

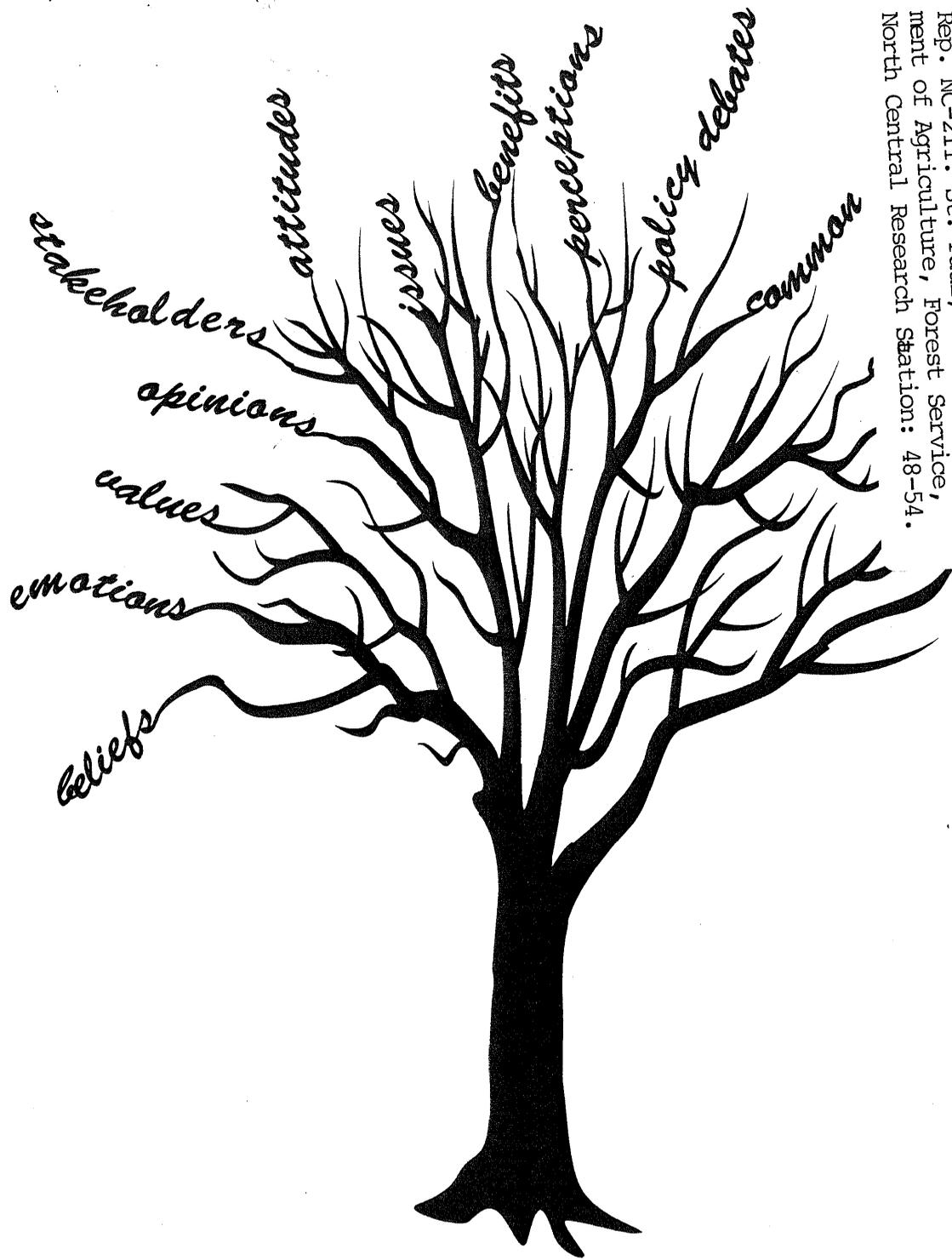
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Applications of Computer - Aided Text Analysis in Natural Resources

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Ten contributed papers describe the use of a variety of approaches to computer-aided text analysis and their application to a wide range of research questions related to natural resources and the environment. Taken together, these papers paint a picture of a growing and vital area of research on the human dimensions of natural resource management.

KEY WORDS: Computer-aided, computer-coded, content analysis, human dimensions, text analysis, textual data.

TABLE OF CONTENTS

	<i>Page</i>
Foreword	1
<i>David N. Bengston</i>	
Increasing the Trustworthiness of Research Results: The Role of Computers in Qualitative Text Analysis	1
<i>Lynne M. Westphal</i>	
What Makes A Place Special? Interpretation of Written Survey Responses in Natural Resource Planning	7
<i>Herbert W. Schroeder</i>	
Exploring Residents' Perceptions of a Natural Protected Area Using Computer-Aided Analysis of Interview Text	12
<i>Terilyn D. Allendorf</i>	
Turning Qualitative Text Into Interval-level Data: A Computer Content Analysis Approach	15
<i>Chad D. Pierskalla and Dorothy H. Anderson</i>	
Exploring the National Benefits of Alaska's Tongass National Forest	19
<i>Stewart D. Allen, David N. Bengston, and David P. Fan</i>	
Applying the VBPro Computer Programs to Analysis of Environmental Policy Debates: Comparing Stakeholder Frames	26
<i>Bonnie P. Riechert</i>	
Messages in Global Climate Change: Using the Diction Program to Analyze News Coverage	29
<i>James Shanahan</i>	
Monitoring the Social Environment for Forest Policy Using the InfoTrend Computer Content Analysis Method	34
<i>David N. Bengston and David P. Fan</i>	
Computer-Aided Qualitative Content Analysis: A Useful Approach for the Study of Values	43
<i>Karen G. Mumford and J. Baird Callicott</i>	
In Search of Common Ground Among Diverse Forest Stakeholders: A Contextual Content Analysis of Online Text	48
<i>Jennifer A. Cuff, David N. Bengston, and Donald G. McTavish</i>	

In Search of Common Ground Among Diverse Forest Stakeholders: A Contextual Content Analysis of Online Text

Jennifer A. Cuff, David N. Bengston, and Donald G. McTavish¹

Abstract.—Managing public forests collaboratively requires an understanding of differences between and similarities among diverse stakeholder groups. The Minnesota Contextual Content Analysis (MCCA) computer program was used to analyze text obtained from World Wide Web sites expressing the views of seven diverse stakeholder groups involved in forest planning and management. Stakeholder groups were found to share a practical orientation toward achievement of goals, but had important differences in the emphasis they placed on a set of more specific concepts. MCCA was found to be a potentially useful tool for stakeholder analysis.

A stakeholder is defined as a person or social group who feels that their interests will be affected by the outcome of a decisionmaking process (Dunster and Dunster 1996). These interests may be financial or economic, but they may also be motivated by the full range of human values, including moral, spiritual, aesthetic, and ecological values. The number and diversity of forest stakeholder groups—and their importance in forest planning and management—have increased in recent decades.

Understanding the ways in which stakeholder groups view forest policy and management is likely to be a key to successful collaborative planning. Members of different stakeholder groups often have widely divergent perspectives on forest management. There may, however, also be significant similarities in the ways in which stakeholders view forest management which may be common ground for collaborative and participatory approaches to forest management. Managing public forests collaboratively requires an understanding of both differences between and similarities among diverse stakeholder groups.

This study used the Minnesota Contextual Content Analysis (MCCA) computer program to

analyze differences and similarities between seven stakeholder groups involved in forest planning and management. In the following section, we describe the data and computer content analysis methodology. This is followed by a discussion of the findings. In the final section, we briefly discuss implications for collaborative approaches to forest planning.

DATA AND METHODOLOGY

The textual data analyzed in this study were obtained during the spring of 1997 from the web sites of forestry stakeholders. We searched web sites of the following seven stakeholder categories for text related to forest or other natural resource policy and management, including position papers, press releases, newsletter articles, speeches, and so on:

- Native Americans (Menominee Tribal Enterprises, Indian Forest Management Team)
- Mainstream environmentalists (Sierra Club, Audubon Society)
- Radical environmentalists (Earth First!)
- Wise use group (Center for the Defense of Free Enterprise)
- Timber industry associations (American Forest & Paper Association, Engineered Wood Association)
- Forestry professionals (Society of American Foresters)
- USDA Forest Service

An important motivation for groups such as these to create web sites is to promote their views about various policy issues. Many of the documents we found on these web sites were an outstanding source of expressions of the

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attitudes, beliefs, values, and worldviews of the seven forestry stakeholder groups.

After identifying and downloading stakeholder texts from the Internet, we analyzed the texts using the MCCA program (McTavish and Pirro 1990). MCCA is a computer-based content analysis program that has been used in the analysis of a wide range of social science research questions (e.g., see Garwick *et al.* 1994, McTavish 1997, McTavish *et al.* 1997, and papers located at <http://www.clres.com>). MCCA builds in certain rules for text analysis that helps users compare a large number of complex texts. To do this, a dictionary is used to organize words into over 100 idea categories and each category is characterized by four weights reflecting the way categories are emphasized in four general social/institutional contexts. Many words with multiple meanings are disambiguated using the context information about categories.

MCCA calculates two normed score profiles for each text segment: institutional or social context scores (c-scores) and concept emphasis scores (e-scores). These are normed against standard English usage found in a broad sampling of written and spoken text. Both scores are useful as part of a systematic analysis of textual data, and they help in an examination of similarities and differences between stakeholder groups.

C-scores: A profile of four social context scores indicates the relative emphasis or lack of emphasis on four general social contexts. The profiles help identify how ideas in a text are framed. In this study, c-scores represent the institutional or social perspective forest stakeholders use in framing their discussions. The four c-scores are identified as follows:

- *Traditional.* This approach emphasizes normative standards of conduct, rules, and sanctions for deviation that are framed as right or wrong. Institutions in which standards guiding social behavior are emphasized include religious, military, and legal institutions. Text generated in these situations would typically receive high positive c-scores indicating their framing in a normative or traditional way.
- *Practical.* This approach is goal or achievement oriented. Deviations are treated as a success or failure in accomplishment. Business institutions

emphasizing the "bottom line" would typically be examples of this way of framing a text. A pragmatic approach to topics would typically receive a high positive c-score on this dimension.

- *Emotional.* This approach emphasizes personal involvement or concern, stronger likes or dislikes, comfort or irritation, engagement or repulsion in the topics being addressed. Leisure institutions tend to emphasize this way of framing ideas and, thus, the approach would receive higher positive c-scores.
- *Analytic.* This approach emphasizes a more distanced or intellectual curiosity about some phenomenon as might be found in educational and research institutions.

E-scores. These scores measure the overemphasis or underemphasis a text places on each of more than 100 idea categories. The following examples are a few of the idea categories and words that may be coded for these categories, depending on the context in which they are used:

- *Virtues* (e.g., benefits, courage, healthy, justice, priority, reputation, valuable, vigilance, virtue)
- *Deviance* (e.g., bribe, bribery, collusion, crimes, deviation, fraud, greedy, lie, murderers, pretenses, propaganda, rumors, theft, vice)
- *Duty* (e.g., commitment, duty, necessity, obligation, registration)
- *Traditional Symbols* (e.g., children, compliance, disadvantage, privilege, regulations, respect, respected, status)
- *Merchandise* (e.g., capital, cattle, crops, economies, economy, expenses, lumber, minerals, oil, products, property, resource, salaries, timber, wealth)
- *Activity* (e.g., activity, energy, meeting, occupied, organizing, programs, reporting)
- *Prohibit* (e.g., abandoned, abolish, barring, excluded, exclusion, forbid, ignored, limiting, limits, prevent, restricted)
- *Submit* (e.g., accept, admitted, conforming, following, obey, organizing, reliance, respect, sacrificing, serve, submit, worship, yielding)
- *Deviant Behavior* (e.g., abuse, attacks, degenerate, fighting, killing, lied, lynch, rob, smuggling, waste, wrong, wrongful)

- *About Changing* (e.g., approaching, attempt, attempting, challenging, conversion, exert, management, renewing, restoring, strives, tried)
- *Creative Process* (e.g., caused, created, creating, creative, devise, discovered, establishing, formulate, generate, imagine, inspired, original)

E-scores range from high negative scores to high positive scores, with zero normed at usual English usage of a broad sample of text. Higher positive scores indicate greater emphasis on that idea in the text, and higher negative scores indicate a censoring or omission of that idea. Sets of related categories can be grouped to examine broader concepts and themes in a text (e.g., categories such as good, virtues, enjoy-like, and happy could be grouped together as a broader positive concept). Quantitative distinctions between texts can be made by calculating an overall distance between profiles of emphasis on idea categories.

FINDINGS

Table 1 provides the profile of social context scores for each of the seven stakeholder groups. The scores are weighted so that they sum to zero within groups. In general, the seven groups frame their presentation of themselves and their perspectives on forest management issues in a practical manner, with all of the practical scores the highest scores for any text. They also avoid an emotional framing of their presentation, or the sense that they are highly involved personally in their position. Instead, the picture they present is one of handling a practical matter.

Beyond the overall practical emphasis, stakeholders present a somewhat different pattern in the framing of their position. Each profile of c-scores shows somewhat different emphases. To analyze these differences, we computed Euclidean distances between c-score profiles of all pairs of stakeholders. These distances are shown in table 2 and portrayed in a two-dimensional plot in figure 1. This plot is the result of a non-metric scaling analysis that iteratively fits plot positions in a way that maintains the relative distances shown in the distance matrix shown in table 2. Figure 1, then, shows how close the seven stakeholders are in the way they frame their views of forestry issues. For example, some groups take a somewhat more normative or traditional approach (e.g., Wise Use Group and the USDA Forest Service). Some couch themselves in a somewhat more distanced analytic way (e.g., Forestry Professionals and the Wise Use Group).

The Wise Use Group, Forestry Professionals and Radical Environmentalists are most distant from each other and they bound the cluster plot (fig. 1). This suggests that these groups would have difficulty understanding each other and, perhaps, communicating with each other unless they moved somewhat closer to each other in the way they frame their discussion. Forestry Professionals and the Wise Use Group are least pragmatic and more analytic than the other stakeholders, suggesting that they are more likely to take on a somewhat academic stance. Radical Environmentalist groups, on the other hand, are lowest on the analytic dimension and, with Native Americans, Mainstream Environmentalists,

Table 1.—*Weighted social context scores (c-scores) for seven forest stakeholder groups (scores sum to zero within groups). Positive numbers indicate overemphasis, and negative numbers indicate underemphasis.*

Forest stakeholders	Social perspective			
	Traditional	Practical	Emotional	Analytic
Native Americans	-5.53	25.00	-18.64	-0.83
Mainstream environmentalists	-0.93	24.44	-24.07	0.56
Radical environmentalists	-2.49	25.00	-14.51	-8.00
Wise use group	5.57	14.93	-25.00	4.50
Timber industry associations	-2.19	25.00	-21.90	-0.91
Forestry professionals	-5.63	18.91	-19.37	6.09
USDA Forest Service	2.40	22.60	-24.06	-0.94

Table 2.—Matrix of Euclidian distances between groups based on the four social contexts (c-scores). Smaller numbers indicate greater similarity between groups, and larger numbers indicate less similarity.

Forest stakeholders	Forest stakeholders*						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Native Americans	.0	7.3	8.8	17.1	4.7	9.2	9.9
(2) Mainstream environmentalists	7.3	.0	12.9	12.2	3.0	10.3	4.1
(3) Radical environmentalists	8.8	12.9	.0	20.8	10.2	16.4	13.1
(4) Wise use group	17.1	12.2	20.8	.0	14.2	13.2	10.0
(5) Timber industry associations	4.7	3.0	10.2	14.2	.0	10.2	5.6
(6) Forestry professionals	9.2	10.3	16.4	13.2	10.2	.0	12.2
(7) USDA Forest Service	9.9	4.1	13.1	10.0	5.6	12.2	.0

* 1 = Native Americans, 2 = Mainstream environmentalists, 3 = Radical environmentalists, 4 = Wise use group, 5 = Timber industry associations, 6 = Forestry professionals, 7 = USDA Forest Service.

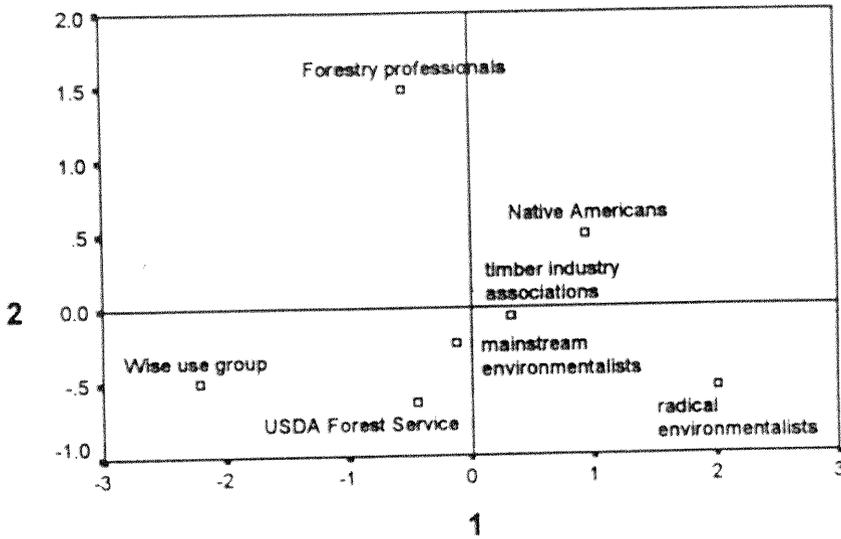


Figure 1.—Plot of context distances (c-scores) between stakeholder texts.²

and Timber Industry Associations, express themselves in a very pragmatic, drive-to-success oriented way. The Wise Use Group and the USDA Forest Service tend to frame their presentations in more traditional terms

than the other groups, stressing rules of appropriate behavior and how things should be. Although all groups tend to frame their position in non-emotional terms, the Native American and Radical Environmental groups are somewhat less "un-emotional" in framing their presentations.

²This two-dimensional plot of the c-score distance matrix shows the Euclidean distance between c-score profiles for the seven text groups. The distance matrix was analyzed using non-metric scaling with the SPSS program Alscal. The plot shows relative distances between texts in terms of how they frame their discussion. Smaller distances mean that the groups are framing their discussion in more similar ways.

Groups that are apparently closest in their framing are Timber Industry Associations and Mainstream Environmentalists, and we would predict that this indicates they may be better able to discuss issues than are groups more distant in social context. The similarity in c-score profiles for these Timber Industry Associations and Mainstream Environmentalists

may indicate that although these groups often have different policy goals related to forestry issues, they are both mainstream in their perspectives and strategies and are attempting to appeal to a broad audience with their views of forest policy.

As shown in figure 1, the USDA Forest Service, Mainstream Environmentalists, Timber Industry Associations, and Native Americans are relatively close to each other, differing mainly in how tradition oriented they are (USDA Forest Service being more tradition oriented and Native Americans the least). The Wise Use Group and Radical Environmentalists are most distant, contextually. Radical Environmentalists are also far from Forestry Professionals. The relatively substantial distance in how the USDA Forest Service and Forestry Professionals frame their presentations of forestry issues suggests some potential for communication problems.

Table 3 provides a probability distance matrix between stakeholders based on their overall profile of over 100 e-scores. Figure 2 is a two-dimensional cluster plot that graphically illustrates these distances. It is clear that Radical Environmentalists and the Wise Use Group are most different from other stakeholders, emphasizing ideas that are relatively different from ideas emphasized by the other groups. In terms of emphasized ideas, the USDA Forest Service and Forestry Professionals are relatively similar (although, as figure 1

reveals, they differ in how these ideas are framed). Mainstream Environmentalists and Native Americans are relatively close in the ideas they discuss in their web presentations.

Table 4 provides a listing of some of the main e-score differences between these groups. There are several noteworthy patterns. For example, the Wise Use Group emphasizes the idea of "prohibit" much more than others do and it emphasizes talk of "deviant behavior." It also tends to emphasize ideas of "creative processes" as do the Forestry Professionals and, to a lesser extent, Mainstream Environmentalist stakeholder groups. All groups except the Wise Use Group and Radical Environmentalists emphasize the concept category "about changing." The Timber Industry Associations emphasize the idea of "merchandise" more than other groups, but Native Americans and Mainstream Environmentalists emphasize this idea as well.

CONCLUDING REMARKS

Is there common ground between these diverse stakeholder groups? This analysis suggests that the social orientation of the seven forestry stakeholder groups is somewhat similar. Forest policy and management is a practical activity, and all of the groups share a pragmatic orientation toward achievement of goals. The success of some collaborative forest management efforts in recent years is evidence that stakeholders can work together to achieve

Table 3.—*Matrix of Euclidian distances between groups based on the concept emphasis scores (e-scores). Smaller numbers indicate greater similarity between groups, and larger numbers indicate less similarity.*

Forest stakeholders	Forest stakeholders*						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Native Americans	.0	23.3	34.8	34.2	28.3	26.7	29.9
(2) Mainstream environmentalists	23.3	.0	35.2	35.5	24.8	30.2	27.7
(3) Radical environmentalists	34.8	35.2	.0	31.2	42.1	44.9	40.7
(4) Wise use group	34.2	35.5	31.2	.0	42.8	40.4	33.7
(5) Timber industry associations	28.3	24.8	42.1	42.8	.0	34.1	35.1
(6) Forestry professionals	26.7	30.2	44.9	40.4	34.1	.0	32.1
(7) USDA Forest Service	29.9	27.7	40.7	33.7	35.1	32.1	.0

* 1 = Native Americans, 2 = Mainstream environmentalists, 3 = Radical environmentalists, 4 = Wise use group, 5 = Timber industry associations, 6 = Forestry professionals, 7 = USDA Forest Service.

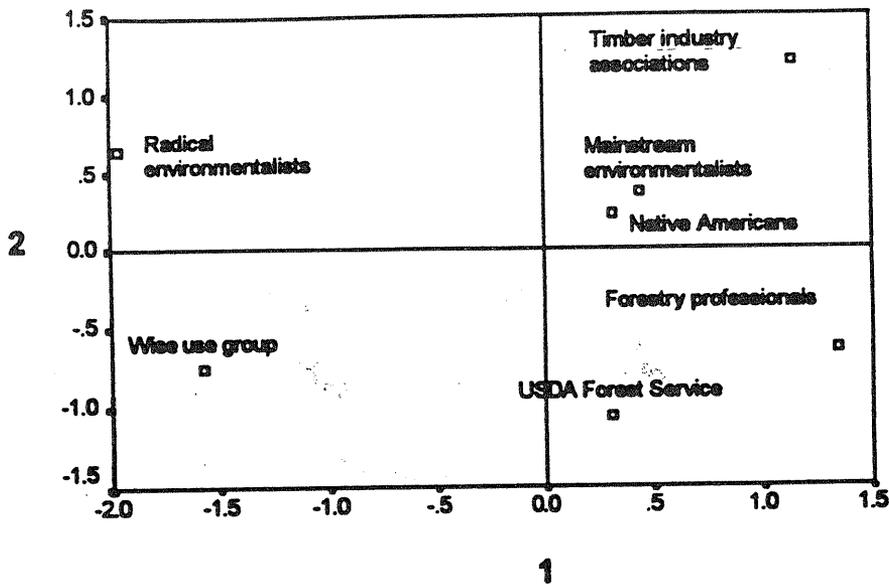


Figure 2.—Plot of concept distances (e-scores) between stakeholder texts.³

common goals, and the similarity in social context shown in table 1 may be a factor in this success.

But this analysis also shows that, as would be expected, significant differences exist between forestry stakeholders, especially in terms of the ideas they emphasize. Differences in values, attitudes, and goals may be inferred from many of the 116 concept categories identified by MCCA. For example, the Native American text emphasized the idea “submit” far more than

the other stakeholder texts. A closer examination of the Native American text reveals that this emphasis reflects a greater concern with

³ This two-dimensional plot of the e-score distance matrix shows the difference between e-score profiles for the seven text groups. The distance matrix was analyzed using non-metric scaling with the SPSS program Alscal. The plot shows relative distances between texts in terms of what they are emphasizing. Smaller distances mean that the groups are emphasizing more similar ideas.

Table 4.—Concept emphasis scores (e-scores) for seven forest stakeholder groups for selected concept categories. Positive numbers indicate overemphasis, and negative numbers indicate underemphasis.

Selected concept categories	Forest stakeholders*						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
About changing	24.65	20.15	3.41	5.16	20.01	30.59	26.59
Creative process	9.88	10.66	3.91	11.55	6.72	27.28	5.86
Submit	8.25	4.60	-2.07	-0.89	-0.38	-0.55	3.51
Merchandise	4.60	4.51	0.80	0.90	5.43	2.98	3.08
Prohibit	4.18	5.53	-0.23	17.30	5.63	5.04	-0.04
Duty	1.86	0.80	-1.01	1.50	0.31	7.55	0.69
Activity	1.75	0.97	3.61	8.86	8.66	0.68	0.09
Virtues	1.15	4.04	-0.43	8.12	3.13	4.91	4.39
Deviance	0.57	-1.39	5.58	1.03	-1.43	-2.61	-2.19
Deviant behavior	-1.59	1.09	5.41	7.71	-0.35	-1.87	-0.64
Traditional symbols	-2.64	-2.75	-3.28	-1.09	0.83	4.86	-0.56

* 1 = Native Americans, 2 = Mainstream environmentalists, 3 = Radical environmentalists, 4 = Wise use group, 5 = Timber industry associations, 6 = Forestry professionals, 7 = USDA Forest Service.

respecting the natural world (indicating a higher ranking of moral/spiritual values) and managing forests in ways that conform with natural processes (indicating a higher ranking of ecological values). Timber Industry Association text emphasized "merchandise" more than the other groups, indicating a higher ranking of economic and commodity values. Working out value differences such as these is perhaps the most daunting challenge of collaborative forest planning and management.

Based on this study, we conclude that Minnesota Contextual Content Analysis may be a useful tool for stakeholder analysis. MCCA could be used in the early stages of collaborative planning efforts to analyze text reflecting the views of stakeholder groups. The fact that such text is widely available on the World Wide Web helps ensure that a stakeholder analysis can be carried out quickly and efficiently. MCCA may be especially useful if text obtained from open-ended surveys or interview transcripts of the general public is included for comparison with the other groups. The perspective of the general public on forestry issues could serve as a benchmark for comparison. Similarities in social context or concepts that are emphasized may be a useful starting point in identifying common ground between diverse groups. Similarities and differences between groups identified in a stakeholder analysis of this type may be helpful in designing more effective collaborative planning processes.

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