MULTIPLE PERSPECTIVES ON BIODIVERSITY IN THE MID-WILLAMETTE VALLEY, OREGON

by

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ABSTRACT Biodiversity has become an important focus of ecological and wildlife research. However, the social aspects of biodiversity policy and regulations, specifically the public's perspectives and values about biodiversity, have not been adequately considered. This study examines the range of opinion about biodiversity of six groups that are potentially affected by biodiversity policy and management in western Oregon. The perceptions of the six groups were investigated through semi-structured interviews that focused on vertebrate biodiversity (species richness) in western Oregon as a surrogate for all biodiversity. The responses of interviewees from the six groups were combined in a Biodiversity Index, which measures the value of native, pre-European biodiversity for each group. Within the six groups, perceptions of native, pre-European biodiversity vary from slightly negative to very positive, with groups in order of: farmers, forest owners, hunters, Native Americans, ecologists, and environmentalists. Responses also indicate that groups with a lower Biodiversity Index tend to prefer biodiversity that is defined as species they value positively, whether introduced, extirpated, or otherwise. Groups with a higher Biodiversity Index tend to prefer native, pre-European biodiversity. It is important to consider these multiple perspectives when developing effective planning, policy, and management related to biodiversity. The results of this study also provide a useful starting point for further research on perspectives toward biodiversity and specific policy or management issues.

INTRODUCTION

In recent years, biodiversity has become an organizing principle in biological and ecological research, and in the management and protection of natural resources (e.g. Wilson, 1988; Norton and Ulanowicz, 1992; Scott et al., 1993; Faith and Walker, 1995). Most biodiversity research that addresses human dimensions focuses on policy options, impact of humans, or value/uses of biodiversity (e.g. Wilson, 1988; Ehrlich and Wilson, 1991; Soulé, 1991; Norton and Ulanowicz, 1992; Hågvar, 1994; Forester and Machlis, 1996; Montgomery and Pollack, 1996). A small number of studies have considered human perspectives and attitudes about biodiversity (e.g. Machlis, 1992; Stinner et al., 1997).

Several recent studies have linked planning and biodiversity by modeling the impact of land use decisions on biodiversity (Hulse et al., 1997; White et al., 1997). Hulse et al. (1997) used input from landowners to define a range of possible future land use scenarios for the Muddy Creek watershed in western Oregon. The possible futures were evaluated for their impact on vertebrate biodiversity. The Muddy Creek project incorporated landowners' expert opinions regarding possible future land uses, but their personal views about biodiversity were not considered.

The study presented here aims to fill the gap in knowledge about the public's perceptions and attitudes toward biodiversity. In-depth interviews were used to explore the range of thought about biodiversity held by six groups: farmers, private non-industrial forest landowners (referred to here as forest owners), hunters, Native Americans, academic ecologists (referred to here as ecologists), and environmentalists. These interest groups were chosen because they are groups that may be concerned about the content and potential impacts of biodiversity policy. The groups also represent a wide range of thought, experience, knowledge, and interaction with the natural world. The goals of this research are: (1) to identify whether each group values biodiversity; (2) if yes, to determine each group's definition of biodiversity; and (3) to investigate the range of thought represented by all six groups, and the differences between groups.

This project translates and analyzes multiple perspectives on biodiversity, which will aid scientists and planners in creating more effective policy. Future policies and planning that relate to biodiversity would be more acceptable to citizens, and therefore more effective, if they are formed with consideration of affected groups' views. Scientists, managers, and planners who influence biodiversity policy need to have an understanding of the values and perspectives of people who are affected by their policies and decisions.

RESEARCH DESIGN AND METHODS

ETHNOGRAPHIC FRAMEWORK

An ethnographic framework was developed through observation of a small group of landowners involved with the Muddy Creek watershed project. In a series of meetings in 1996, landowners worked to define a set of possible future land use scenarios for the watershed, with the guidance of a planning research team (Hulse et al., 1997). In these meetings, a variety of natural resource issues were discussed, including protecting forest and farm land, regulation of forest and farm practices, population growth, rural development, water quality/quantity, and wildlife habitat.

The landowner discussions about possible futures were not adequate for a more detailed analysis of group perspectives about biodiversity for two reasons. First, the landowners were primarily farm and forest owners, who were not a very complete cross section of interests in the watershed. Second, the possible futures were defined based on goals of resource production and protection, but not biodiversity goals specifically. Biodiversity was only used to evaluate the possible futures. The landowner discussions were a rich source of perspectives about local resource and wildlife issues, but not about biodiversity specifically. The range of the stakeholder groups needed to be widened, and the specific issue of biodiversity needed consideration.

The insights gained from the ethnographic observations formed the basis for predictions about the general responses of the six groups. Farmers and forest owners have a very direct economic dependency on natural resources, where domesticated species (monocultures) tend to provide economic gain, and wilder (more diverse) species tend to cause economic loss. Farmers and forest owners are predicted to have the least favorable perspective toward biodiversity. Hunters are direct, consumptive resource users with less of an economic stake, but with a stake in protecting native and non-native wildlife habitats. Hunters are predicted to be have a more positive perspective toward biodiversity. Native Americans tend to be direct consumptive resource users with a close connection to nature and wildlife. Ecologists have a research interest in natural resources. Environmentalists are interested in protecting and preserving natural resources. It is difficult to predict the relative order of Native Americans, ecologists, and environmentalists, but all three groups are predicted to have favorable perspectives toward biodiversity.

SELECTION OF INTERVIEWEES

Selection of Groups

Six interest groups were selected for in-depth interviews to investigate their perspectives on biodiversity. These groups were chosen based on being potentially affected by natural resource issues or policy related to biodiversity. The six groups are: farmers, forest owners, hunters, Native Americans, ecologists, and environmentalists. These groups represent a broad range of perspectives, but they do not cover all possible interests (e.g. urban residents). Three representatives were interviewed from each of the six groups. A number of steps were taken to select appropriate interviewees from each group.

Membership Criteria for All Groups

Membership criteria that apply to all groups were used to standardize interviewees and to avoid as many confounding variables as possible. Interviewees were limited to men, with a preferred age range of 40 - 60 (4 interviewees were in their late 30's and 2 were over 60). All interviewees had at least 10 years living in western Oregon and at least 10 years experience in their group. There were no membership criteria about formal education or income, because experience was considered an equalizing factor.

The Muddy Creek watershed was too small (320 km^2) to supply all the interviewees. The geographic source area was expanded to all of Benton County (west edge of the mid-Willamette Valley, western Oregon) where most (15) interviewees live. The three Native Americans are members of the Confederated Tribes of the Grand Ronde Community of Oregon (located west of Salem, in Polk County). All the Native Americans have ancestry that includes Kalapuyan Indians, who are native to the mid-Willamette Valley, including Benton County.

Interviewees were limited to those actively involved and knowledgeable about issues affecting their group. Individuals who are extremely involved (e.g. movers and shakers, innovators) were not selected for interviews. Interviewees were further limited to those roughly in the political center of their group, in order to define each group's central tendency, rather than each group's complete range of opinion. Interviewees with strong affiliations in other interview groups were avoided by questioning either group informants or the potential interviewees themselves.

Membership Criteria for Each Group

In addition to the membership criteria that apply to all interviewees, criteria were also developed for each group (Table 1), in some cases with the assistance of a group informant (contact person to the group). The additional membership criteria limited the populations of each group and helped target discrete, non-overlapping populations. Farmers were narrowed to those who grow row crops. Forest interests were limited to private non-industrial forest landowners whose management practices include harvesting timber. Hunters and environmentalists were each restricted by membership in a moderate club. Native Americans were limited to those with Kalapuyan ancestry, who have an active interest in tribal culture and traditions. Ecologists were constrained to OSU professors who do research in non-wildlife ecology in western Oregon.

Non-Random Selection Methods

The overall sampling method for identifying all 18 interviewees was quota sampling, by which a certain number of interviewees with desired characteristics are selected (Eckhardt et al., 1977; Chadwick et al., 1984). Within each group, an informant (Table 1) was contacted as an initial link to the group. The group informant provided names of potential interviewees based on all the standardized and group-specific membership criteria. Within each group, informants used judgment sampling, by which group members are judged to be representative of the desired population (Eckhardt et al., 1977; Chadwick et al., 1984). For three groups (farmers, forest owners, ecologists), informants named more than three qualified people, who were subsequently narrowed to three interviewees. For the other three groups (hunters, Native Americans, environmentalists), informants named exactly three qualified interviewees.

In the three cases where the group informant provided more than three qualified names (farmers, forest owners, ecologists; Table 1), additional selection methods were used to narrow the list to three interviewees. Non-random selection methods were used because the small sample size and qualitative approach preclude statistical inference to a larger population. Furthermore, the influence of confounding variables was avoided through the use of numerous membership criteria, rather than random sampling. For the farmers and forest owners, convenience (Chadwick et al., 1984) or accessibility (Eckhardt et al., 1977) sampling (e.g. people who live nearby or answer the

Table 1. Selection of interviewees.

Group	Code	Other Membership Criteria	Group Informants	Selecting Interviewees
farmers	FA	-primary income from farming -grow row crops	-OSU Extension agents -Soil Water Cons. District -other farmers	-1st 3 willing/able out of 12 that qualified
private forest owners	FO	-primary income from forest -forest ≥100 acres -active management of forest	-OSU Extension -Oregon Small Woodlands Assoc., Benton Co. chapter mailing list	-1st 3 out of 8 that qualified -favored - live nearby
hunters	H	-members of Oregon Hunters Assoc. Benton County Chapter -frequent, enthusiastic hunter	-Oregon Hunters Association, Benton County chapter, treasurer	-all 3 names given
Native Americans	N	-Kalapuyan ancestry -interest in tribal traditions and culture and from childhood and/or adulthood -willingness to talk to non tribal member	-Confederated Tribes of the Grand Ronde Community of Oregon, co-chair, Board, Kwelth Tahlkie Culture and Heritage Society	-all 3 names given
ecologists	EC	-PHD-level teachers/researchers -ecology research in W. Oregon -avoid research on wildlife, bio-diversity, ag/forest production	-Oregon State University, 1996-1997 Graduate Catalog, self-described research interests	-randomly selected 3 from the 16 who qualified
environ-mentalists	EN	-members of Sierra Club (Mary's Peak Group)	-Sierra Club. vice chair	-all 3 names given

phone first) was used to narrow the list of names to three interviewees. For the ecologists, random sampling was used to provide an order in which to contact potential interviewees.

The level of participation of potential interviewees was high. In addition to 18 successful interviews, there were 5 people who declined to be interviewed: two farmers and two ecologists said they could participate several weeks later; one farmer indicated that he was not interested.

SURVEY INSTRUMENT

Format of Questions

The survey instrument was an in-person interview with both open-ended and structured questions (Appendix 1). The questions were reviewed by several people with interview experienced, and were pre-tested. The interviews averaged about 1 hour, ranging from about 45 to 90 minutes. Responses were recorded on interview forms and on cassette tapes.

The questionnaire covered 11 topics, all of which had open-ended questions. The open-ended questions followed an ethnographic approach in which interviewees expressed ideas in their own words, which contributed to a greater understanding of issues from the interviewees' perspective. This kind of qualitative approach provides richness in meaning and an insight into the world of the interviewee. Most open-ended questions were used to ask "what do you think about xxx", and in some cases "why do you feel that way about xxx".

Six of the 11 topics also had structured questions, where interviewees chose from pre-determined responses. Structured questions were used to ensure consistent responses that could be compared in all groups. Structured questions help to avoid a problem with qualitative responses, in which a non-response may be an oversight or a meaningful response. Most structured questions featured a rating scale, with 4 or 5 options. Some structured questions featured more options, with instructions for the interviewee to choose their top 3 responses.

Content of Questions

Inspiration for many of the questions came from observations made at the Muddy Creek landowner meetings (Hulse et al., 1997), where a variety of perspectives on resource issues were discussed. Additional ideas came from involvement in the Muddy Creek biodiversity research and modeling (Freemark et al., 1996). Compilation of a vertebrate species list for the Muddy Creek watershed raised a number of issues that seemed to have a social aspect as well as a scientific one. For example, introduced and extirpated species were interesting to consider from a scientific perspective, but they also raised issues relevant to people's values and opinions.

Vertebrate biodiversity was used as a surrogate concept to represent all biodiversity. Some questions were also extended to all wild animals, to wild plants, or to habitats (Appendix 1). The interview did not overtly deal with biodiversity until the last question. The order of the other questions was somewhat arbitrary, after beginning with two relatively simple questions.

Vertebrate biodiversity was used as a surrogate for all biodiversity for several reasons: (1) the average person is probably familiar with more wild animals than plants; (2) it was important to avoid biasing the interviewee with the actual word "biodiversity", because some interviewees might respond differently if they knew biodiversity was the subject of the interview; (3) vertebrate biodiversity has been used as a surrogate for all biodiversity in other studies (e.g. Scott et al., 1993; White et al., 1997); (4) knowledge gained from the scientific biodiversity study for Muddy Creek (Freemark et al., 1996) was used as a basis for some questions. Table 2 summarizes the interview questions and how the responses were used to examine perspectives on biodiversity.

Potential for Bias

In the interview process, there is the potential for bias from many sources. This study has examined bias due to group membership, but other unintended sources of bias (e.g. poor sampling technique, leading questions, responses biased toward interviewer) should be minimized. In each of these cases, steps were taken to avoid bias. The methods used to select interviewees were designed to target the center of six well-defined populations, as discussed above. Responses to open-ended questions were not prompted or discussed, except occasionally to clarify the question, or to clarify a response (e.g. "what did you mean when you said xxx?"). All interviews were done

Table 2. Summary of interview questions and insights to gain from responses (see Appendix 1 for complete questions).

#	Question (Paraphrased and Summarized)	Insights to Gain from Responses
1-2	-what kinds of wildlife are valued positively and negatively, and why?	-number and diversity of + and - species mentioned -reasons - insight into value of biodiversity
3	-what reasons is biodiversity most important; why?	-nature-centric, human-centric
4	-what human activities pose the greatest threat to biodiversity; why?	-which groups recognize which problems -do groups see their own actions as problems?
5-6	-what are the positive and negative features of diverse and simple forest and field landscapes? -rate each photo: health/not and benefit/harm scales	-is diverse or simple landscape preferred; why? -are diverse or simple landscapes considered healthy or not; beneficial or not?
7	-feelings about mountain lions and their population -mountain lion threatening; what solution preferred?	-controversial example to see desired actions, which may vary despite agreement on value of species
8	-reaction to hypothetical reintroductions of species extirpated since arrival of Europeans	-what value do recently-extirpated species have? -are extirpated species valued as part of biodiversity?
9	-acceptability of local vs. complete human-caused extinction	-intraspecies diversity -priority of human vs. wildlife needs
10	-opinions about introduced species	-what value do introduced species have? -are introduced sp. valued as part of biodiversity?
11	-preferred natural landscape in western Oregon -concepts and feelings about biodiversity	-is biodiversity part of preferred landscape? -value of biodiversity

by one interviewer, thus standardizing any bias. Pre-testing the interview allowed the questions to be consistent throughout the interviews. Interviewees' responses indicate that there was little or no bias toward the interviewer, because the responses were quite varied, and some were unexpected.

CODING AND ANALYSIS OF RESPONSES

After the interview phase was completed, the responses were coded and entered into a computer database (spreadsheet). Responses were taken from the interview forms, and cassette tapes were consulted only in the event of incomplete or unclear notes on the interview forms. The coding used for each question is shown in Appendix 1. Responses were coded to organize the data in a meaningful way that would help answer research questions. The coding of structured responses was established by the pre-determined responses. The coding categories for open-ended responses were not determined prior to interviews, but were based on the actual responses, to allow meaning to emerge from the data.

Coding of each question's responses resulted in some general trends in coding categories. Many questions' codes (Appendix 1) are divisible into three broad categories: (1) environment- or nature-centric (pro-biodiversity); (2) neutral or compromise; (3) human- or production-centric

(anti-biodiversity). A small number of responses seemed unrelated to the research questions, and were not analyzed.

The coded interview responses were analyzed to examine the perspectives of each group on biodiversity (e.g. Table 2), and the range of thought between groups. Responses from all the questions were combined to create a Biodiversity Index. Group responses to individual questions were evaluated based on the relative group order derived from the Biodiversity Index. Group responses to each question were compared to expected trends, which were based on the Biodiversity Index and/or on ethnographic observations. Trends were identified by eye, based on coded responses that rise or fall with group order. Meaningful trends rise or fall monotonically (or with minor deviations); weak trends rise or fall overall. The data were also examined for possible correlations in each group between questions, and in each question between groups. Insights came from patterns that parallel the Biodiversity Index scores, and patterns that contradict them.

RESULTS

The Biodiversity Index is presented first, so that responses to individual questions can be compared to the groups' relative Biodiversity Index scores. Following the Biodiversity Index is a brief discussion of demographic trends among the interviewees. Next, an analysis of the interviewees' responses to Questions 1 - 11 are presented in the order that they appear in the interview (Appendix 1; Table 2). Because of the rich body of data generated in the interviews, the majority, but not all responses, are presented here.

BIODIVERSITY INDEX

The Biodiversity Index (Figure 1) was determined from 20 responses that were taken from the 11 interview questions (see Appendix 2). The Biodiversity Index for each group is between 0 and 20 points, with each response being worth 1 point (pro-biodiversity), 1/2 point (neutral), or 0 points (anti-biodiversity). Responses that merit 1, 1/2, or 0 points are indicated in Appendix 2.

The Biodiversity Index is based on a definition of biodiversity that includes all native species present prior to European settlement. A high Biodiversity Index (close to 20) would have responses such as: eliminate introduced species, reintroduce extirpated species, maintain interspecies and intraspecies diversity, value more species positively than negatively, preserve or create native/diverse landscapes (Appendix 2). Conversely, a low Biodiversity Index (close to 0) would have responses such as: protect valued introduced species, do not reintroduce extirpated species, allow reductions in interspecies and intraspecies diversity, value more species negatively than positively, preserve or create production/simple landscapes. A medium Biodiversity Index (close to 10) would have neutral or contradictory responses to these subjects.

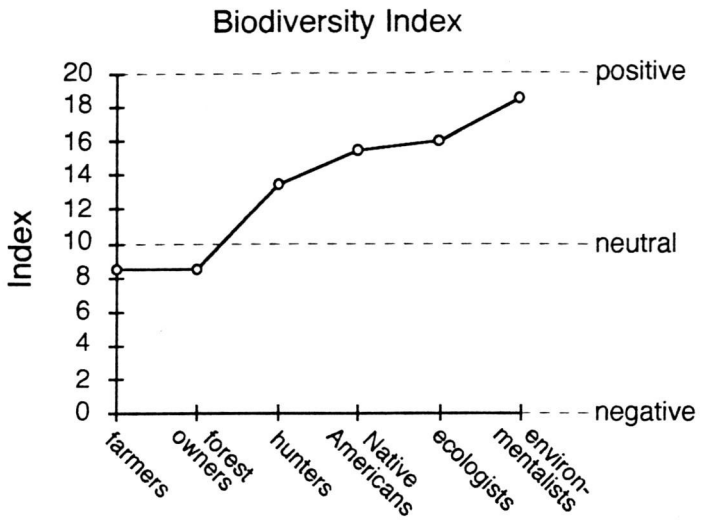

Figure 1. Biodiversity Index for the six groups, determined from 20 responses from interview questions. See Appendix 2 for details of how group scores were determined for the 20 responses. In subsequent figures, the six groups are presented in the same order: farmers, forest owners, hunters, Native Americans, ecologists, environmentalists. For each of the 20 contributing responses, the group gets a score of +1 (positive about biodiversity), +1/2 (neutral about biodiversity), or 0 (negative about biodiverstiy). Thus, the Biodiversity Index ranges from 20 (most positive) to 10 (neutral) to 0 (most negative).

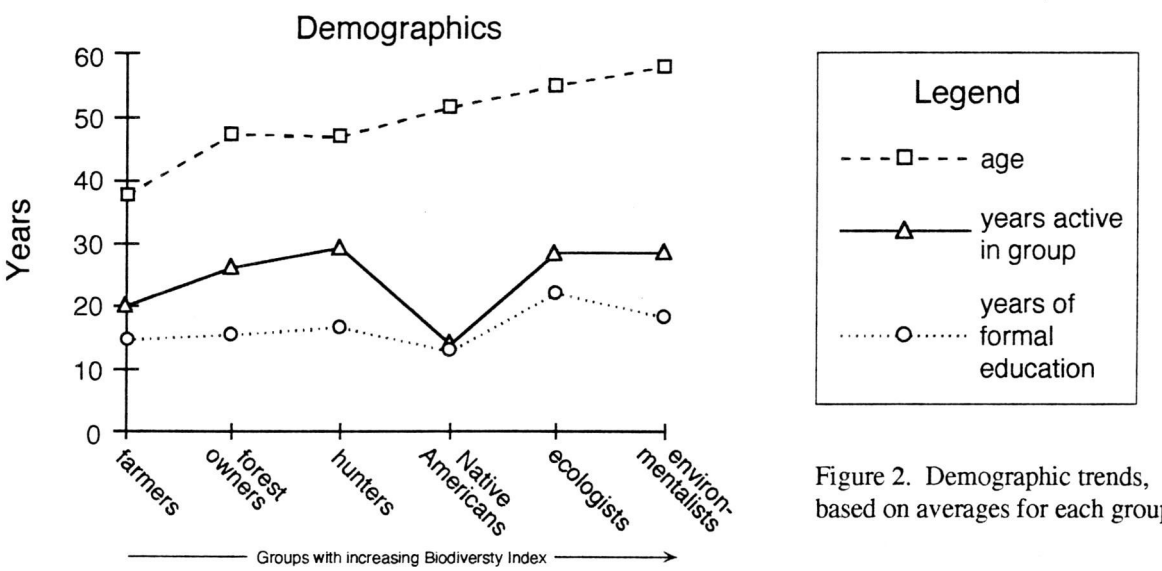

Figure 2. Demographic trends, based on averages for each group.

The Biodiversity Index for the six groups (Figure 1) increases from farmers and forest owners (8.5; slightly anti-biodiversity), to hunters (13.5; somewhat pro-biodiversity), to Native Americans (15.5; moderately pro-biodiversity), to ecologists (16; moderately pro-biodiversity), to environmentalists (18.5; very pro-biodiversity). The results of the Biodiversity Index were predicted in part from insights gained from ethnographic observation, which suggested that farmers and forest owners would be the least pro-biodiversity, followed by hunters. The predictions were not able to anticipate the relative order of Native Americans, ecologists, and environmentalists. The group order is somewhat consistent with the groups' self-identified political views toward resource issues, which tend to be more conservative with lower Biodiversity Index, and more liberal with higher Biodiversity Index.

On Figure 1, the six groups (X axis) are presented in order of increasing Biodiversity Index. On subsequent figures, the groups will be presented in the same order on the X axis, to facilitate comparison to the Biodiversity Index. On Figures 3-12, higher numbers on the Y axis tend to be pro-biodiversity, and lower (or negative) numbers on the Y axis tend to be anti-biodiversity. Thus, monotonically-increasing trends (up to the right) on subsequent figures will be paralleling the Biodiversity Index. Many responses to individual questions follow this trend, but others diverge in interesting and significant ways.

DEMOGRAPHICS

Figure 2 shows some of the demographics of interviewees, averaged by group affiliation. "Age" generally increases with Biodiversity Index. However, increasing age tends to be correlated with decreasing concern for the environment (Harper, 1996 and refs. therein; but see also Kohut and Shriver, 1989). Therefore, "age" is more likely to be muting than enhancing the Biodiversity Index. "Years active in group" increases slightly with Biodiversity Index, with most groups averaging at least 20 years experience, suggesting little influence on the Biodiversity Index. Native Americans are plotted with less than 20 years experience because adult involvement began in mid-adulthood in all cases, but childhood would have added additional years.

"Years of education" (see Appendix 1 for coding) increases slightly with Biodiversity Index, with exceptions for Native Americans and environmentalists. People with more education tend to be more concerned about the environment (Kohut and Shriver, 1989; Harper, 1996 and refs. therein), which suggests that "years of education" may be enhancing the Biodiversity Index slightly for some groups. Ecologists, who have the highest education, may have pursued their additional education because of their interests, rather than additional education causing the interests.

INDIVIDUAL SPECIES VALUED POSITIVELY OR NEGATIVELY

Questions 1 and 2 asked interviewees to name wildlife species they value positively or negatively, and to state why (see Appendix 1 for coding). Figure 3 shows three kinds of responses to these questions: (1) total number of positive and negative responses, (2) ratio of positive to negative responses, and (3) reasons for positive and negative responses.

(1) The total positive (and negative) heights of the group columns indicate the number of species valued positively (and negatively) for each group (Figure 3). The expected trends are for increasing positive responses with higher Biodiversity Index. These trends are expected because groups with a lower Biodiversity Index (farmers, forest owners) tend to be threatened economically by more species, whereas groups with a higher Biodiversity Index tend to value wildlife diversity (Native Americans' spiritual connection, ecologists' research interests, and

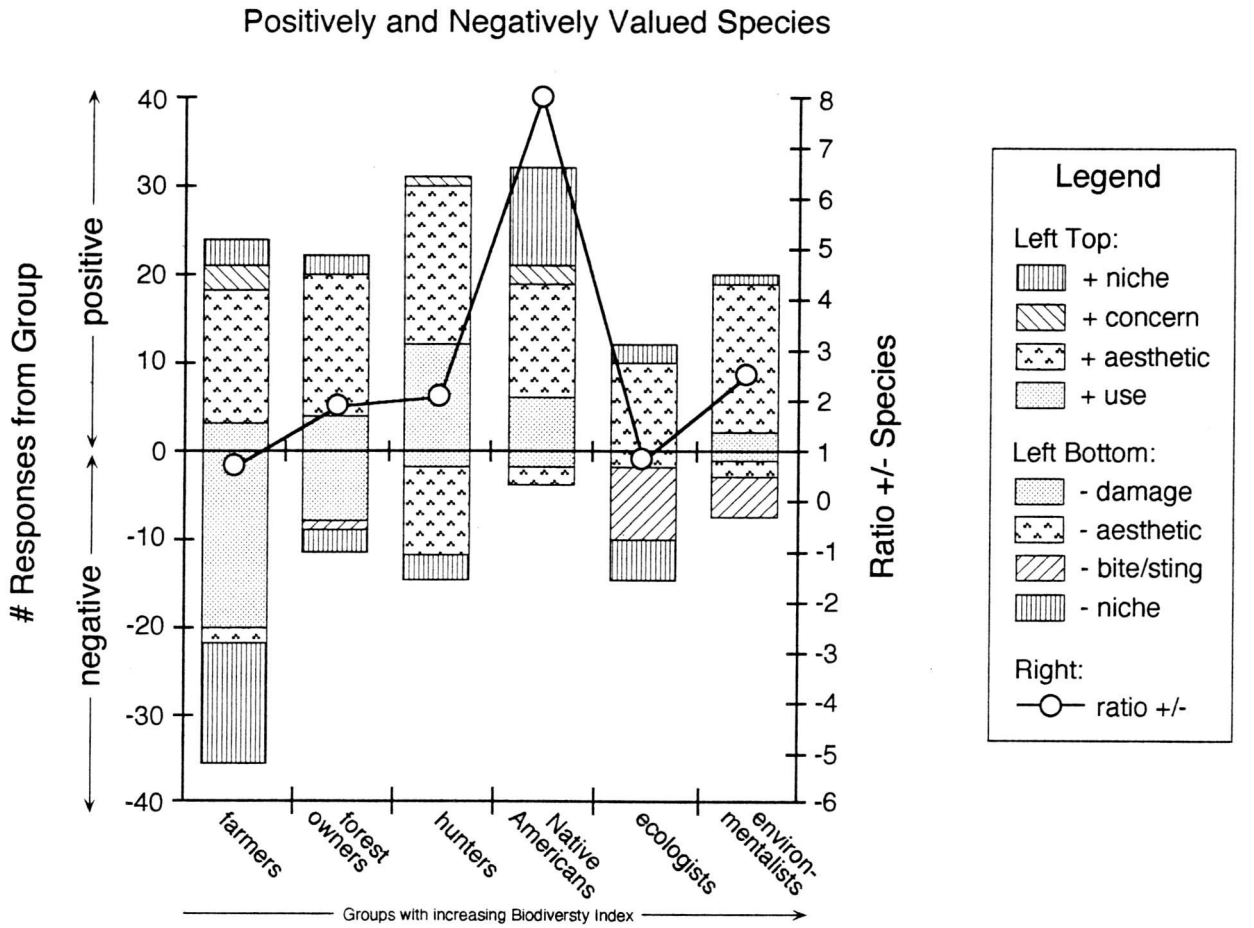

Figure 3. Left scale (columns): reasons for valuing species positively (+) and negatively (-), based on open-ended responses to Questions 1 and 2 (see Appendix 1). Right scale (line): ratio of positively/negatively valued species, based on total number of positive and negative species mentioned by each interviewee. Reasons for positively valuing species are: "+niche" = species plays a beneficial ecological role; "+concern" = concern for wellbeing of species; "+aesthetic" = like to see/watch species, spiritual tie or respect for species; "+use" = species used for hunting, fishing, food, products. Reasons for negatively valuing species are: "-niche" = species plays a harmful ecological role; "-bite/sting" = species bites, stings, or threatens people physically; "-aesthetic" = species disliked, ugly, or has other undesirable traits; "-damage" = species causes or threatens economic damage.

environmentalists' ethical interests). The positive responses (Figure 3) have no meaningful trend compared to the Biodiversity Index. This result cannot be explained by available data. The negative responses have a (weak) decreasing trend with higher Biodiversity Index, as expected.

(2) The ratio of positive to negative responses (line on Figure 3) is expected to rise with higher Biodiversity Index. This rising trend is present for four groups (farmers, forest owners, hunters, and environmentalists). However, Native Americans and ecologists are anomalous. Native Americans have the highest number of positive species and the lowest number of negative species, resulting in an unusually high ratio. Ecologists have the lowest number of positive species and a moderate number of negative species, resulting in an anomalously low ratio (<1).

(3) Reasons for positive and negative responses are defined in Figure 3. Positive responses are expected to increase with higher Biodiversity Index, and negative responses are expected to decrease with higher Biodiversity Index. "+Aesthetic" accounts for the largest number of positive responses for each group. None of the four positive reasons ("+aesthetic", "+niche", "+concern", and "+use") show any trends. Two of the negative reasons show the expected trend: "-damage" (good trend) and "-niche" (weak trend). "-Aesthetic" and "-bite/sting" show no trend.

There are several possible explanations for unexpected or lacking trends. With an open-ended question format, talkative people would tend to name more positive and negative species. Omissions may be meaningful, or they may just be omissions.

WHY BIODIVERSITY IS IMPORTANT

In Question 3, interviewees were asked to choose their top three reasons why biodiversity (many kinds of animals and plants) is important, from a list of seven options (see Appendix 1 for coding). Figure 4 shows the responses (total of 3x3=9 responses per group) and defines the seven codes. By choosing their top three responses, interviewees indicated which responses they agreed with most strongly, not all the responses with which they agreed. No interviewee disagreed that "many kinds of animals and plants are important" or was unable to choose three top reasons.

The seven possible response codes are shown on Figure 4, in rough order (upward) from human-centric to nature-centric responses. In general, the human-centric responses are expected to be more popular with lower Biodiversity Index groups, and the nature-centric responses are expected to be more popular with higher Biodiversity Index groups.

"Food" shows no trend, but "hunt" shows an expected (but weak) trend of higher popularity with lower Biodiversity Index groups. "Future" (for future generations) and "watch" (non-consumptive recreation) both show weak trends of being more popular with higher Biodiversity Index groups. "Function" (for nature to function well) and "services" (natural services) were each chosen by a large majority of interviewees, making trends difficult to detect. "Exist" (right to exist) is slightly more popular with higher Biodiversity Index groups, as expected.

THREATS TO BIODIVERSITY

In Question 4, interviewees were asked to choose the top three things they feel pose the greatest threat to biodiversity (many kinds of animals and plants), from a list of eight options (see Appendix 1 for coding). Figure 5 shows the responses (total of 3x3=9 responses per group) and defines the eight codes. By choosing their top three responses, interviewees indicated which responses they agreed with most strongly, not all the responses with which they agreed. No interviewee disagreed that "human activities pose threats to many kinds of animals and plants" or was unable to choose three top reasons.

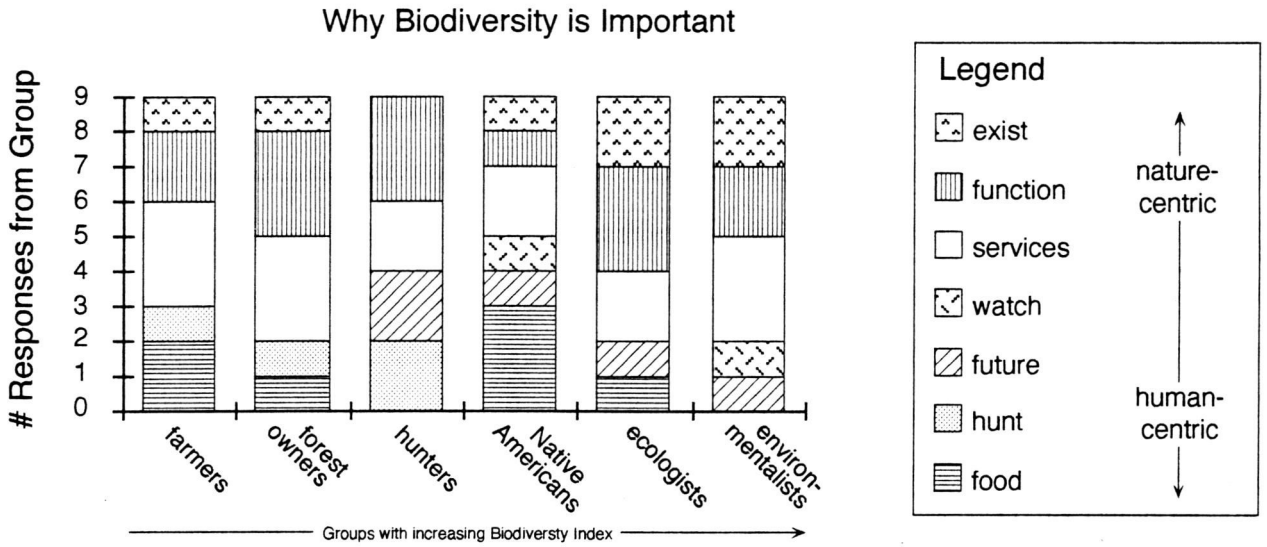

Figure 4. Reasons why biodiversity is important, based on interviewees' top three reasons why many kinds of plants and animals are important. Each group has 9 responses (top 3 reasons for each of 3 people). Coded responses are: "food" = providing food, income, medicine/drugs, or other products; "services" = providing natural services, such as bees that pollinate flowers, or birds that eat insects; "hunt" = recreation such as hunting or fishing; "watch" = recreation such as bird watching or wildlife photography; "future" = future human generations; "function" = for nature to function well; "exist" = because they have a right to exist. Based on responses to Question 3 (see Appendix 1).

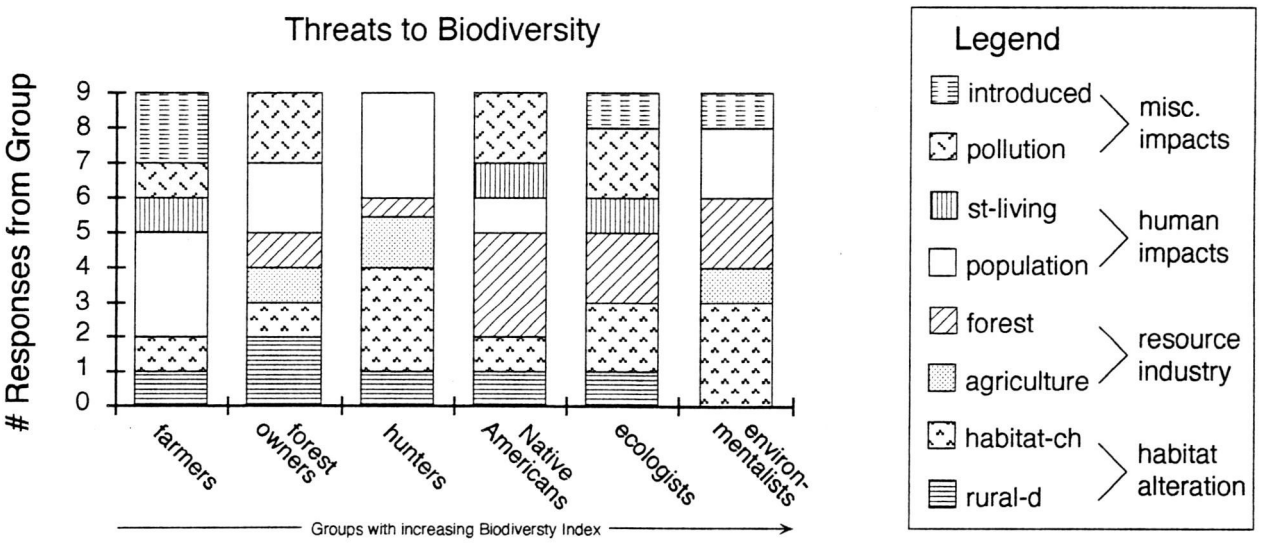

Figure 5. Threats to biodiversity, based on interviewees' choice of three human activities that threaten the largest number of kinds of plants and animals. Each group has 9 responses (top 3 reasons for each of 3 people). Coded responses are: "rural-d" = rural development; "habitat-ch" = habitat loss or change; "pollution" = chemicals, toxins, water and air pollution; "introduced" = other animals/plants that have been introduced from elsewhere; "population" = human population growth; "st-living" = the relatively high standard of living that many Americans have; "agriculture" = agricultural practices and methods; "forest" = forest practices and methods. Based on responses to Question 4 (see Appendix 1).

The eight possible response codes can be combined into four sub-groups: habitat alteration ("habitat-ch", "rural-d"), renewable resource industry ("agriculture", "forest"), human impacts ("population", "living"), and miscellaneous impacts ("pollution", "introduced").

For habitat alteration, there are no expected trends with Biodiversity Index, because groups at both ends of the Biodiversity Index have concerns about habitat change and rural development. The groups have a weak trend of increasing concern about "habitat -ch" with higher Biodiversity Index, but slightly more concern about "rural-d" with lower Biodiversity Index.

For renewable resource industry, the expected trend is increasing concern with higher Biodiversity Index, because groups with lower Biodiversity Index would not tend to recognize their own industry as a threat to biodiversity. There is no trend of concern about "agriculture" with Biodiversity Index, although no farmers cite "agriculture" of "forest" as a threat to biodiversity. There is a trend of increasing concern about "forest" with higher Biodiversity Index.

For human impacts, the expected trend is increasing concern with higher Biodiversity Index, because these issues tend to be concerns of the political left. "Population" has a weak trend opposite to the expected, perhaps due to development pressure that increasing human population places on rural land. A trend cannot be identified for "living" because of too few responses.

For miscellaneous impacts, the expected trend for "pollution" is an increase with Biodiversity Index, because the resource industries are unlikely to consider their own practices to be problematic. "Pollution" does not show a trend. For "introduced", no trend is expected since introduced species pose problems for groups with low and high Biodiversity Index. "Introduced" does not show a trend.

DIVERSE AND SIMPLE LANDSCAPES: FOREST AND FIELD

In Questions 5 and 6, interviewees were asked about the positive and negative aspects of diverse and simple landscapes, with examples of forests (Question 5) and fields (Question 6). Interviewees were shown unlabeled photographs, and questions did not refer to any words or concepts such as diverse, simple, natural, etc. Open-ended responses (positive and/or negative about the diverse and/or simple landscapes) were followed by selection from a rating of 1 to 5 for healthy/unhealthy and beneficial/harmful scales. For columns on Figures 6 and 7 (left scale), positive numbers indicate group responses that are net positive about the diverse landscape or net negative about the simple landscape. Because net responses are shown, two opposing responses from one group cancel each other out and are not plotted. For lines on Figures 6 and 7 (right scale), values indicate each group's health or benefit index, determined by [(diverse health or benefit score) - (simple health or benefit score)]. A positive index indicates a group's preference for a diverse landscape; a negative index indicates a group's preference for a simple landscape.

Diverse and Simple Forests

The expected trend for responses to Question 5 is increasing preference for diverse forests with higher Biodiversity Index. For the open-ended responses, there is an overall trend of increasing preference for diverse forests (and decreasing preference for simple forests) with higher Biodiversity Index, as shown by total height of columns (Figure 6). The largest deviation from this trend is for farmers, who are unexpectedly positive about diverse forests.

Eight out of ten forest attributes are generally associated positively with diverse forests or negatively with simple forests (Figure 6): "natural", "# species", "structure", "decay", "services", "soil/H2O", "fire/disease", and "habitat". Four of these attributes show an expected (but weak) trend of increasingly positive about diverse forests (or negative about simple forests) with higher Biodiversity Index ("# species", "structure", "decay", "fire/disease"). Most (14/18) interviewees name species diversity ("# species") as a positive attribute of diverse forests or a negative (lacking) attribute of simple forests. Forest owners are the only group to indicate that "soil/H2O" and "natural" are net positive attributes of simple forests.

The other two forest attributes ("aesthetic" and "timber/$") are mixed in net group response. Three groups see "aesthetic" as net positive, and three see it as net negative, but there is no correspondence with Biodiversity Index. Three groups see "timber/$" as net positive, two see it as net neutral, and one sees it as net negative, but there is no trend with Biodiversity Index.

The forest health and benefit indices (shown by lines; Figure 6) indicate the degree of preference for the diverse landscape over the simple one. The health and benefit indices (lines) generally follow the open-ended responses (columns), with an overall trend of greater preference for the diverse forest with higher Biodiversity Index. However, there are some major deviations. Farmers are equally favorable toward both landscapes, despite the expectation that they would prefer the simple (economically productive) forest. Forest owners, who are more likely to be biased toward simple (economically productive) forests, do indeed prefer the simple forest. Native Americans (unexpectedly) have the strongest preference for diverse forests over simple forests, despite the fact that all three Native Americans had worked in the timber industry for part of their lives. For all groups, the health index is at least as extreme as the benefit index. This indicates that all of the groups tend to see the two landscapes as differing more in health than in benefit factors.

Diverse and Simple Fields

The expected trend for responses to Question 6 is increasing preference for diverse fields with higher Biodiversity Index. For the open-ended responses, there is an overall trend of increasing preference for diverse fields (and decreasing preference for simple fields) with higher Biodiversity Index, as shown by total height of columns (Figure 7).

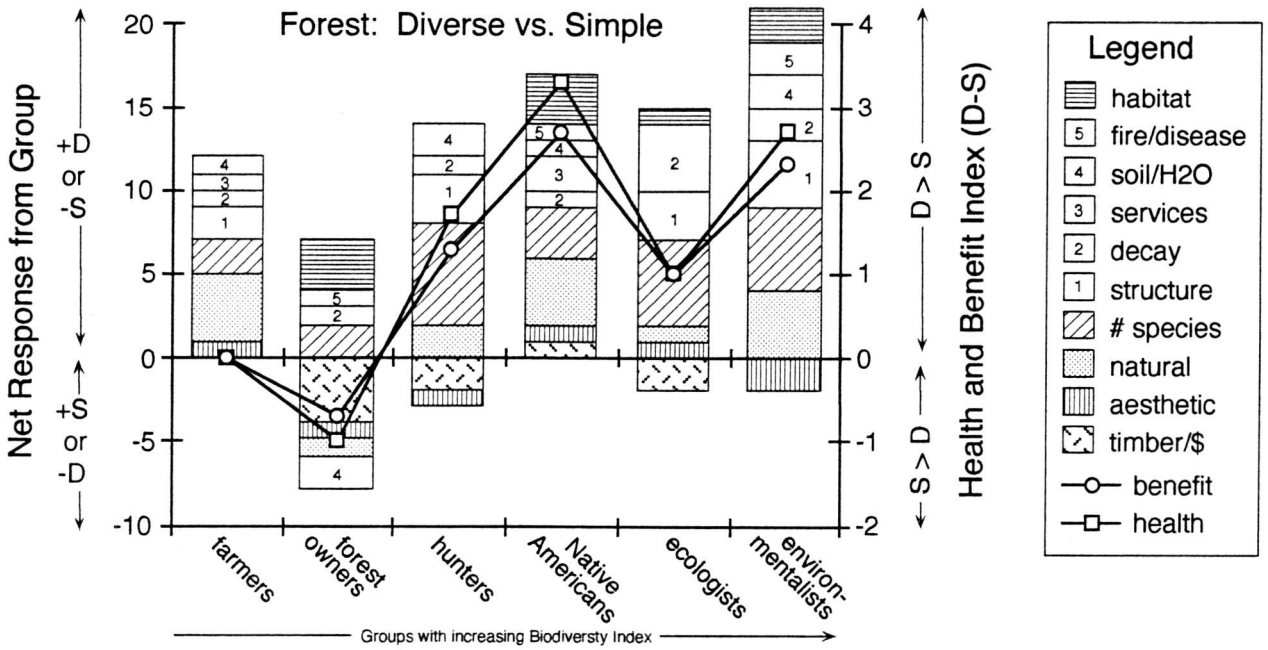

Figure 6. Reactions to diverse (D) and simple (S) forest landscapes, based on responses to Question 5 (see Appendix 1). Left scale (columns): open-ended responses; positive values indicate statements favoring the diverse landscape (+D) or disfavoring the simple landscape (-S); negative values indicate statements favoring the simple landscape (+S), or disfavoring the diverse landscape (-D). Open-ended responses are coded: "timber/$" = use as timber, for products or income; "aesthetic" = aesthetic/spiritual (for hiking, watching, hunting); "natural" = natural, healthy, native; "# species" = diversity of species vs. monoculture; "structure" = varied structure/age of vegetation; "decay" = rotting, decaying, dead woody debris; "services" = ecosystem services (air, water, watershed, medicine); "soil/H2O" = drainage, erosion, runoff, soil condition; "fire/disease" = threat of fire or disease; "habitat" = habitat for wildlife. Right scale (lines): Index = [(diverse health or benefit score) - (simple health or benefit score)]. Health scale is coded: very healthy (5), somewhat healthy (4), neutral (3), somewhat unhealthy (2), very unhealthy (1). Benfit scale is coded: very beneficial (5), somewhat beneficial (4), neutral (3), somewhat harmful (2), very harmful (1).

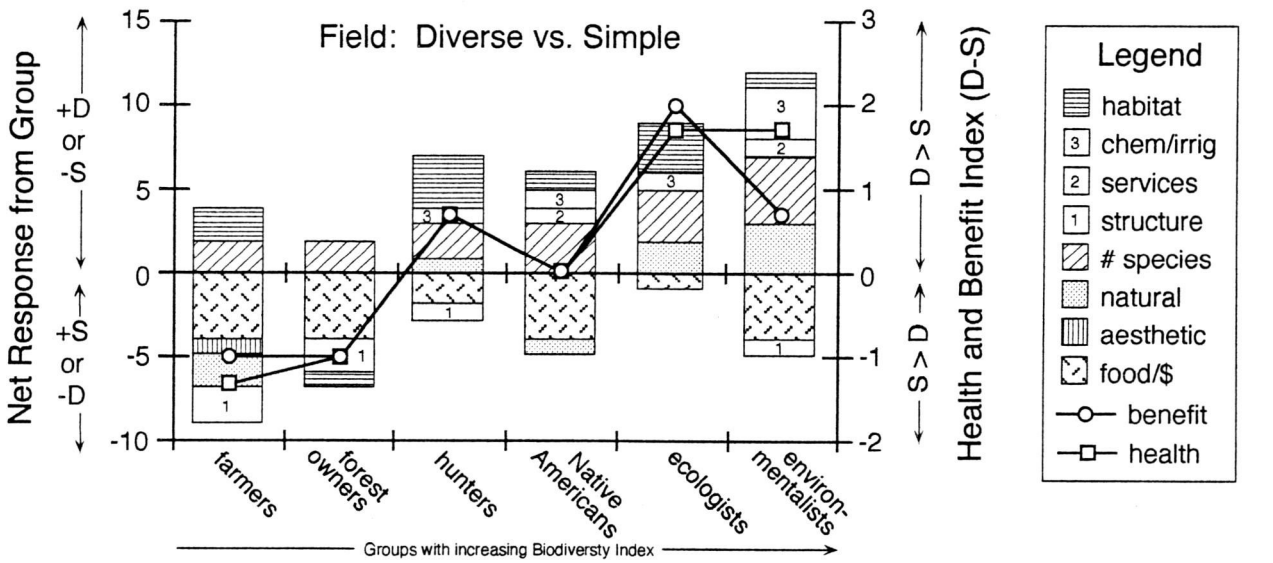

Figure 7. Reactions to diverse (D) and simple (S) field landscapes, based on responses to Question 6 (see Appendix 1). Left scale (columns): open-ended responses; positive values indicate statements favoring the diverse landscape (+D) or disfavoring the simple landscape (-S); negative values indicate statements favoring the simple landscape (+S), or disfavoring the diverse landscape (-D). Open-ended responses are coded: "food/$" = use as food, for products or income; "aesthetic" = aesthetic/spiritual (for hiking, watching, hunting); "natural" = natural, healthy, native, weedy; "# species" = diversity of species vs. monoculture; "structure" = varied structure of vegetation; "services" = ecosystem services (for future, medicine); "chem/irrig" = use chemicals or irrigation; "habitat" = habitat for wildlife. Right scale (lines): Index = [(diverse health or benefit score) - (simple health or benefit score)]. Health scale is coded: very healthy (5), somewhat healthy (4), neutral (3), somewhat unhealthy (2), very unhealthy (1). Benfit scale is coded: very beneficial (5), somewhat beneficial (4), neutral (3), somewhat harmful (2), very harmful (1).

The eight forest attributes that tend to be associated positively with diverse forests have six equivalent field attributes: "natural", "# species", "structure", "services", "chem/irrig", and "habitat". Four of these field attributes show an expected trend (weak for some) of increasingly positive about diverse fields (or negative about simple fields) with higher Biodiversity Index ("natural", "# species", "services", and "chem/irrig"). Half the interviewees (9/18) name species diversity ("# species") as a positive attribute of diverse fields or a negative (lacking) attribute of simple fields. Most groups indicate that one or more of these six field features are net positive attributes of simple fields. For four groups, "structure" (diverse age or physical structure) is net positive for the simple field. A number of interviewees pointed out the positive attributes of woody vegetation at the edge of the simple field photo, but did not notice the equivalent woody material in the diverse field photo. Most groups see "habitat" as a net positive attribute of diverse fields, but there is no trend with Biodiversity Index.

All six groups see "food/$" as net positive about the simple field (or negative about the diverse field) but there is no trend with Biodiversity Index. All groups see "aesthetic" as net neutral, except for farmers, who (not surprisingly) see "aesthetic" as net positive for the simple field (or negative for the diverse field).

The field health and benefit indices (shown by lines; Figure 7) indicate the degree of preference for the diverse landscape over the simple one. The health and benefit indices (lines) generally follow the open-ended responses (columns), with an overall trend of greater preference for the diverse field with higher Biodiversity Index. However, there are some major deviations. Farmers and forest owners both prefer the simple (economically productive) field. Hunters prefer the diverse field. Native Americans rate both landscapes equally, resulting in a lower-than-expected index. Ecologists and environmentalists both rate the diverse field as healthier and more beneficial than the simple field. For all groups except the ecologists, the health index is at least as extreme as the benefit index. This indicates that most groups tend to see the two landscapes as differing more in health than in benefit factors.

Comparison of Forest and Field Responses

The overall trends of responses for forest and field are similar, but there are some noticeable differences. Farmers are fairly negative about diverse (economically unproductive) fields or positive about simple (economically productive) fields, which is not surprising. However, farmers view diverse forests more positively than simple forests, indicating that they may view simple forests as something other than economically productive. Forest owners, however, view forests and fields similarly, with fairly negative views about diverse (economically unproductive) landscapes and fairly positive views about simple (economically productive) landscapes. Surprisingly, forest owners view diverse (economically unproductive) forests more

positively than diverse fields. Hunters, ecologists and environmentalists all view diverse forests and fields more positively than simple forests and fields, but there is a stronger preference for diverse forests over simple forests than for diverse fields over simple fields. Native Americans view diverse forests very positively compared to simple forests, but view diverse and simple fields equally, indicating an unexpectedly high value of simple fields.

REINTRODUCING EXTIRPATED SPECIES

In Question 8, interviewees were asked their views about the hypothetical idea of reintroducing extirpated Gray Wolves, White-tailed Deer, and California Condors in western Oregon. Each interviewee's overall positive, neutral, or negative responses were taken directly or inferred for each species. Figure 8 shows the net positive or negative response of each group, for each species. Neutral responses and positive-negative pairs that cancel are not plotted. The net number of individuals with consistent positive or negative responses are also plotted for each group.

The expected trend was for increasingly positive responses to reintroductions with higher Biodiversity Index. The expected trend is well-expressed for the overall response of each group (column heights in Figure 8). The consistency scores follow the same trend, with lower Biodiversity Index groups having consistently negative responses or neutral, and higher Biodiversity Index groups having consistently positive responses.

All three individual species were expected to follow the same trend of increasing net positive responses to reintroductions with higher Biodiversity Index, and all three species do show this trend. Gray Wolf reintroductions were expected to draw more negative responses, because they are feared predators, and because of recent controversial reintroductions in the Yellowstone area. As expected, Gray Wolves have the most negative responses, with negative responses from 2 groups (farmers and forest owners). California Condor reintroductions were also expected to be somewhat negative, because they are a less familiar species, and they are the subject of a controversial single-species reintroduction effort. As expected, California Condors also have fairly negative responses, with neutral responses for 3 groups and positive responses for 3 groups. White-tailed Deer have the most positive responses, with a neutral response for 1 group, and positive responses for 5 groups.

INTRODUCED (NON-NATIVE) SPECIES

In Question 10, interviewees gave open-ended responses about their views on three introduced (non-native) species in western Oregon (Pheasant, Bullfrog, and Opossum). Each interviewee's overall positive, neutral, or negative responses were taken directly or inferred for each species. Figure 9 shows the net positive or negative response of each group, for each

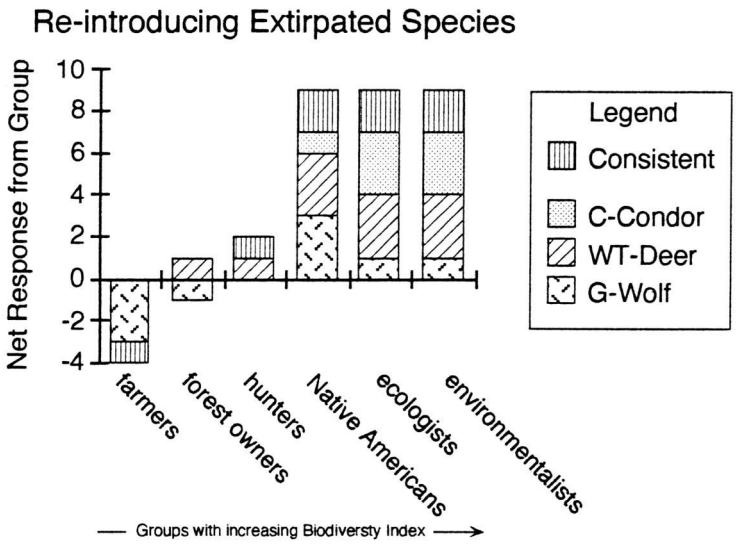

Figure 8. Reintroducing extirpated species. Group score is net response of the 3 members of each group. Possible range is -3 to +3 for each of 3 species. Positive numbers indicate favorable responses to reintroducing extirpated species (pro- native biodiversity). Consistency score (for any person with a consistent response for all three species) adds an additional possible 3 + or - responses. Based on responses to Question 8 (see Appendix 1).

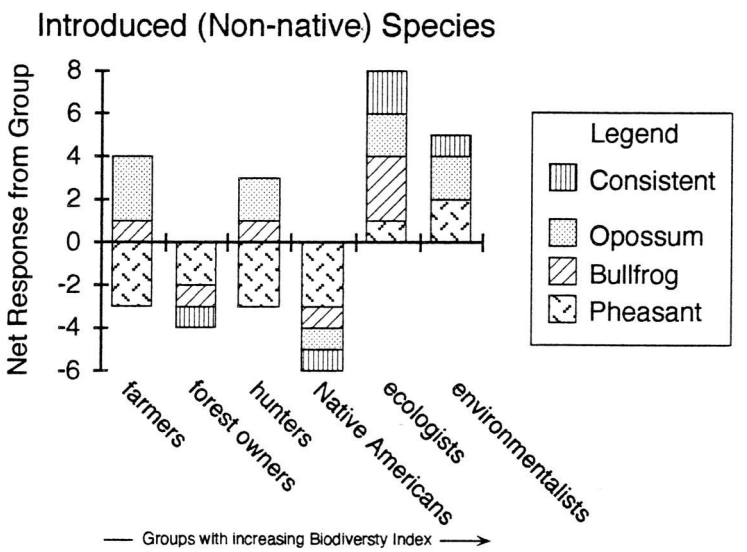

Figure 9. Introduced (non-native) species. Group score is net response of the 3 members of each group. Possible range is -3 to +3 for each of 3 species. Positive numbers indicate unfavorable responses to introduced species (pro- native biodiversity). Consistency score (for any person with a consistent response for all three species) adds an additional possible 3 + or - responses. Based on responses to Question 10 (see Appendix 1).

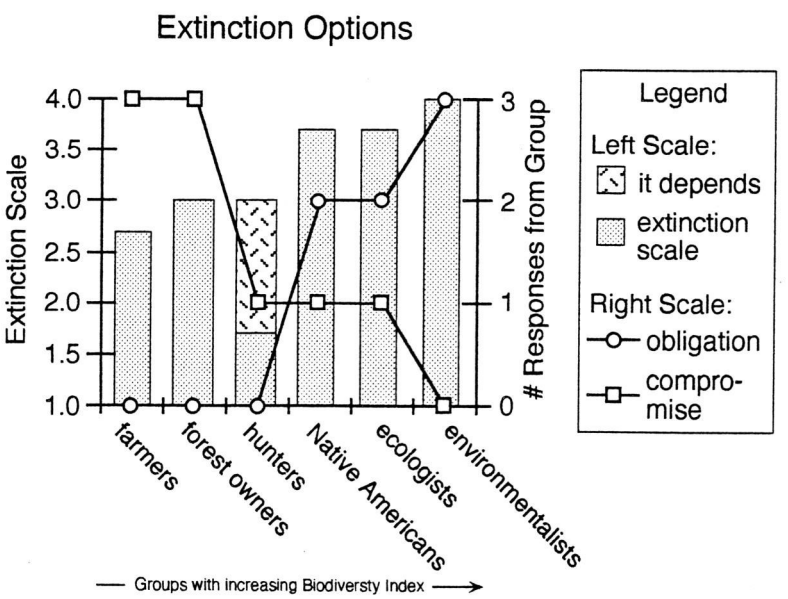

Figure 10. Left scale (columns): acceptable options for extinction due to human activities, based on average scores of 3 members of each group. 1 = entire natural range; 2 = entire natural range, but only for a good enough reason; 3 = part of natural range, but only if doing well in other parts of natural range; 4 = extinction not acceptible. "It depends" = different answer depending on what species. Right scale (lines): total number of responses for selected open-ended responses; open-ended responses are coded: "compromise" = realistic balance between needs of humans and wildlife; "obligation" = ethical obligation to prevent further losses, right to exist. Based on responses to Question 9 (see Appendix 1).

species. Positive responses (pro- native biodiversity) indicate disapproving feelings about introduced species. Neutral responses and positive-negative pairs that cancel are not plotted. The net number of individuals with consistent positive or negative responses are also plotted for each group.

The expected trend was for increasingly positive (disapproving) responses to introduced species with higher Biodiversity Index. The expected trend is only weakly present for the overall response of each group (column heights in Figure 9), with negative responses confined to the four groups with the lowest Biodiversity Index, and the highest positive responses corresponding to the two groups with the highest Biodiversity Index. The consistency scores weakly follow the same trend, with lower to middle Biodiversity Index groups being consistently negative or neutral, and high Biodiversity Index groups being consistently positive.

All three individual species were expected to follow the same trend of increasingly positive (disapproving) responses to introduced species with higher Biodiversity Index, but only the Pheasant shows this trend. Pheasants were expected to draw more negative (approving) responses, because they are appreciated by many people for hunting, watching, and for their rural character. As expected, Pheasants have the most negative (approving) responses, with negative responses from the four lowest Biodiversity Index groups, and positive (disapproving) responses from the two highest Biodiversity Index groups. A moderate response was expected for the Bullfrog, since some people appreciate its sound and flavor, but others may be aware of its voracious appetite for native aquatic species. There is no trend for Bullfrog responses. The most positive (disapproving) responses were expected for Opossums, which are considered aesthetically unappealing by many people. There is no trend for Opossums, but they are considered neutral to positive (disapproved of) by all groups, except Native Americans. Native Americans have surprisingly negative (approving) responses for all three species, due to this group's acceptance of all forms of life, and recognition that even introduced species can play a beneficial ecological role.

ACCEPTABILITY OF EXTINCTION OPTIONS

In Question 9, interviewees indicated how they feel about different degrees of human-caused extinctions. Columns on Figure 10 (left scale) show averaged group response scores. Lines on Figure 10 (right scale) show the number of responses to two explanatory comments.

The expected trend was that human-caused extinction would be more acceptable to low Biodiversity Index groups. This trend is well-expressed, with low Biodiversity Index groups accepting extinction in part of all of some species' ranges, and high Biodiversity Index groups accepting no extinction in any part of any species' range. Two hunters were the only interviewees to choose the option of "it depends" (depends on what species). Two averaged responses are

plotted on Figure 10 for hunters, reflecting extinction scenarios for favored and for disfavored species.

The two explanatory comments also have predictable trends compared to the Biodiversity Index. Low Biodiversity Index groups tend to see their answers as a compromise between the needs of humans and wildlife ("compromise"). High Biodiversity Index groups tend to believe that their answers are based on an ethical obligation to protect other species ("obligation").

PREFERRED LANDSCAPE WILDLIFE

Question 11 asked interviewees to describe the natural landscape they would like to see in western Oregon. Four responses are plotted on Figure 11. Concepts that tend to contribute to the preservation of native biodiversity are plotted as positive. There is a tendency for lower Biodiversity Index groups to offer comments such as "OK now" (preferred landscape is present now) and "compromise" (want compromise or balance between the needs of humans and environment). There is a tendency for higher Biodiversity Index groups to offer comments such as "ecosystem" (need more native ecosystems). Farmers indicate the desire for more resource production, whereas all the Native Americans indicate the desire for less resource production.

FEELINGS ABOUT BIODIVERSITY

In Question 11, interviewees who were aware of the word biodiversity were asked to indicate their feelings about the concept. For each interviewee, positive, neutral, or negative codes were taken directly or inferred from the responses for each species. Net group responses are plotted on Figure 12. All groups have a net positive feeling about biodiversity, which tends to increase with higher Biodiversity Index. Farmers and hunters have lower net scores, because one interviewee in each group feels that biodiversity is merely a popular crisis buzzword currently being used by radical environmentalists to attract financial support.

Two additional explanatory responses are also plotted on Figure 12. Several interviewees from both ends of the Biodiversity Index mention respect for or sacredness of all species ("respect"). Several interviewees with higher Biodiversity Index indicate that biodiversity contributes to the quality of life for humans ("quality of life").

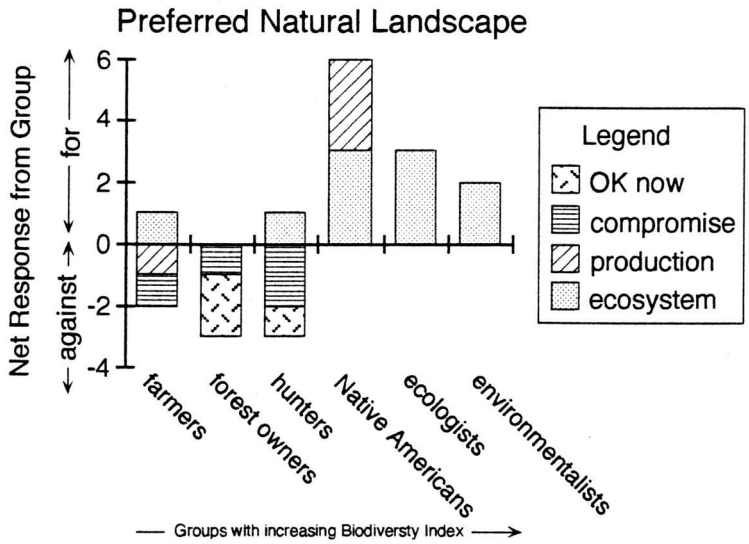

Figure 11. Preferred natural landscape, showing net number of responses that enhance (+) or harm (-) biodiversity. Open-ended responses include: "ecosystem" = more (+) or less (-) native ecosystems; "production" = less (+) or more (-) resource production; "compromise" = need compromise between human needs and protection of environment; "OK now" = landscape conditions close to desired now, do not need additional protection. Based on responses to Question 11 (see Appendix 1).

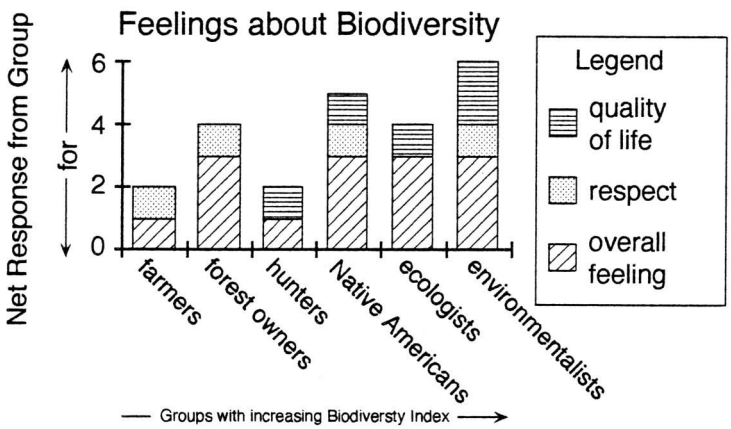

Figure 12. Feelings about biodiversity. Left scale indicates net number of responses that are for (+) or against (-) biodiversity. Open-ended responses include: "overall feeling" = overall feeling about biodiversity; "respect" = respect, empathy for other species, other species sacred; "quality of life" = biodiversity contributes to human quality of life. Based on responses to Question 11 (see Appendix 1).

DISCUSSION AND CONCLUSIONS

A number of substantial results have emerged from the interview data. Group responses for most questions show some meaningful correlations with the groups' Biodiversity Indices. Analysis of these results will help explain the groups' Biodiversity Indices. Additional insights can also be gained from unexpected group responses.

VALUE OF BIODIVERSITY FOR GROUPS

All six groups possess a concept of biodiversity, although there is a tendency for groups with higher Biodiversity Index to have a greater appreciation of biodiversity. Almost all (16/18) interviewees, and all six groups, have net positive feelings about biodiversity, which generally increase with Biodiversity Index (Figure 12). When asked what species they value positively (Question 1), two out of three interviewees from most groups indicate that they value most or all species positively (surprisingly, no environmentalists offered this opinion). When asked what species they value negatively (Question 2), all groups name some species, but more interviewees from high Biodiversity Index groups indicate that there are not any species they value negatively.

Interviewees from all groups mention the concept of (bio)diversity or variety of species, with a slight increase in number of comments corresponding to higher Biodiversity Index. There are, however, important differences between the groups for definitions of biodiversity, preferred uses of biodiversity, perceived threats to biodiversity, and efforts to protect biodiversity.

DEFINITIONS OF BIODIVERSITY FOR GROUPS

Groups with lower and higher Biodiversity Indices clearly value biodiversity. However, the "biodiversity" valued by lower Biodiversity Index groups is somewhat different from the "biodiversity" valued by higher Biodiversity Index groups.

Groups with a lower Biodiversity Index tend to negatively value some introduced species (especially farmers) and positively value others, depending on the species (Questions 1, 2, and 10; Figure 9). Groups with a lower Biodiversity Index tend not to want extirpated species as part of today's landscape, regardless of what species is being considered (Figure 8). These groups are also more accepting of human-caused local or complete extinctions (Figure 10).

Groups with a higher Biodiversity Index tend to negatively value most introduced species (Questions 1, 2, and 10; Figure 9). These groups tend to want extirpated species as part of today's landscape, although the species being considered makes some difference in their views (Figure 8). These groups are also less accepting of human-caused local or complete extinctions (Figure 10).

In summary, lower Biodiversity Index groups tend to want biodiversity that is defined in practical terms (species they value positively, whether introduced, extirpated, or otherwise). Higher Biodiversity Index groups tend to want biodiversity that is defined in a more ideal way (native, pre-European species).

OTHER PERCEPTIONS OF BIODIVERSITY

Groups with a lower Biodiversity Index tend to be content with the way things are, and with a compromise between the needs of humans and the needs of other species (Figures 10 and 11). Groups with lower Biodiversity Index also tend to feel that biodiversity is very important because of food and products that are provided for humans (Figure 4).

Groups with a higher Biodiversity Index, however, are more willing to make sacrifices for the wellbeing of other species (e.g. reintroduce species at any cost or inconvenience; add native ecosystems at any cost). Groups with higher Biodiversity Index also appreciate biodiversity's contribution to their quality of life (Figure 12), and feel it is very important for future human generations (Figure 4).

NATIVE AMERICANS

An interesting exception to these trends is found with the Native Americans. The Native Americans have a mixture of some values similar to low Biodiversity Index groups, plus some values similar to high Biodiversity Index groups.

There are several areas in which Native American values are similar to values of groups with low Biodiversity Index. Native Americans are the most favorable of any group toward introduced species (Figure 9), because they accept that there is a place for all species, even non-natives (including non-native people). Native Americans also value biodiversity highly for the food and other products that it yields (Figure 4). Native Americans value both diverse and simple field landscapes, noting that food is a positive attribute of simple field landscapes (Figure 7).

There are also several areas in which Native American values are similar to values of groups with high Biodiversity Index. Native Americans value the largest number of species positively, and the smallest number of species negatively (Figure 3). Native Americans favor reintroducing extirpated species (Figure 8), and are not very accepting of human-caused extinctions (Figure 10). Native Americans see forest practices as a significant threat to biodiversity (Figure 5), and favor native ecosystems (including forests) over forest production (simple forests) (Figures 6 and 11).

FURTHER RESEARCH

This study has yielded many meaningful results on the perspectives of six groups toward biodiversity in western Oregon. The results are not quantitative or statistically significant, but they provide important insights into the values held by those groups. The methods and results of this study can serve as a starting point for more quantitative research on perspectives towards biodiversity. This study can also serve as a starting point for investigations of more specific issues, such as perspectives on policy and management options for individual species.

IMPLICATIONS FOR POLICY, PLANNING, AND MANAGEMENT

This study has important implications for people involved in policy, planning, and management related to biodiversity. The results indicate that the public values biodiversity, but there is not one simple definition of what "biodiversity" they value. In a sense, there are multiple publics, whose perspectives should all be considered. People involved in matters of biodiversity policy, planing, and management need to be aware of, and responsive to, these multiple perspectives toward biodiversity.

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APPENDIX 1. INTERVIEW QUESTIONS AND CODING OF RESPONSES

Interview Instructions to Participants

I am asking you to participate in this study, to help me determine the range of opinions that people have about some local wildlife issues. I will be interviewing representatives of six different groups, in order to learn about the range of viewpoints that people have on this subject. The six groups are: farmers, private forest owners, Native Americans, environmentalists, hunters, and ecologists. It is important for scientists, policy makers, and planners to have an understanding of the opinions and priorities of people like you, who may be affected by policies and decisions about natural resources and wildlife.

I am interviewing you as someone representing the _____ (e.g. farmer) group. Therefore, I want you to try to answer my questions as someone representing that group, even though you probably also identify with some other groups I am interviewing. During this interview, I want your honest opinion about the questions I ask - there are no right or wrong answers. Feel free to ask me questions at any time - to clarify something I said, or to ask about something related to what we are discussing.

I'll be asking you some questions about local wildlife. When I say "local", I mean wildlife that lives in western Oregon. When I say "wildlife", I mean all kinds of animals living out in their natural settings, and not intentionally kept by people. Therefore wildlife includes birds, mammals, amphibians, reptiles, and fish, as well as insects, slugs, spiders, and other small creatures.

Question 1

What are some kinds of wildlife in western Oregon that are your favorites, or kinds that are most useful or important to you? Why did you mentioned each of these kinds of wildlife?

Coding of Responses (* see Figure 3)

Species:		mammals, birds, reptiles, amphibians, fish, invertebrates	
	*	total number of positive species mentioned	
Reasons:	*	+niche	species plays a beneficial ecological role
	*	+concern	concern for wellbeing of species
	*	+aesthetic	like to see/watch species, spiritual tie or respect for species
	*	+use	species used for hunting, fishing, food, products

Question 2

What are some kinds of wildlife in western Oregon that are pests or nuisance animals for you, or that you just don't like? Why did you mentioned each of these kinds of wildlife?

Coding of Responses (* see Figure 3)

Species:		mammals, birds, reptiles, amphibians, fish, invertebrates	
	*	total number of negative species mentioned	
Reasons:	*	-niche	species plays a harmful ecological role
	*	-bite/sting	species bites, stings, or threatens people physically
	*	-aesthetic	species disliked, ugly, or has other undesirable traits
	*	-damage	species causes or threatens economic damage

Question 3

For the next two questions, I want you to consider both animals and plants. I am going to read a list of reasons why animals and plants may be important in western Oregon. For some of these things, a few kinds of animals and plants may be enough, but for other things, it is good to have many kinds of animals and plants. Then I want you look over the list, and choose your top 3 reasons why it is important to have many kinds of animals and plants.

It is most important to have many kinds of animals and plants for...		Code	
...providing food, income, medicine/drugs, or other products.	_____	food	*
...providing natural services, such as bees that pollinate flowers, or birds that eat insects.	_____	services	*
...recreation such as hunting or fishing.	_____	hunt	*
...recreation such as bird watching or wildlife photography.	_____	watch	*
...future human generations.	_____	future	*
...nature to function well.	_____	function	*
...(because) they have a right to exist.	_____	exist	*
...other _____	_____	other	
None of the above.	_____	none	

Could you tell me briefly why you chose each of those 3 things?

Coding of Responses (* see Figure 4)

* Pre-determined responses: Responses (top three choices) are equally weighted.

Open-ended responses: diversity, variety of species, all species.

Question 4

Some kinds of animals and plants may be threatened by a variety of human activities in western Oregon. I am going to read you a list of human activities that may threaten a lot, some, or no kinds of animals and plants. Then I want you look over the list, and choose the 3 things that you believe pose a threat to the largest number of kinds of animals and plants.

Large numbers of kinds of animals and plants are most threatened by...		Code	
...rural development.	_____	rural-d	*
...habitat loss or change.	_____	habitat-ch	*
...chemicals, toxins, water and air pollution.	_____	pollution	*
...other animals/plants that have been introduced from elsewhere.	_____	introduced	*
...human population growth.	_____	population	*
...the relatively high standard of living that many Americans have.	_____	st-living	*
...agricultural practices and methods.	_____	agriculture	*
...forest practices and methods.	_____	forest	*
...(other) _____	_____	other	
None of the above.	_____	none	

Could you tell me briefly why you chose each of those 3 things?

Coding of Responses (* see Figure 5)

* Pre-determined responses: Responses (top three choices) are equally weighted.

Open-ended responses: diversity, variety of species, all species, extinction/loss of species.

Question 5

Here are some photographs of scenes you might see in the area where you live or work or recreate in western Oregon. What seems good or bad to you about one or both of these scenes, and why? [Photo A: simple forest landscape with dense single-age stand of mature Douglas fir trees; little in understory; little or no downed woody debris. Photo B: diverse forest landscape with several species of multi-age conifers; moss and lichens; understory covered with ferns; large rotting log sprouting understory plants.]

Now that you have told me your ideas in your words, I want you to choose which of my words best describes your opinions about each scene. Use YOUR definition of healthy and beneficial.

	A	B		A	B	Code	
very healthy	___	___	very beneficial	___	___	5	*
somewhat healthy	___	___	somewhat beneficial	___	___	4	*
neutral	___	___	neutral	___	___	3	*
somewhat unhealthy	___	___	somewhat harmful	___	___	2	*
very unhealthy	___	___	very harmful	___	___	1	*

Coding of Responses (* see Figure 6)

* Pre-determined responses: see above.

Open-ended responses: each comment is coded positive (+) or negative (-), and coded to A (simple forest) or B (diverse forest). Each participant may have any number and combination of responses. Subjects of comments are coded as:

*	timber/$	use as timber, for products or income
	density	density of trees (not graphed)
*	aesthetic	aesthetic/spiritual (for hiking, watching, hunting)
*	natural	natural, healthy, native
*	# species	diversity of species vs. monoculture
*	structure	varied structure/age of vegetation
*	decay	rotting, decaying, dead woody debris
*	services	ecosystem services (air, water, watershed, medicine)
*	soil/H2O	drainage, erosion, runoff, soil condition
*	fire/disease	threat of fire or disease
*	habitat	habitat for wildlife

Question 6

Here are some more photographs of scenes you might see in the area where you live or work or recreate in western Oregon. What seems good or bad to you about one or both of these scenes, and why? [Photo A: diverse field landscape with foreground and middle ground dominated by variety of grasses and herbaceous plants; middle ground has brushy thicket; background has deciduous trees. Photo B: simple field landscape with wheat field in foreground and middle ground; deciduous trees in background.]

Now that you have told me your ideas in your words, I want you to choose which of my words best describes your opinions about each scene. Use YOUR definition of healthy and beneficial.

	A	B		A	B	Code	
very healthy	___	___	very beneficial	___	___	5	*
somewhat healthy	___	___	somewhat beneficial	___	___	4	*
neutral	___	___	neutral	___	___	3	*
somewhat unhealthy	___	___	somewhat harmful	___	___	2	*
very unhealthy	___	___	very harmful	___	___	1	*

Coding of Responses (* see Figure 7)

* Pre-determined responses: see above.

Open-ended responses: each comment is coded positive (+) or negative (-), and coded to A (diverse field) or B (simple field). Each participant may have any number and combination of responses. Subjects of comments were coded as:

*	food/$	use as food, for products or income
*	aesthetic	aesthetic/spiritual (for hiking, watching, hunting)
*	natural	natural, healthy, native, weedy
*	# species	diversity of species vs. monoculture
*	structure	varied structure of vegetation
*	services	ecosystem services (for future, medicine)
*	chem/irrig	use chemicals or irrigation
*	habitat	habitat for wildlife

Question 7

(a) I want to ask you some questions about mountain lions. How do you feel about mountain lions, and why?

(b) State wildlife biologists estimate that there are about 3,500 mountain lions in Oregon today, more than half of which live in western Oregon. Choose the statement is closest to your opinion about the number of mountain lions in western Oregon.

		Code
There are way too many mountain lions in western Oregon.	___	1
There are a few too many mountain lions in western Oregon.	___	2
There are about the right number of mountain lions in western Oregon.	___	3
There should be a few more mountain lions in western Oregon.	___	4
There should be a lot more mountain lions in western Oregon.	___	5

Why did you choose that statement?

(c) If you [lived in a rural area and] thought that a mountain lion was actively threatening your livestock or a pet, which of the following solutions would you prefer? Which solution would you prefer if a mountain lion was actively threatening a person?

		Code
Do nothing to the threatening mountain lion; scare it away.	___	1
Relocate the threatening mountain lion.	___	2
Eliminate the threatening mountain lion.	___	3
Relocate all mountain lions that come near houses or farms.	___	4
Eliminate all mountain lions that come near houses or farms.	___	5
Eliminate all mountain lions from western Oregon.	___	6
Other _____	___	7

Why did you choose those/that solution(s)?

Coding of Responses

Pre-determined responses: see above.

Open-ended responses to (a), (b), and (c):

+niche	positive ecological role (e.g. predator, part of nature)
-niche	negative ecological role (e.g. over-hunts deer or elk)
aesthetic	symbol of wild, like to see/watch/hunt, spiritual
conflict	increasing conflict with people; high populations of humans
diversity	good for species diversity
equal	right to exist; valued as much as people
threat	threat of danger to humans, pets, livestock
reclusive	reclusive, cunning, hide
manage	reduction or control of population needed
territory	territorial, large territories, young/sick pushed human areas
fair game	fair game in each other's territory

Additional open-ended responses to (c):

problem	response different if it is a problem animal (previous incidents)
no threat	not generally a threat, only attacks to protect itself
relocation	relocation is a waste of money or ineffective
Darwin	elimination prevents problem animals from passing along traits

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Question 8

There are several kinds of wildlife that used to live in this part of western Oregon before European settlement, but have now died out in most or all of this area. These include the gray wolf, the white-tailed deer (which has remnant populations in Douglas County and on the Columbia River), and the California Condor. What positive and/or negative reactions would you have if there was an effort to reintroduce the [gray wolf/white-tailed deer/California Condor] locally, and why?

Coding of Responses (* see Figure 8)

For each species:

*	consistent	participant consistent in overall response to all 3 species
*	+ (1)	overall positive about reintroduction (stated directly or inferred)
*	= (0)	overall neutral about reintroduction (stated directly or inferred)
*	- (-1)	overall negative about reintroduction (stated directly or inferred)
	habitat	concern that appropriate habitat or food would not be available
	existing	cause problems for existing wildlife species through competition, predation, interbreeding
	opinion	public opinion would be a barrier
	population	not compatible with human population density and land uses
	$ impact	threat or help to financial investments or income (e.g. livestock)
	rights	would be a threat to private property rights
	wilderness	reintroduction into wilderness/remote areas would be OK
	diversity	good/bad/unnecessary to have additional species
	adaptation	good/bad to help species not well adapted to present conditions
	niche	good/bad for ecology or balance of nature
	use of $	good/bad use of money; single-species approach wasteful
	benefit	benefit to other species through management for this species
	improve	need to improve conditions where species is still present

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Question 9

Supposed you learned that one kind of animal was probably going to die out (or go extinct) in western Oregon, due to human activities. How would you react? Choose the statement that most closely matches your opinion.

		Code	
It is OK for an animal to die out in all of its natural range.	____	1	*
It is OK for an animal to die out in all of its natural range, but only for a good enough reason [what?]	____	2	*
It is OK for an animal to die out in part of its natural range, but only if it is still doing well in other parts of its natural range.	____	3	*
It is not OK for an animal to die out in any part of its natural range.	____	4	*
It depends on what kind of animal we are talking about [select 2 answers with examples]	____	1,2,3,4	*

Why do you feel this way?

Coding of Responses (* see Figure 10)

* Pre-determined responses: see above.

Open-ended responses:

*	compromise	realistic balance between needs of humans and wildlife
*	obligation	ethical obligation to prevent further losses; right to exist
	natural	had original natural range for a reason; should still have that range
	adaptation	do not help species that not well adapted to present conditions; unhealthy or small populations can die out
	come/go	species naturally come and go, due to natural change or management
	impact	long-term negative impact (loss of intra- or inter- species diversity)
	option	we should consider other options wherever possible
	megafauna	OK for small animals to lose natural range, not OK for large animals
	use of $	good/bad use of money; single-species approach wasteful
	causes	human causes are still natural

Question 10

There are some kinds of wildlife in western Oregon that have been introduced from other parts of the country or the world. In this question, I am going to ask you about pheasants, bull-frogs, and opossums, which all have been introduced into this area by humans. How do you feel about introduced [pheasants/bullfrogs/opossums] as part of the natural landscape in western Oregon?

Coding of Responses (* see Figure 9)

For each species:

*	consistent	participant consistent in overall response to all 3 species
*	+ (-1)	overall positive about each introduction (stated directly or inferred)
*	= (0)	overall neutral about each introduction (stated directly or inferred)
*	- (1)	overall negative about each introduction (stated directly or inferred)
	aesthetic	positive or negative about watching, seeing, listening
	hunt	positive of negative about hunting or eating
	more/less	want more, less or none of this species
	harm	OK only if no harm to native species
	obligation	humans obligated to consider/avoid impact of introductions
	belong	species (wildlife, human) can belong if present for long time
	niche	ecologically beneficial (+), neutral (=), harmful (-), unknown but concerned (c)
	adapt	introduced species not well adapted (to land use, natural conditions)
	pest/help	species impact on humans is helpful (+), neutral (=), harmful (-)

Question 11

(a) How would you describe the natural landscape and wildlife you'd like there to be in this part of western Oregon?

(b) What about the word "biodiversity" - is that a word you've heard before? (Ask only if diversity/variety were not mentioned at all in the interview; if these were mentioned, check Yes).

No _____ go to (c), skip (d), (e), (f) Yes _____ skip (c), go to (d), (e), (f)

(c) Biodiversity generally means all the variety of living things, including all plants and animals and all variation there is both between and within kinds. Given this definition, would you want to add the word biodiversity to the description you just gave about how you would like western Oregon to be?

No _____ (go to demographics) Yes _____ (go to demographics)

(d) What sources that you listen to or read have discussed or mentioned "biodiversity", in your personal and/or professional life?

(e) What aspects of nature or the landscape do you associate with the word biodiversity?

(f) How do you feel about biodiversity?

Coding of Responses

(a) (* see Figure 11)

*	ecosystem	more (+), same (=), or less (-) native ecosystems
*	production	more (+), same (=), or less (-) resource production
*	compromise	need compromise between human needs and environment
*	OK now	landscape conditions close to desired now
	rural-d	more (+), same (=), or less (-) development, rural development
	buffers	more (+), same (=), or less (-) stream or field buffers, greenways
	species	more (+), same (=), or less (-) species (e.g. native, introduced)
	population	more (+), same (=), or less (-) human population
	diversity	more (+), same (=), or less (-) species diversity
	accessible	need abundant/accessible natural areas for humans to connect with

(d)	media	TV, radio, magazines, newspaper
	peers	discussions with peers (individually or in interest group)
	job	job experience
	agency	discussions with government agency people; written materials
	political	lobbying or political activity
	academic	academic journals, meetings, proposals; discussions with professors
	self	from personal observations, childhood, traditions
	classes	university or other adult classes
(e)	health	healthy, natural ecosystem; flexible; redundancy
	interactions	species interactions; impact of losing species; each has a role
	political	catchy political phrase for fundraising
	benefits	humans benefit (+) or harmed (-) from biodiversity
	definitions	problems with different definitions of biodiversity
	+manage	more effective management when manage for biodiversity
	-manage	management for human goals more important than for biodiversity
	species	diversity within or between species
	habitat	diversity of habitats, topography, or streams
	not-human	places where humans are not dominant
(f) (* see Figure 12)		
*	+ (1)	overall positive about biodiversity (stated directly or inferred)
*	= (0)	overall neutral about biodiversity (stated directly or inferred)
*	- (-1)	overall negative about biodiversity (stated directly or inferred)
*	respect	respect, empathy for other species, other species sacred
*	Q of life	biodiversity contributes to human quality of life
	+discussion	glad so many people discussing biodiversity
	-discussion	wish more were discussing biodiversity

Demographics (* see Figure 2)

How many years have you lived in western Oregon?

* How old are you?

What is your job or occupation?

* How many years experience have you had with this job (or very involved with this group)?

* How much formal education have you had?

		Code
completed HS	_____	12 years
some college	_____	14 years
BA or BS	_____	16 years
MA or MS	_____	18 years
PhD or equivalent	_____	22 years

APPENDIX 2. RESPONSES CONTRIBUTING TO THE BIODIVERSITY INDEX

BD Index #	Ques -tion #	What Counts	How Count 3	Possible Range	Actual Range	+1	+1/2	0
1	1-2	# species ratio like/dislike	average	0 - inf	0.7 - 4.3	≥ 2.0	1.0 - 1.9	0.0 - 0.9
2	1-2	# classes ratio like/dislike	total	0 - inf	0.7 - 2.5	≥ 2.0	1.0 - 1.9	0.0 - 0.9
3	3	mentioned diversity/variety	all 3	0 - 3	2.0 - 3.0	2.5 - 3.0	1.0 - 2.0	0.0 - 0.5
4	4	mentioned diversity/variety	all 3	0 - 3	2.0 - 3.0	2.5 - 3.0	1.0 - 2.0	0.0 - 0.5
5	5	ratio A-B+/A+B-	total	0 - inf	1.1 - 22.0	≥ 2.0	1.0 - 1.9	0.0 - 0.9
6	5	health index(B-A)	average	-5 - +5	-1.0 - +3.3	>0	0	<0
7	5	benefit index (B-A)	average	-5 - +5	-0.7 - +2.7	>0	0	<0
8	6	ratio A+B-/A-B+	total	0 - inf	0.4 - 2.2	≥ 2.0	1.0 - 1.9	0.0 - 0.9
9	6	health index (A-B)	average	-5 - +5	-1.3 - +1.7	>0	0	<0
10	6	benefit index (A-B)	average	-5 - +5	-1.0 - +2.0	>0	0	<0
11	8	wolf reintroduction	all 3	- - - +++	- - - +++	+++ or ++=	mixed	- - - or - - =
12	8	deer reintroduction	all 3	- - - +++	- =+ +++	+++ or ++=	mixed	- - - or - - =
13	8	condor reintroduction	all 3	- - - +++	- =+ +++	+++ or ++=	mixed	- - - or - - =
14	9	extinction OK? - scale	average	1.0 - 4.0	1.7 - 4.0	≥ 3.5	2.5 - 3.4	1.0 - 2.4
15	9	it depends	any	no yes	no yes	no	(na)	yes
16	10	introduced pheasant	all 3	- - - +++	- - = +++	- - - or - - =	mixed	+++ or ++=
17	10	introduced bullfrog	all 3	- - - +++	- - - ++-	- - - or - - =	mixed	+++ or ++=
18	10	introduced opossum	all 3	- - - +++	- - - ==+	- - - or - - =	mixed	+++ or ++=
19	11	landscape desired	all 3	- - - +++	mixed +++	+++ or ++=	mixed	- - - or - - =
20	11	general feeling re: BD	all 3	- - - +++	- ++ +++	+++	mixed	- - -

Explanation of Column Headings:

BD Index #	20 contributions to the Biodiversity Index
Question #	Question number from interview (see Appendix 1)
What Counts	What aspect or code of the question's response is used
How Count 3	How the three interviewees' responses were combined any = any one interviewee all 3 = all three interviewees must agree (otherwise "mixed")
Possible Range	Theoretical range of combined response
Actual Range	Actual range of combined response of the six groups
+1	Range of combined responses that receive a score of +1
+1/2	Range of combined responses that receive a score of +1/2
0	Range of combined responses that receive a score of 0