspects of environmental quality. When a decision has to be made on whether to spend scarce public funds on water pollution programs or air pollution programs, the result of such a survey will not serve as a very useful guide. On the other hand, categories can be too disaggregated, increasing the chances of leaving a particular good out. Therefore, in the Walsh, et al. study (1978), the definition of "recreational enjoyment" was left up to each individual respondent since any definition of water-based recreation activities provided by the interviewers might have omitted an activity for which the respondent would be willing to pay. Groups with unique recreational interests (e.g., whitewater canoeing, kayaking) would be especially prone to underrepresentation if the categories of choice were not complete.

A final factor which can have an effect on willingness-to-pay games is the implied distribution of property rights that is implied by the rules of the game. A question which asks "How much would you be willing to pay for a clean environment?" implies that polluters have a property right in the environment and must be compensated for any reduction in pollution. Alternatively, a question which asks "How much would you have to be compensated for impairment of a clean environment?" assumes a different

distribution of rights. Randall, et al. used both versions of the game in their study. The compensation question was, "If you owned the environment and therefore had the right to insist on its preservation, would you be willing to accept X dollars per month rental payment from the coal-electricity industry if the environment was damaged as shown (in the following photographs)?" The authors note, however, that compensation games are not based on behavioral patterns routine to the respondents. Thus, the responses may be unreliable.

These two different measures of "value" which are derived from these games are known as equivalent and compensating variation. In theory, and in empirical studies, the compensating variation is always greater than the equivalent variation (Brookshire, et al.). In the Randall, et al. survey, 61 percent of the respondents answered that an infinite amount of compensation would have to be paid to them for damage of their environment. The authors felt that these results did not indicate that literally no finite sum would be sufficient, but rather that the respondents "would demand compensation sufficiently high that the industry would find abatement less expensive than paying compensation" (p. 19). These results could have profound implications for policy making. If public officials decide that the right to a clean environment is held by the public, then this type of study would indicate that abatement regulation should be mandatory. However, the trade-offs which would be forthcoming from such a policy have not been considered by the respondents of this survey.

While there are many shortcomings of willingness to pay surveys, Randall, et al. have offered suggestions for approaching an internally valid survey design. These include:

- there must be realism--credibility in the hypothetical situation.

This can be achieved by test items which have properties similar to those in the actual situation.

- the situations posited must be concrete rather than symbolic.

- test items should involve institutionalized or routinized behavior, where role expectations of respondents are well defined.

- where the behavioral predispositions under study are affected by attitudes about a number of different things, the test instrument must be designed to focus upon those attitudes which are relevant.

- in bidding games for public goods, the test must be designed to avoid effects of the free rider problem which encourages non-revelation or misrepresentation of preferences.

While these suggestions may lead to a valid survey design, they do not necessarily lead to greater policy validity. If a policy maker is going to use bidding games as guides for public choices, then trade-offs in the public spending area must be presented to the respondents. Care must be taken to find if a particular interest group in the population has had its preferences weighted more heavily by any given bidding game.

Chapter IV

Aggregation and Reporting of Survey Results

The aggregation of responses to open-ended questions has already been discussed. It involves making normative decisions about whose preferences are going to be lumped together with others. There is always the trade-off between getting disaggregated, well defined expressions of preference and having a reasonable number of categories to work with. Especially in reporting the results of a survey, it is easier to make general statements if the categories are more aggregated.

With the simple, dichotomous response questions the respondent is only allowed to answer "yes or no," "agree or disagree," "concerned or not concerned," etc. These questions cannot say anything about intensity of preferences. One respondent may agree intensely while another mildly disagrees, yet their preferences are weighted equally when the results are reported. For a person who wishes to use survey results for political influence, these dichotomous response questions may be very useful. A statement can be made that most people are likely to either agree or disagree with, and then the report of the results can be very persuading. For example, a Harris survey asked if people agreed or disagreed with the statement, "environmental problems are really not that serious in New York State, and all the fuss is mainly the work of a few loud trouble-makers." Since only 13 percent agreed with this value-laden question, Harris reported that the citizens of New York are surely

concerned about environmental problems (Harris, 1971). Yet, the response to this question says nothing about whether people feel environmental problems are more serious than other problems or what the people would like to see spent on environmental problems.

When a third category of "don't know," "no opinion," or "not sure" is included with the dichotomous responses, the reporting of results can be even more misleading. The results of one Harris poll were reported by the Washington Post (April 29, 1969). The headline of the article said, "Public Backs ABM, but Many Have Doubts." The actual results of the survey were 47 percent agreed to go ahead with the anti-missile system, 26 percent disagreed and 27 percent were not sure. Thus, even though the "disagree" and "not sure" responses taken together are greater than the "agree" responses the newspaper said that the public "backs" the ABM. In fact, in a later question which said, "We could have used the \$7 billion better for education, health, housing and poverty needs at home," 49 percent agreed while 31 percent disagreed. A great deal of political influence may have been generated by a headline which only considered the results of one question in the survey. Earl Shorris (Harpers, 1978) has said that the use of surveys by politicians results in only "yes" or "no" being heard. Minorities are not counted and he feels that this runs counter to the Madisonian notion of diversity. The use of polls and surveys by politicians should be analyzed more carefully.

While greater disaggregation of categories of choice can allow a truer indication of preferences by the respondents, the results are often not reported in their disaggregated form. The effect of disaggregating the scale is to reduce the support for the two extreme positions. People are more likely to respond that they are "somewhat concerned" or that they

"mildly disagree" rather than answer "very concerned" or "strongly disagree." When the results of a disaggregated scale survey are used for political influence, the mild and strong responses are often aggregated and reported as just "support" for one position or another. In a survey which was entered into the Congressional Record (12/16/69), it was stated that 82 percent of the public was interested in conservation. However, this was an aggregation of the actual indication of interest which was "a great deal--48 percent; some interest--34 percent."

When the National Wildlife Federation reported the results of its environmental survey, it stated that three out of every four respondents favored setting aside more land for conservation purposes. The actual results were that 51 percent said they favored setting aside a small amount of land, 18 percent said a moderate amount, and 4 percent said a large amount.

In ratio scale surveys (including willingness-to-pay and budget pie types) decisions must sometimes be made about whether to discard extreme responses. The advantage of using the ratio scale is that intense preferences can be measured, and therefore a decision to throw out extreme responses may negate this advantage. However, the ability for a respondent to influence the results intentionally is much greater with a ratio scale survey. If a respondent feels that his/her interests can be furthered through survey results, then the ratio scale facilitates the ability of the respondent to influence those results. The analyst can only use judgment in deciding whether extreme responses are actual measures of intense preference or merely fabricated responses intended to influence further policy.

When aggregating survey results involving dollar sums, the analyst must ask whether a dollar to one person has the same meaning as a dollar to another person. Consider the case where a dollar is taken away from one person and given to another. From the point of view of society, the net wealth change is zero. Yet, it is uncertain whether the utility lost by the first person is equal to the utility gained by the second person. Especially if the first person is poor and the second rich, there may have been a net utility loss. This may also be thought of in terms of expenditures on public programs. A program which spends fifty cents on every person below the poverty line may result in a greater increase in total utility than a program which spends a dollar on everyone earning over \$50,000 a year. The first program may also be more politically favorable and therefore add extra utility to the politician who supports it.

In willingness-to-pay surveys, the individual dollar amounts that are offered are usually summed to represent the aggregate amount that people would be willing to pay. However, there is some doubt as to whether this represents the value (utility) of the item being considered. A poor person values the marginal dollar that he/she offers much more than a rich person does. If the poor person had more money to start with, then she/he may be willing to pay more for the item. Thus, the difference in their willingness-to-pay may stem only from their initial wealth positions, rather than from differences in how they value the item. The policy maker must ask if it is actual willingness-to-pay or if it is the value of the item to the respondents that is of interest.

Like other statistical measures, the results from surveys can be manipulated and reported in different ways. Merely saying "three out

of four" rather than "75 percent" may have a different impact on the recipient of the information. When the results of surveys are used for political influence, the reporter will want the results to sound as impressive as possible. Therefore, preferences which are moderate are often lumped together with those more extreme in order to show greater support for any particular issue.

PART III

A case study will now be examined where a survey was used to guide public decision-making. An experiment was also done where two different survey designs were used to measure the preferences of the respondents. There are various possible explanations for divergent results of these surveys, but what is important is whether either of them favors the representation of particular interest groups. Thus, construct and policy validity of these surveys will be analyzed.

Chapter V

The Department of Natural Resources (DNR) in Michigan is one agency that is using a survey in some of its planning processes. The Forest Management Division is currently adopting a comprehensive plan for the Pigeon River Country (PRC) (Thiede, 1978) and they are using a technique called goal programming (GP). This technique, which is described in the next section, is very conducive to getting involvement of some of the public in the planning process. Part of this involvement includes surveying the relevant public to measure preferences for alternative land uses within the PRC.

The PRC is located in the northern part of Michigan's lower peninsula (Figure 1). It includes 600 square miles, of which 228 are in fairly solid state ownership. In 1918, a herd of Rocky Mountain elk were planted in the area and this herd quickly increased its numbers to around 500 by 1927. The elk were protected until a limited season was conducted in 1964-65. This reduction, combined with many other factors such as more mature forests, more disturbances from people and increased poaching, all led to a serious decline in the elk herd. By 1974-75 there were only 200 elk estimated to be left and continued survival of the herd became questionable. The response by DNR was to make elk survival a key goal in managing the PRC.

At the same time though, other interests were claiming to be "key values" of the PRC. Oil leases were let in 1968 and oil was actually

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discovered in 1970. Exploratory work has shown that sizable oil and gas deposits are located in the southern one-third of the Pigeon River Country State Forest (PRCSF). This work brought immediate opposition from environmentalists who were eager to save one of the last semi-wilderness areas in lower Michigan. A court case ensued in which the environmentalists argued that oil and gas drilling would lead to the end of the elk herd. The court, in early 1979, ruled in favor of the environmentalists.

While the elk herd and the oil wells are the two most seriously conflicting uses of the PRC, there are many other uses which also involve interdependencies. Thus, the DNR decided that a comprehensive plan should be developed for the PRC which would be based on:

- 1) Regional demands for all major resource outputs,
- 2) Resource capability within the area,
- 3) Expressions of public preference.

Such a plan would be developed using the goal programming framework.

Goal Programming

Goal Programming (GP) is a mathematical optimization technique which is a modification and extension of linear programming (LP). Like LP, the GP model also has an objective function to be satisfied, subject to certain constraints. It differs from LP, however, in three important respects. Rather than having an objective function which either maximizes or minimizes one goal, the GP model allows multiple goals to be considered in the objective function. A single goal with multiple subgoals or multiple goals with multiple subgoals can be incorporated into the framework. The model also allows the goals to be ordinally

ranked such that the more important goals can be achieved before less important ones are considered. Perhaps most important for use in land management, GP can handle goals which are quantified in non-homogeneous units. Therefore, the analyst can state the goal for timber in board feet, for camping in camper-days, and for deer population in herd size. The traditional LP problem of having to put all goals into a dollar or value measurement is avoided. The way in which GP does these things is discussed in the next section.

Since GP is a linear mathematical model, it incorporates certain assumptions which may or may not be limitations on the applicability of the model. The fact that the model requires linearity in both the objective function and the constraints means that any given change in the activities will proportionately affect the outputs. For example, if one acre of land provides three visitor days of recreation, then the model assumes that ten acres will provide thirty visitor days. Linearity also implies that average values will not change as quantities change. That is, quantity must not be so large as to affect factor and product markets. The assumption of additivity also is present which requires that activities be independent so that the sum of the outputs of the individual activities equals the output of the combined activities. The assumption of divisibility means that all activities or variables in the problem can be divided into smaller and smaller parts. This may be a limitation for multiple land use analysis since units of animals cannot meaningfully be divided beyond one. Usually rounding would be adequate in these cases. The GP formulation also requires that the problem be finite, or that there be a fixed number of activities. For example, a definite planning or management period must be specified. The model is

also deterministic. This means that for given inputs, outputs will occur with certainty. This assumption should especially be kept in mind when interpreting the results of a GP analysis of a multiple-use State Forest. The results will only be as accurate as the production functions that are specified and it is difficult to predict types and quantities of outputs that can be provided from a large forest area.

Besides these inherent mathematical limitations of GP, it must be kept in mind that such a model does not make all the decisions for the analyst. The model is only a tool which takes what is given to it and manipulates this input in an ordered fashion. Many subjective decisions must be made both in specifying the input and in interpreting the output.

The Model

A GP model consists of an objective function, which includes the ranking of goals, and linear constraints. The constraints are either system constraints representing relationships among the variables, or goal constraints which define the relationships between the variables and the goals.

The concept behind the objective function of a GP problem is that deviations away from stated goals are to be minimized. For this purpose, the objective function takes the form of a distance function, where the distance is measured by the difference between the stated goals and the attainable values as determined by the solution (Bell, 1975).

Bare and Anholt (1976) have described a general form of the GP model in the following way:

$$\text{Minimize } Z = w_1 d^- + w_2 d^+$$

$$\text{subject to: } Ax + Id^- - Id^+ = b$$

$$Bx \{ \leq, =, \geq \} h$$

$$x_j \geq 0 \text{ for all } j=1,2,\dots,n$$

$$d_k^- \geq 0 \text{ for all } k=1,2,\dots,m$$

$$d_k^+ \geq 0 \text{ for all } k=1,2,\dots,m$$

$$d_k^+ + d_k^- = 0 \text{ for all } k=1,2,\dots,m$$

where,

$w_1, w_2 = (1 \times m)$ vectors of priority factors ($P_k, k=1,2,\dots,m$) for ordinal ranking, and differential weights ($a_{i,k}, i=1,2,\dots,m; k=1,2,\dots,m$) for cardinal weighting within a given priority rank. These weighting vectors can, therefore, be expressed as:

$$w_\ell = (a_{1,k}, P_k, a_{2,k}, P_k, \dots, a_{m,k}, P_k), \ell = 1,2 \text{ and } k=1,2,\dots,m.$$

$d^-, d^+ = (m \times 1)$ vectors of negative and positive deviational variables representing negative and positive deviations from goals.

$b = (m \times 1)$ vector of desired goal levels.

$A = (m \times n)$ matrix of coefficients which relate the technical relationships between decision variables and goals.

$x = (n \times 1)$ vector of decision or choice variables.

$I = (m \times m)$ identity matrix.

$B = (r \times n)$ matrix of coefficients which defines the technical relationships between decision variables and constraints.

$h = (r \times 1)$ vector of constraint levels.

$n =$ index referring to the number of variables.

$m =$ index referring to the number of goals.

$r =$ index referring to the number of constraints.

The w_1 and w_2 in the objective function are defined so that goals can be ranked in a preemptive, ordinal fashion (P_k), as well as with differential weights ($a_{i,k}$) which are a cardinal ranking within a given priority level. Bell (1975) argues that preemptive priority factors are not the same as an ordinal ranking. The preemptive priorities require

that the first goal be achieved completely before going on to the second, and this implies that the first goal is infinitely better than the second. An ordinal scale, however, merely states the order of goals and says nothing about the interval between them. To avoid the assumption of infinite weights, and also to reduce the size of the matrix, Bell suggests that only cardinal weights be used. However, this would require some common denominator of value between all the goals. Putting cardinal weights on goals is much like trying to put prices on them (except only relative values are needed such as a ratio scale), and with non-market goals this is very difficult. Bare and Anholt argue that Lee's (1972) algorithm for solving the GP problem is conceptually based on an ordinal ranking and yields an ordinal solution. It is true that when preemptive priority factors are used, lower goals will only be considered after higher-order goals are achieved, so the importance of a valid ranking system is apparent. Sensitivity analysis can be used if the analyst is unsure about goal levels. In this way, many runs of the program can be made with alternative ranking schemes, and trade-offs between the goals can be established. When the trade-offs are available, the task of ranking becomes easier.

GP For Use In Land Management Plans

GP is becoming increasingly attractive to planners of outdoor recreation areas. These planners must always work with multiple goals and these goals seldom have homogeneous measurement units between them. In the LP models previously used by many planners, it was necessary to place a common denominator of value on goals. This meant specifying in dollar terms the value of such things as camper-days, wilderness hiking

days, and deer population. While the ability to price these things would be very useful, and the effort to do this should continue in my opinion, it is not necessary for the GP model.

There are still value judgments that have to be made, but GP provides a framework which is conducive to getting some public involvement in this judgment process. If an ordinal ranking system can be used, the relevant public and the area manager can be surveyed to find out how goals are ranked in order of importance to these people. The concept of putting goals in order of importance is much easier to handle than either trying to state an optimal amount for each goal or to put an explicit value on each goal. In the Dane, et al. study of the Mt. Hood National Forest, they found that their public groups "were able to indicate for a particular future, what outputs were important and their relative priorities," however, these same public groups "were not able to give the planning team specific output targets to constrain the model except in the case of timber" (p. 329). Resource specialists would then be needed to determine the physical and biological capacities of the area (according to some definition of carrying capacity) which are judged from the relevant production functions.

After initial priorities have been assigned to the goals, the analyst can run the program and then present the output to the public groups to get reactions. If the output is not acceptable to these people, priorities can be altered and more runs can be made until the output is consistent with the desired goal. Although this may seem like a backward way to get priorities, it is not uncommon for people to change their relative values for goals when they see what has to be traded off for each goal. People don't necessarily have neat, pre-existing

preference maps, but form (learn) them in the process of problem solving. Multiple runs of a GP model can be made, changing either rankings or constraint values each time, and then these trade-offs can be presented. Trade-offs are one way of getting explicit prices (values) for non-market goods and this is a useful concept for outdoor recreation goods.

The Pigeon River Country Programming Model

The analyst at the DNR who was working on the plan for the PRC decided to only use an ordinal ranking system with the GP model. This decision was reached because it was felt that people could more easily rank their preferences for all land uses in an ordinal way rather than in some type of ratio scale. Therefore, getting public input would be facilitated by using concepts that people were able to handle. It was also felt that the ordinal rankings people could give would be a truer measure of their preferences than a ratio scale that people would have difficulty understanding (personal interview with Jerry Thiede, April 1979). For example, the analyst found that people could readily say whether they liked fishing better than hunting. However, when asked how much more one was liked, people did not know how to express this quantitatively. Although many new techniques are being developed which are designed to measure people's preferences on a ratio scale (see for example, Serota, et al., 1975), using such techniques requires that people think in terms and concepts which are new to them. Thus, the analyst felt the reliability of the responses would be in question. There are trade-offs between reliability and interpretability for policy and budget formulation.

Before the alternative land uses could be ranked, they had to be defined in some meaningful way (i.e., a taxonomy had to be chosen).

A team of resource professionals identified the following major outputs of the forest:

- Big Timber
- Fiber Timber
- Developed Recreation
- Dispersed Recreation
- Vehicular Recreation
- Elk
- Big Game
- Small Game
- Oil and Gas
- Other Minerals
- Fish
- Research Areas
- Rare and Endangered Species

It should be noted that other outputs were suggested but had to be rejected because little or no data existed to quantify those outputs. Such a decision may have resulted in some interests being left out of the planning process. For example, berry picking is a common use of the PRC, yet it is difficult to quantify this as an output. The forest manager had never counted the number of berry pickers in the forest and therefore it is not known how many acres of certain vegetation would be needed to produce one user-day of berry picking. The production formula is unknown. But, if berry picking is left out of the model, then it will also be left out of any final plan that develops.

When presenting a taxonomy of uses for people to rank, the way in which each use is described will have an effect on the respondent. While short definitions or labels may appear simpler and easier to handle, they may also be ambiguous. For example, the word "Elk" may have different meanings to different people. The respondent is being asked, "Should the PRCSF be used for elk?" To some this may mean the DNR should attempt to

increase the elk herd at the expense of all other uses. To others it may mean the DNR should maintain an elk herd at a level just above its safe minimum stand (see Bishop, 1978). Others may feel the DNR should maintain a herd large enough to allow for hunting. Since the DNR's management scheme will vary according to how large an elk herd is desired, it is important that the size of an elk herd is included in the taxonomy which is to be ranked.

Some of the labels presuppose a certain knowledge by the respondent. "Big Game" and "Small Game" may be familiar categories to hunters, but non-hunters may not know which animals are included in which category. "Big Timber" and "Fiber Timber" are not ambiguous to a forester, but to others such labels may be meaningless. A person who wishes to walk through a colorful forest in the fall might not have any idea whether "big" or "fiber" timber is desired. The respondent may even be offended by the use of such a technical term and might decide not to answer truthfully, if at all.

To obtain the ordinal ranking of land uses, the opinions of several groups within the PRC were solicited. These were: Pigeon River Advisory Council (PRAC), a DNR-appointed citizen advisory council with 17 members who are supposed to represent statewide interests; the Vanderbilt Group, residents of Vanderbilt who showed up at a public meeting after the DNR announced through the mail that the meeting would take place; Huron Pines Resource, Conservation and Development Group, a volunteer advisory body to the forester in the northeast of the Lower Peninsula; Gaylord Rotary Club; large private landowners in the planning unit, representatives from five different Sportsmen's Clubs which own extensive land within

the PRC planning unit; Black Land Sportsmen's Club, not landowners, a club made up of mostly hunters.

In an effort to avoid the problems of definitions noted above, as well as any other problems the respondents might have, a representative of the DNR explained the questionnaire in person to each of the groups that were surveyed. The different outputs of the PRCSF were discussed as well as their compatibility with each other. Then a list of the 13 uses was presented to each individual, which was the same list as shown above. The respondents were asked to rank the uses according to their preferences for having these uses in the PRC. Number one was to go to the most preferred, number 13 to the least preferred. Then the individual responses were aggregated and a ranking for each group was derived. The results are shown in Table 2. The analyst was encouraged by the similarities between the groups. For example, big timber was ranked from fourth to eighth place by the different groups. However, all these groups are from the immediate area, and only the PRAC has members from other areas of the state. So, it could be expected that most of these people would have the same interests for their area.

If the question being asked is whose preferences count in any given survey, then in this case it can be said that local, day-users preferences count more in the decision process of the PRC. This is a result of three things which have been mentioned: the people surveyed were more heavily oriented toward local, day-users; the type of survey used was easier for present users to handle--they would be more familiar with the uses and could more easily state their preferences; and the aggregation technique added every group's rankings to obtain a total rank. Since there were more sportsmen's groups than others, they were again weighted more

TABLE 2
Goal Priorities By Interest Groups and Land Use for the PRCSE*
(Ordinal Ranking)

	Pigeon River Advisory Council	Vanderbilt Group	Large Private Landowners in Planning Unit	Huron Pines RC&D Group	Gaylord Rotary Club	Black Lake Sportsmen's Club	All** Groups
Big Timber	7	8	8	6	7	4	8
Fiber Timber	5	7	5	2	5	5	4
Developed Recreation	8	3	7	10	1	10	7
Dispersed Recreation	3	6	4	7	6	7	5
Vehicular Recreation	11	12	10	13	11	11	12
Elk	6	1	6	5	8	9	6
Big Game	1	2	1	1	3	2	1
Small Game	4	3	2	3	2	1	2
Oil and Gas	13	11	12	9	9	13	11
Fish	1	3	2	4	4	3	3
Other Minerals	12	13	13	12	13	12	13
Research Areas	10	10	11	8	10	6	9
Rare & Endangered Species	9	9	9	11	12	8	10

*If a groups' summed priority rating resulted in equal totals for two or more goals, the goals were assigned the same rank. This, for example, could result in two number 1 and no number 2 priorities in a column.

**Responses from all members of all groups were totaled to get the ranking for "All Groups."

Source: Thiede, 1978.

heavily. However, it must be asked whether these people represent the relevant "public" for the purposes of the DNR. The analyst felt that they did. Even though the PRCSF is a State owned area, most of its use comes from people living in the immediate vicinity. These are also the people who would be affected by any "spillover effects" from a land management plan (e.g., employment effects if oil and gas drilling is allowed; tourist effects if developed camping is pursued). One of the unique features of the PRC, however, is its relative nearness to the population centers of lower Michigan. With increasing use from people in these areas expected in the future, their opinions might be relevant. The DNR's objective with the PRAC was to get a representative group of all potential users of the PRCSF, which would include those from lower Michigan. However, it appears that local, day-users are more heavily represented. The analyst can't say whether this is right or wrong, good or bad. It could be argued that local, day-users are the heaviest users of the forest and therefore should be more heavily represented. These choices of rules of representation must be made at all levels of government. We must also consider the trade-off present between higher numbers of people representing themselves (i.e., one person one vote, a referendum on all political choices) and keeping decision costs low (i.e., agency director making autonomous choices). This point was persuasively made by Lawrence Libby in his draft entitled "Current Rules Affecting Natural Resource Use" (Libby, 1979). An agency can become so encumbered by efforts to "include the public" as to become ineffective. Finding the "optimum" amount of public input is a political issue, however, and not a technical one alone.

It should be noted that in this particular case allocation of funds by the DNR to the management of the PRC was not an issue. The budget for managing the area had already been set and was a constraint to the decision-making system. Thus, whether public money should be spent on the PRC or on an alternative program elsewhere in the state was not the problem that the DNR wanted the public to address. Instead, the problem was where money and resources should be allocated within the PRC.

The entire planning process was delayed while the case between the environmentalists and the oil companies went to court. In the interim, the DNR ran the GP model with alternative rankings of the land uses so that the trade-offs between conflicting uses could be analyzed. The consistency of the top priorities across the surveyed groups reduced the number of alternatives which had to be examined. Using the different rankings which were provided by the groups, the different alternatives were developed and were presented to the PRAC, who worked closely with the DNR throughout the process. Thiede (1978) stated that involvement with the Advisory Council was "most helpful in developing a feel for the amount of information that could reasonably be absorbed by the public while still providing enough for them to make informed judgments about management programs. These factors indicated that five management alternatives would adequately serve to inform and stimulate the public to take part in the planning process" (p. 7). The next step for the DNR would be to present these alternatives to the public and ask them to respond to them, indicating what they think is good or bad, and suggesting changes. This is a good example of how the timing of public input can be important. The outputs of the PRC were decided upon without formal public input and then the "public" was asked to rank these outputs (or uses) according to

their preferences. These rankings were a factor in producing the final five alternatives that were to be considered. Then these alternatives would again be commented on by "the public." It appears, however, that the public in the latter stage is not the same as the public in the first stage of this planning process. While the PRAC was the key public group that had input in formulating the five alternatives, these alternatives will be circulated to many more people for comments. Just as the PRAC did not have the chance to define the outputs that they ranked, the second public group will not have the chance to define the alternatives that are being considered. The PRAC is, in effect, the public group which gets to "set the agenda" for a second public group to discuss. This is an important political right that the DNR has given to the PRAC. In this case, the DNR analyst realizes that he has given the Council a political power and he feels that this was an informed, justified decision. In many other cases the analyst may see these issues as mere "technicalities" that should be decided by "experts."

Since the PRAC was the group having the most public input, I asked if I might survey them using two different survey techniques and compare the results. The original rankings had become out-of-date as the law suit went on for over a year. Therefore, the analyst for the DNR said he would be happy to have an updated ranking for the PRAC.

It was decided to use two alternative ranking schemes, one an ordinal scale, the other a ratio scale. The ordinal scale repeated the survey that the DNR had done earlier with only a few changes. The names of the outputs or uses were changed in some cases and two new outputs were added at the suggestion of the analyst. These changes were made in an attempt to make the outputs clearer in the minds of the

respondents, so that hopefully everyone would be ranking the same concepts. For example, the output or use labelled "Elk" previously was changed to "Maintenance of an Elk Herd (around 500-600 animals)." It was felt that this would reduce any ambiguity associated with just the word elk.

The two outputs which were added were "Off-Road Vehicles (ORV) Recreation (winter and summer vehicles)" and "Natural Areas (no timber cutting or other development)." The ORV use was included because the analyst felt this was a separate category from "Vehicle Recreation (roads for viewing the forest and its wildlife)." In the earlier survey the use was just labelled "Vehicular Recreation" and thus people had to combine their preferences for all types of vehicular recreation under one category. Since ORV use is not popular among most of the people being surveyed, "Vehicular Recreation" was rated very low. This was not, however, a true representation of how those people felt about scenic roads through the forest (as shown by the results of the second survey). The category of "Natural Areas" was included because it was a possible use according to the GP model but had been left out of the ranking survey. Thus, it was basically a correction of an earlier omission.

The short explanations in parentheses after each use were also added to reduce misinterpretation of any of the outputs. The order that the outputs were presented was also slightly changed, mainly in an effort to keep similar uses together which might facilitate comparison. There is, of course, no "right" order to put the outputs in, and the one chosen was basically arbitrary. (The survey that was used is included in the appendix.)

In addition to the ordinal ranking question, the same respondents were asked to express their preferences in a ratio scale. They were told

to assign the number 100 to their preference for maintaining an elk herd. Then in relation to that value, they were to assign numbers for their preferences for other uses. The example was given that if they preferred big game hunting 5 times as much as maintaining an elk herd, then they were to assign big game hunting 500. If they preferred big game hunting only half as much, they were to assign it a 50. The numbers could be as low as 0 and as high as the respondent wanted. The same list in the same order was presented with a "100" to the left of "Maintenance of an Elk Herd." Elk had been consistently ranked in the middle of the order in the previous survey done by the DNR. Thus, following the suggestions of Hamblin for constructing ratio scale surveys, elk was chosen as the benchmark for this survey.

The survey was mailed to the 17 members of the PRAC and 13 surveys were initially returned. A stamped, addressed envelope had been sent along with the survey to encourage returns. After three weeks, a postcard was sent to everyone stating that there were still some unreturned surveys and asking for people to return them if they had not already done so. (A copy of this correspondence is also included in the appendix.) One additional Questionnaire was then returned which brought the total to 14 (a response rate of 82 percent).

The responses were aggregated to obtain two sets of ordinal rankings for the uses (Table 3). The first part of the survey was aggregated to obtain one group ranking and the second part of the survey was aggregated to yield the second group ranking. In the first part, each individual's rank was added across each land use category. For example, fishing

TABLE 3

Aggregate Ordinal Rankings Obtained From the
Ordinal Ranking Scale and Ratio Scale Techniques

<u>Rank</u>	<u>Ordinal Scale</u>	<u>Ratio Scale</u>
1	Small Game (SG)	Small Game
2	Fishing (F)	46 < Fishing
3	Dispersed Recreation (DisR)	5 < Fiber Timber
4	Big Game (BG)	21 < Big Game
5	Fiber Timber (FT)	11 < Big Timber
6	Big Timber (BT)	85 < Dispersed Recreation
7	Elk (ELK)	38 < Developed Recreation
8	Developed Recreation (DR)	3 < Natural Areas
9	Natural Areas (NA)	39 < Rare & Endangered Special
10	Rare & Endangered Species (RES)	13 < Vehicle Recreation
11	Research Areas (RA)	9 < Research Areas
12	Vehicle Recreation (VR)	20 < Elk
13	Oil and Natural Gas (ONG)	6 < Oil and Natural Gas
14	ORV's (ORV)	6 < Other Minerals
15	Other Minerals (OM)	52 < ORV's

The numbers to the left of the Ratio column refer to the average number of units which separated the two uses (see text p. 76 for explanation).

received ranks of 5, 1, 4, 6, 2.5,* 3, 1, 1, 7, 4, 1, 3, 9, 5 from the respondents. These added up to 52.5 which placed Fishing in the second position overall since Small Game added up to 52.

The second part of the survey, the ratio scale, was aggregated in a similar way. The individual responses were aggregated across each land use to obtain a total value. In this case, however, a higher total value signified a higher rank (closer to 1), since respondents indicated preference by placing higher values on the land use. The example of Fishing shows the individual responses of 120, 400, 800, 500, 100, 200, 200, 300, 300, 200, 200, 200, 300, 1000, which add up to 4,820. This again placed Fishing second to Small Game which had a total of 5,460. Table 3 contains the two ordinal rankings based on the two parts of the survey.

Overall, the order which was based on the ordinal scale differed only slightly for the order based on the ratio scale, except in the case of elk. However, "Maintenance of an Elk Herd" was seventh in the ordinal scale results and twelfth in the ratio scale results. Considering the controversy surrounding the survival of an elk herd, this result is significant. Elk have been labelled "Incompatible" with both big timber and developed recreation by resource specialists. Both of these uses were ranked far ahead of elk by the ratio scale method, while the ordinal scale method resulted in developed recreation being below elk and big timber being only one place above elk. While a policy-maker could justify making elk a "key value" from the results of the ordinal scale

*The reason for non-integer values is that some respondents ranked more than one land use with the same number (e.g., Fishing and Small Game both ranked #1). All such responses were assigned the average value of their position. For example, if there were two #1 responses, both land uses were assigned a 1.5.

method, it would be difficult to do so from the results of the ratio scale method. Elk is ranked relatively close to oil and natural gas and other minerals in the ratio scale.

One of the advantages of the ratio scale is that relative preferences can be measured between two uses. Not only can the respondent say that A is preferred to B, but also how many times more A is preferred to B. If A were preferred much more than B by all of the respondents, then it would be expected that A would have a much larger total value assigned to it than B. In this survey, instead of measuring these differences in total value, the differences in average values were recorded (merely for the convenience of working with smaller numbers). The total values were divided by the number of responses and the differences between consecutive average values are listed to the left of the ratio scale column. A small number, such as the five between Fishing and Fiber Timber, indicates an aggregate preference which is similar for both of these land uses. However, a large number such as 46 between Small Game and Fishing indicates an unambiguous preference for Small Game relative to Fishing for this group as a whole.

It is difficult to say whether one of these methods is "better" than the other for measuring the preferences of the PRAC. It is possible that elk was a bad choice for a benchmark, yet it is not clear that any other choice would be better. What was clear, however, was that many members of the PRAC were very upset with the results of the ratio scale question. They claimed the question was confusing and an attempt to "trick" them into revealing their true preferences. They also felt that the twelfth position of elk in the order was caused only by the fact that elk was used as the benchmark, not because their preferences would

dictate that. They may be right, but it also may be a function of allowing people with intense preferences to be given more weight when preferences are expressed in the ratio scale method. The two techniques represent two political judgments of whose preferences should count.

The important point is that the results of these two question formats could result in very different land management plans, depending on how they were used. They could also result in different court decisions regarding the case between the elk and the oil companies. One DNR official who saw these results told the members of the Council that they should take the results home and burn them before the oil companies got hold of them. This official had testified in the court case earlier and said that if the oil companies had the results of the ratio scale question they would claim that "even the members of the PRAC don't feel that the elk are more important than oil and natural gas." This, of course, just points out that the oil companies could have done this survey and used the results to their own advantage. Surveys can be constructed, aggregated and used in many ways to give political power.

After discussing these results with the agent for the DNR, he felt that the ordinal scale method was still most appropriate for his uses. He had more confidence that people revealed their preferences better through the ordinal question than through the ratio question. This is a decision that the analyst must make, but it is not purely a technical decision which involves choosing the "correct" method. By choosing the ordinal ranking system, those people with intense preferences are not given more weight in the final results. However, the ordinal system may give more weight to those people who were confused by the

ratio scale method. They will be better able to state their preferences by using an ordinal ranking.

The analyst must realize (and in this case, does), that neither of these methods indicates where additional resources should be spent. While the respondents claimed that small game hunting was most important to them, they have said nothing about whether small game hunting needs to be further developed. Appropriate goal levels for all of these uses must still be specified by the analyst. The rankings will only dictate which goal levels are to be achieved first, second, third, etc.

It is interesting to compare the results of this survey with the results of the DNR's survey a year earlier. In the DNR's survey, the PRAC ranked the land uses:

<u>Rank</u>	<u>Land Use</u>
tie < 1	Big Game
1	Fish
3	Dispersed Recreation
4	Small Game
5	Fiber Timber
6	Elk
7	Big Timber
8	Developed Recreation
9	Rare and Endangered Species
10	Research Areas
11	Vehicular Recreation
12	Other Minerals
13	Oil and Natural Gas

It is apparent that the representation of preferences is different between the two surveys, especially with respect to the position of Small Game. Whether preferences actually changed over a year's time or whether the different members on the Council caused the change is not known.

Media attention and more concern over the fate of the PRC could result in changed preferences. Different members on the Council between the two surveys also could lead to different interest groups being represented.

Chapter VI

Conclusions and Recommendations

It has been documented that surveys are being used by many different people for many different purposes. Surveys are often used as guides for public decision-making. At times the decision-makers have conducted their own surveys and in other cases the results of a previous, non-government survey are referred to. Too often, the results are taken as unambiguous, true measures of "what the public wants." It has been shown that there are many different publics with multidimensional preferences which can be measured and aggregated in a variety of ways. Therefore, different survey designs will result in different measures of public preferences. None is more "correct" than another and all can be equally valid in their construction. However, some may be extremely misleading as guides to public policy-making. This is particularly caused by the single-issue nature of most public opinion polls. The respondent's attention is focused on one issue and trade-offs are seldom considered. There are many issues which people are "somewhat concerned" about, and when asked about any one of those issues independent from other issues, the respondent is likely to express a desire for the government to act on that issue. The respondent may even express a willingness to pay for a particular good or service, even if she/he has only a mild preference for it. This is because trade-offs between spending scarce public funds are not being considered by the respondent. Even if a survey

does try to deal with the problem of trade-offs, it is impossible to present every alternative that a given dollar could be spent on in the government's budget. If an alternative has been left out which is important to the respondent, then that respondent's preference for the left out alternative will not be counted.

There is a potential problem that any interest group which has the resources to conduct a single-issue survey will have an access to political power. Groups without the resources may not have their preferences counted. This will depend on how politicians and public officials use the various surveys. It is difficult for a politician to ignore the results of a nationwide Harris or Gallup poll which is published in newspapers across the country. Although, in the case of gun control legislation, Schuman and Presser (1978) have found that the results of surveys may not have much political influence. They cite seven Gallups and five NORC surveys which all show support for gun registration, yet no legislation has come about. Their conclusion, after futile tests of various hypotheses explaining this discrepancy, is that "pressure groups" (i.e., the gun lobby) have more political influence than the survey results. Even though the majority of the electorate may favor gun registration, they lack information about the actual activities of their legislators on this issue. It is also possible that there are no differences in the gun registration positions of the viable candidates for office. If voters can only choose between two anti-gun registration candidates, then they must vote according to other issue positions.

Some correlations have been suggested between socio-economic groups in society and their positions on different issues. In general, the more educated show more support for conservation programs (Congressional

Record, 12/16/69). The affluent, the college educated and the people under 30 are more willing to allocate public money to natural resources (Congressional Record, 12/20/69). The less educated, blue collar occupations and those who farm or were raised on farms are more use-oriented toward natural resources (Carlson, 1976). These types of relationships should be investigated further, since they would facilitate studying how the different survey designs favor certain groups' preferences. Surveys involve using samples of the population, and if the sample or question format favors a particular socio-economic group, then the survey may favor the preferences of a particular interest group.

It is difficult to tell how much influence public opinion polls have on the political process. Polls which are done near election time regarding the actual issues to be voted on probably have a large influence on election results (e.g., Proposition 13 in California). Polls done at other times can probably be either used or ignored by politicians (e.g., those entered into the Congressional Record). Certain polls are used directly by public agencies and these will have an influence on that agency's decision making (e.g., the PRC example).

Since polls are having at least some impact on public decision-making, it is important that each part of the public becomes aware of how certain polls may misrepresent their interests. Survey rules, just like voting rules, will have an influence on whose preferences count. However, unlike voting rules, survey rules are made up without any public debate, and can be entirely different from survey to survey, depending on who is conducting the survey. People should become aware of how the different survey designs favor revelation of different people's preferences, and should become involved in making the survey rules so that their preferences will be counted.

APPENDICES

APPENDIX A

Questionnaire Used For the Pigeon River Advisory Council

PART I.

Rank the following uses between 1 and 15 according to your preference for them.

- _____ Big Timber (long rotation or saw timber)
- _____ Fiber Timber (wood for energy, pulpwood, small trees)
- _____ Developed Recreation (campgrounds, picnic areas, hiking trails, etc.)
- _____ Dispersed Recreation (mushroom and berry picking, dispersed camping, backpacking, etc.)
- _____ Natural Areas (no timber cutting or other development)
- _____ Vehicle Recreation (roads for viewing the forest and its wildlife)
- _____ Off-Road Vehicle (ORV) Recreation (winter and summer vehicles)
- _____ Maintenance of an Elk Herd (around 500-600 animals)
- _____ Big Game Hunting (bear, deer, bobcat)
- _____ Small Game Hunting (grouse, rabbit, woodcock, etc.)
- _____ Oil and Natural Gas Development
- _____ Fishing
- _____ Research Areas (for example, the fisheries research in the pothole lakes)
- _____ Other Mineral Development (sand and gravel, limestone)

PART II.

Think of assigning the number 100 to your preference for maintaining an elk herd. This will be your "yardstick." Then, in relation to that value, what number would you assign to your preferences for these other uses? For example: Your preference for maintaining an elk herd is at 100. If you prefer big game hunting 5 times as much, assign big game hunting a 500. If you prefer big game hunting half as much as you prefer maintaining an elk herd, assign it a 50.

The numbers can go all the way to 0 and can go as high as you like.

Remember, your preference for maintaining an elk herd is at 100. What number do you assign to:

- _____ Big Timber (long rotation or saw timber)
- _____ Fiber Timber (wood for energy, pulpwood, small trees)
- _____ Developed Recreation (campgrounds, picnic areas, hiking trails, etc.)
- _____ Dispersed Recreation (mushroom and berry picking, dispersed camping, backpacking, etc.)
- _____ Natural Areas (no timber cutting or other development)
- _____ Vehicle Recreation (roads for viewing the forest and its wildlife)
- _____ Off-Road Vehicle (ORV) Recreation (winter and summer vehicles)
- 100 Maintenance of an Elk Herd (around 500-600 animals)
- _____ Maintenance of Rare and Endangered Species (both plants and animals)
- _____ Big Game Hunting (bear, deer, bobcat)
- _____ Small Game Hunting (grouse, rabbit, woodchuck, etc.)
- _____ Oil and Natural Gas Development
- _____ Fishing
- _____ Research Areas (for example, the fisheries research in the pothole lakes)
- _____ Other Mineral Development (sand and gravel, limestone)

APPENDIX B

Follow-Up Correspondence Used

Dear Pigeon River Advisory Council Member,

About a month ago I mailed a survey to each of you. The response has been good, but there are still a few surveys that have not been returned. If you have already returned yours, please disregard this notice. If you have not and you need another copy of the survey, I would be happy to send you one. Just let me know.

Thanks again for your cooperation.

Becky Johnson
Rm. 3, Cook Hall, MSU
East Lansing, MI 48824

APPENDIX C

Individual Responses to the Ranking Question

BT	FT	DR	DisR	NA	VR	ORV	ELK	RES	BG	SG	ONG	F	RA	OM
9	8	1	2	10	13	14	6	12	4	3	7	5	11	15
6	3	9	5	10	7	13	4	11	8	2	15	1	12	14
9	3	10	5	12	8	15	7	6	1	2	14	4	11	13
1.5	1.5	9	8	15	11	13	10	14	4	3	7	6	12	5
8.5	7	12.5	5.5	2.5	12.5	12.5	8.5	2.5	12.5	2.5	12.5	2.5	5.5	12.5
5	6	11	4	7	10	15	8	12	1	2	14	3	9	13
11	10	4	2	5	13	15	3	6	8	9	12	1	7	14
6	5	4	0	14	11.5	13	7	11.5	3	2	9	1	10	15
1	4	10	5	2	9	15	11	3	8	6	13	7	12	14
6	5	11	1	8	10	13	7	9	2	3	14	4	12	15
12	11	10	4	3	6	15	9	2	8	7	14	1	5	13
9	8	11	6	10	12	13	4	5	1	2	15	3	7	14
2.5	2.5	2.5	2.5	5	6	12	11	10	7.5	7.5	13	9	14	15
9	8	4	6	7	14	3	13	11	2	1	12	5	10	15
95.5	82	109	64	110.5	143	181.5	108.5	115	70	52	171.5	52.5	137.5	187.5
6.82	5.86	7.79	4.57	7.89	10.21	12.96	7.75	8.21	5	3.71	12.25	3.75	9.82	13.39
6	5	8	3	9	12	14	7	10	4	1	13	2	11	15

RANK

TOTAL

AVERAGE

RANK

Individual Responses to the Ratio Question

BT	FT	DR	D'sR	NA	VR	ORV	ELK	RES	BG	SG	ONG	F	RA	OM
150	160	500	250	80	20	30	100	50	150	160	110	120	40	10
100	300	75	125	75	125	0	100	60	100	500	0	400	100	25
500	1000	100	500	100	500	25	100	100	1000	800	50	800	100	100
1000	1000	50	200	0	25	0	100	25	600	800	800	500	25	900
100	200	30	50	400	10	0	100	100	0	200	0	100	100	0
100	100	50	200	200	50	0	100	100	200	200	0	200	100	10
10	15	125	150	100	10	0	100	100	50	50	10	200	100	5
200	250	275	200	50	75	0	100	100	300	300	100	300	300	10
1000	400	200	250	700	600	50	100	500	350	450	50	300	150	75
100	100	50	150	100	100	50	100	100	200	200	50	200	100	50
50	100	10	100	10	25	0	100	200	50	100	0	200	150	0
500	500	500	500	300	200	50	100	200	200	200	50	200	50	50
90	120	20	130	25	10	0	100	100	400	500	0	300	160	0
400	500	600	300	400	50	300	100	250	750	1000	100	1000	200	0
4300	4745	2575	3105	2540	1800	505	1400	1985	4450	5460	1320	4820	1675	1235
307.14	338.93	183.93	221.79	181.43	128.57	36.07	100	141.79	317.86	390	94.29	344.29	119.64	88.21
5	3	7	6	8	10	15	12	9	4	1	13	2	11	14

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