SUSTAINABLE FOREST MANAGEMENT NETWORK

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RESEARCH COMMUNICATIONS
2003

Forest values, perceptions, and co-management in northwestern Ontario

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[April 2003]

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Forest Values, Perceptions, and Co-management in Northwestern Ontario

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Abstract

An understanding of forest values and perceptions of the members of different user groups is essential for designing co-management regimes. Hence, forest values and perceptions of the members of four groups, Aboriginal People, Environmental Non-Government Organizations (ENGOs), Forest Industry, and the Ontario Ministry of Natural Resources (OMNR), in northwestern Ontario, are recorded and analyzed. The Conceptual Content Cognitive Mapping, 3CM, is used to record forest values and perceptions. Forest values universe, comprising ten dominant forest value themes, is created through hierarchical clustering. Inter-group and intra-group similarities and differences among the rankings of participants' personal values and their perceptions are determined through various non-parametric statistical tests such as the Friedman test, the sign test, the Kruskal Wallis Test and the Wilcoxon test or Mann Whitney U test. Generally, comparable rankings were found across the participant groups' personal ranking of the value themes. The dominant three value themes that were consistent across the groups were Recreation, Environment, and Spirituality, while Aboriginal Values were included by Aboriginal participants and Economic Impact was included by industry participants. Perceptions about a particular group were similar across the participant groups, and perceptions seem to be based on common social view about that group or misperceived notions. Perceptions of the members about their own organization's forest values differ from their own forest values. The perceptions about ENGOs varied more than the perceptions for the any other groups.The similarities across personal values, even when organizational values may differ, could as a minimum provide a foundation on which to base discussions for co-management regimes.

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1.0 Introduction

Sustainable forest management (SFM) has replaced sustained yield timber management as the current forest management regime in Canada. SFM is designed around the concept of incorporating multiple forest values, that is, values beyond the customary timber value (Behan 1990; Bengston 1994; Davidson-Hunt and Berkes 2001; Erdle 1999), and these values include Aboriginal values, environmental values, and economic values. This multiple values-based forest management requires a collaborative approach to decision-making among all affected groups such as Aboriginal People, environmental groups, forest industry, and government. This collaborative approach is termed as forest co-management (Beckley 1998).

Co-management requires the incorporation of each groups' preferences for forest management objectives. These preferences are easily obtained through one's forest values, as they are considered to be the underlying basis for preferences of forest use and non-use (Bengston 1994). Thus, it is imperative to recognize and understand forest values of the members of different groups in order to create a foundation for co-management. An understanding of values alone however, will not suffice for developing conflict resolution mechanisms or building cohesive and equitable relationships among the various groups, for which conflict is common. An understanding of people's perceptions of one another's forest values is necessary for these purposes (Druckman et al. 1988), because it will assist in highlighting matters of agreement and appreciating areas of disagreement, and thus creating more positive views of one another's intentions. Consequently, the identification and comparison of forest values and perceptions of the members of different groups is an essential component of the co-management framework (Bengston 1994; Brown and Reed 2000; Steel et al. 1993).

In order to elicit these forest values and perceptions, a new methodology known as Conceptual Content Cognitive Mapping (3CM) was used. 3CM is a methodology used to measure both people's perspectives regarding an issue or their cognitive maps of complex issues. Cognitive maps assist individuals to recognize, predict, evaluate and take action in an environment (Kaplan 1973 cited in Austin 1994).

The main purpose of this research is to develop an understanding of forest values and perceptions of the members of four groups, Aboriginal People, Environmental Non-

Government Organizations (ENGOs), Forest Industry, and the Ontario Ministry of Natural Resources (OMNR), in northwestern Ontario. Specifically, this research answers the following five questions: What are the personal forest values of the members from each of the four groups? What are the similarities and differences of values across the groups? What are member's perceptions of their own group's forest values as well as the other groups' values? Are people's perceptions of their own group's forest values similar to their personal forest values? Finally, are people's perceptions of other groups' forest values similar with the members' personal values of that group?

To put these issues into perspective this working paper is divided into six sections. Section 2 consists of a description of both the participants involved and the study area of interest, followed by the objectives of this study. The development of the 3CM methodology used in this study is explained in Section 3, as well as an explanation of how data was collected and analyzed. Section 4 presents the dominant forest value themes that were externalized from participants' individual values. Also, the results from comparing participants' personal ranking of the forest value themes using non-parametric statistical tests are included. Section 5 consists of an analysis of participants' perceptions regarding one another's ranking of the forest value themes, using similar non-parametric tests as in Section 4. Comparisons are made between personal values and perceptions of one's own group, as well as across all groups' perceptions for each group. In order to provide some insight into the connection between the quantitative results and the possibilities to assist in developing a co-management framework, conclusions are drawn from the results in Sections 4 and 5 and are summarized in Section 6.

2.0 Background

The shift toward SFM in Canada has also challenged forest management within Ontario. In 1991, the OMNR developed a strategic policy framework known as "Direction 90s", in which they envisioned the definition of sustainable development, from the Brundtland Report, as the direction towards managing Ontario's forests (Casimirri et al. 2001). Consequently, in the last decade Ontario has developed strategies such as the *Ontario Living Legacy* (OLL), and the *Ontario Forest Accord* (OFA), which have changed the direction of forest management. Both the OLL and OFA involved

members from the forest industry, the OMNR and ENGOs. Aboriginal people were excluded from both the decision making table, as well as from the four primary objectives of the OLL, ensuing a significant setback to this process. Consequently, those involved in this study include the forest industry, the OMNR, Aboriginal People, and ENGOs.

Ontario's forest industry has been a significant contributor in sustaining the economic development of numerous northern communities. While, on a larger scale Ontario exports about $10 billion annually in forest products, making it one of the provinces top five export industries, (Ontario Forest Industries Association 1998). In addition to the economic importance of forestry to both northern communities and the province, professional foresters represent the forestry profession and thus, they possess a substantial influence in developing and interpreting policy, and recommending forest management practices. The forests are representative of Aboriginal culture, a way of life, a sense of identity and home. Forests are also seen as providing a resource critical in achieving several Aboriginal Peoples' aspirations, such as sustained economic development, business opportunities, and to increase employment. On other hand, the environmental movement has exerted a significant influence on forest management practices, and ENGOs have started playing a critical role in forest management practices all over the world including Ontario.

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2.1 Study Area

The study area for this thesis research is northwestern Ontario consisting of three treaty areas, Treaty 9 (Nishnawbe-Aski Nation), Treaty 3 (Grand Council Treaty 3) and Robinson-Superior Treaty (Anishnabek Nation).

2.2 Objectives

Subsequently, the objectives of this study are:

1) To identify personal forest values of the members of different groups, in order to understand their scope and range.

2) To identify the similarities and differences, in the forest values of members, within and across the group's.

3) To determine the perceptions each group members have of forest values of another groups, including the perception of their own group's values.

4) To compare and analyze the differences and similarities among perceptions of members of different groups about another group's forest values.

5) To provide suggestions in facilitating open and effective communication among the groups for the development of a co-management framework.

3.0 Methodology

This chapter describes the methods of data collection, steps for 3CM, and the methods used for data analysis - the non-parametric statistical analysis.

3.1 Methods of Data Collection
3.1.1 Sample Size and Selection of Participants for Data Collection

Approximately 30 members from each target group - the forest industry, Aboriginal People, OMNR and ENGOs - participated in data collection. Although, ENGOs have considerable influence in the planning process, they are a recent addition and are small in comparison to the large forest industries, government and Aboriginal People. Hence, we were unable to identify thirty members from ENGOs in northwestern Ontario, and as a result, members were interviewed from ENGOs based in Toronto, as that is where the majority of them are located. Specifically, twenty members from environmental groups, thirty-six from OMNR, thirty-three Aboriginal people, and thirty-one forest industry participants were interviewed, with a total of 120 participants. The response rate was 90.1% as only twelve people who were contacted refused to participate.

Participants were drawn from various levels of hierarchy within each group. Since a diverse collection of forest values was wanted, little restrictions were placed as to who was asked to participate. Specifically, within the forest industry people from various positions were interviewed, such as the corporate level, planners, cutters, Aboriginal liaisons, area superintendents, operation foresters, and people working within the mill. The OMNR and ENGOs however, possess members who are not involved in forest issues, consequently only those in related positions were asked. From the OMNR,

participants were from biologists, field technicians, planners, area supervisors, district managers, wildlife specialists, foresters etc. An effort was made to spread the OMNR participants over the different districts of northwestern Ontario. The ENGO participants included people, from ENGOs based in Toronto, who were involved in forest management planning. Others who were from northwestern Ontario included environmental representatives on Local Citizens' Committee, active environmentalists within the north, and people from organized environmental groups. Any Aboriginal person who agreed to participate was included. Specifically, people were included from political treaty organizations such as Grand Council Treaty 3, band councils, Grand Chiefs, environmental representatives within the communities, trappers, and people living within the communities. The distribution of the participants within each group was aimed to diversify the forest values and perceptions, while not creating a biased sample. Finally, it should be mentioned that participants came from across northwestern Ontario, and specifically from within each treaty area.

A few participants overlapped across the participant groups. First an Aboriginal person who was identified in this study as Aboriginal was also a contractor for a forest industry. In addition, three Aboriginal participants were also part of an organized environmental group formed within their community. Finally, another Aboriginal participant worked for the OMNR who was identified as an OMNR participant under his request.

In February 2001, the workshop, *Research Issues, Strategies, Partnerships for Sustainable Forest Management in Northwestern Ontario and Beyond* was held in Thunder Bay to bring together the different groups who would be involved in this project. Several participants of the workshop participated in this study. Other contacts were made through the following: a Local Citizens Committee meeting in Kenora, participation in an OMNR regional manager's meeting in Thunder Bay, and finally through a PhD forestry student, Peggy Smith. Additional participants were identified through a modified snowball approach with recommendations solicited from initial contacts within each group.

3.1.2. Preliminary Contact with Participants

Prior to the interview people were contacted through telephone or email and were given an introduction regarding the project and the researcher. Both individual and group interviews were conducted. This was dependent on whether participants felt comfortable within a group. Group interviews consisted of five people or less. If an interview was arranged then a phone call was given to the participant prior to the meeting as a reminder.

3.1.3 Conceptual Content Cognitive Mapping, 3CM

At the beginning of the interview, participants were asked to fill out a personal information form, and then were explained the project's objectives and steps for the 3CM task. Interview times ranged from 20 minutes to 2 hours in length with an average of approximately 50 minutes.

The steps for the 3CM exercise were as follows:

1) Participants were ensured that everything was kept confidential and that their names, personal forest values and perceptions would not be associated with them. Care was taken in providing a relaxed and supportive environment, particularly for those who were unaccustomed to sharing information of this type. As well, the participants were reassured that it is not a test, there are no correct or wrong answers, and there is no minimum or maximum number of cards needed to be filled.

2) *Introduction to the issue.* A visualization exercise was used to stimulate participants to begin thinking about their forest values.

> "If you like you may close your eyes. I want you to take a moment and imagine yourself in a forest. What are you doing there, what do you see? This is for you to take a moment and visualize why forests are important to you."

Give the participant a moment to think.

> "At this time, I want you to think specifically what it is that make up your personal forest values, that is, why are forests important to you? As you think of these reasons, write each one down on a separate index card and place it in front of you."

If the participant was stuck, prompts were provided to stimulate their thought process, however without instilling interviewer's values or others that may not be their own.

3) *Identification of forest* values. Participants wrote their values on the index cards and when completed, they were told that if they thought of any more they were free to add them as the interview continued.

4) *Organization of Values*. When participants were satisfied with their values they were asked to group or arrange their cards in a way that would be useful for explaining the significance of their values, that is, some participants categorized them into similar themes or kept them as one large group.

5) *Explanation and labeling of clusters*. Once the cards were organized, participants were asked to explain their arrangement by placing a title, describing a common theme of all the cards in that group, on each group of cards

6) *Ranking of values*. After the cards were arranged and labeled, participants were asked to rank the groups in the order of importance, followed by ranking the individual cards within the groups in the order of importance.

7) *Perceptions of other's forest values*[1]. Participants were then asked to repeat the exercise, four times, but now giving their perceptions for forest values of each participating organization (forest industry, OMNR, ENGOs, and Aboriginal People) including their own organization.

8) *Summary*. Upon completion, participants were again reminded of the project's objectives and purpose to reiterate why the participant was taking part in the exercise.

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[1] Each participant group was asked to give their perceptions of their organization that they are affiliated with (e.g. a forest industry participant will provide his/her perceptions of what he/she believes the industry's forest values are). Aboriginal participants however, included members from Aboriginal organizations as well as people from communities, all of who provided perceptions of people within their community (i.e. themselves) as opposed to the members of political treaty organizations or band members.

3.2 Methods for Statistical Data Analysis

3.2.1 Hierarchical Clustering

The dominant forest value themes were identified through hierarchical clustering using SPSS. A similarity matrix was made combining participants' personal values from the four groups. Although the values may differ considerably across the groups, it was beneficial to have combined them into one matrix because this data will contribute to a co-management framework, where people's values will ultimately become a collective set. As well, this combination allows for comparisons to be made because all values are categorized on a similar scale, preventing the problem that would occur if separate matrices were made per participant group. If separate matrices were used then value categories would differ because some participants would include values that others in another group would not, creating inconsistency when comparing. Finally, because the participant groups are merged there is little chance of placing a bias onto a group. For instance, with separate matrices an opportunity is present to exclude a value due to a biased judgment that the participant's value does not belong to his or her group.

Hierarchical clustering was done in three stages to produce a Forest Values Universe consisting of ten dominant value themes. First, all value items that were included by more than one participant were identified producing the similarity matrix of the size, 360 x 360. Each box within the matrix represented the percentage of participants who grouped those two values together. For ease of entering data, values listed on the spreadsheet were categorized into broad themes based on how participants had grouped them during the 3CM exercise, as well as how past literature had combined similar values. Participants who listed only one value in a group were not counted for, as values on the diagonal of a similarity matrix will always be one. This matrix was then subjected to hierarchical clustering, and because of its size and the small percentages in each cell, results were not useful.

Participants' cards were then re-examined and similar values within the themes were combined to produce a new similarity matrix. For instance, a participant indicated biodiversity protection and protection of endangered species in one 3CM cluster[2];

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[2] 3CM clusters refer to the groups made by participants with their values during the 3CM exercise.

therefore, these values were counted as one as opposed to two values. Care was taken when combining participants' forest values so as to prevent information from being lost. This similarity matrix consisted of 321 values, which were organized into 20 broad value categories and was then subjected to hierarchical clustering. Results from hierarchical clustering identified five groups for each of the 20 value categories, producing a 100 x 100 matrix. Titles originating from participants' 3CM labels were given to both the 20 categories and its five groups. Categories were re-examined to ensure rationality of grouping, and if necessary value items were re-grouped according to participants' original grouping and personal judgment.

From this, a new matrix was formed by combining similar value categories such as Work, Economic and Social, reducing the number of categories to ten. This matrix was then subjected to hierarchical clustering, creating five sub-themes for each of the ten dominant value themes. Finally, a Forest Values Universe was created. In summary, there are ten dominant value themes, each with five sub-themes. The sub-themes consist of the 20 value categories and these are comprised of participants' value items.

3.2.2 Participants' Rankings of the Ten Forest Value Themes

Since the Forest Values Universe consisted of a combination of participants' value items, the rankings of the ten themes from these value items need to be determined. A spreadsheet for each participant group was made comprising of the ten value themes and each participant's ranking of that theme. Ranking of the themes was conducted by looking at participants' original ranking of their 3CM clusters (i.e. the groups they made from their values during the 3CM exercise). If a value item such as 'carbon sink' was grouped in a 3CM cluster that was ranked second, then the ranking two would follow under the Environment theme. Thus, depending on where the value item falls within the ten themes the ranking from the 3CM cluster in which that value was found, was placed under the corresponding theme.

If however, the participant did not indicate more than one 3CM cluster then the rankings from the value items were used. For instance, a participant indicates seven value items and leaves them as one 3CM cluster, however, she ranks them from one to seven. Then, the ranking from the value item is used to determine the participant's

ranking of the value themes. As well, if a participant did not indicate any value items pertaining to a theme, then a rank of twenty was placed for that theme. Twenty was used because the total number of participants' value items did not exceed twenty, and because one was ranked as being the most important, hence twenty would indicate lack of importance to a participant.

3.2.3 Non-parametric Statistical Analysis

During the 3CM exercise, participants ranked their values in the order of importance indicating a preference of one forest value over another. The act of choosing one thing over another implies an assigning of value (Bengston 1994). It is important to distinguish this because values are not being measured (e.g. in dollars) instead they are being assigned a value (e.g. 1, 2, 3 with 1 being most important). These rankings are considered as ordinal data. Hence, non-parametric statistical techniques are used to analyse data for the intra-group and inter-group similarities and differences among participants' forest values and their perceptions. The different non-parametric statistical tests used in this research are discussed next.

The Friedman Test for Randomized Block Design and the Sign Test

These tests were used to determine the similarities and differences of rankings within each participant group. The Friedman test is a more general test revealing whether differences exist within the rankings of the ten value themes for each participant group. In this test, the null hypothesis is the following:

"At a 5% significance level can we conclude that significant differences exist in industry participants' rankings of their forest values?"

For each participant group, a similar null hypothesis was tested. Results then would indicate whether participants within a group ranked each of the value themes (e.g. Recreation and Environment etc.) significantly different, if not, this suggests comparable importance placed on two or more forest values. If the results from the Friedman test indicated that values were significantly different, this implies that each group possesses a sequence of values in some order of importance. Accordingly, a more specific test - the Sign Test was used, which compared the rankings of two value themes at a time in order

to establish a sequence of the importance of the values. Hence, the Sign test established whether one value (e.g. economic) is perceived to be more important than another value (e.g. environment) in a group. It questions whether, "At a 5% significance level, can we conclude that one value such as Economic is perceived (by a group e.g. industry participants) as being more important than Societal Benefits?" Various combinations of two values were tested in order to provide the final order of importance of all the values. For instance, Economic Impact was tested against the remaining nine values themes, then, Societal Benefits was tested against the remaining eight value themes and so forth. In addition, the Sign test also computed the differences in rankings by the participants between the two values being tested, that is, it indicated the number of positive and negative differences. This determined which values were to the left or to the right of each other, depending on whether the differences were positive or negative. When a value is to the left (i.e. a negative difference) it indicates that this value is more important, because participants ranked their values with one being most important thus, the lower the rank the more important.

The Kruskal Wallis Test and the Wilcoxon Test or Mann Whitney U Test

These tests were used to determine the differences and similarities of the rankings for each value theme across the four groups. The Kruskal Wallis test determines whether the rankings of a value theme are significantly different across the four groups. The Wilcoxon Test or Mann Whitney U Test compares the rankings of a given value theme between two participant groups' (e.g. Aboriginal and the forest industry). First, this test determines which values are significantly different between the two groups, and then, from those values it distinguishes which participant group ranked which value more importantly. At a 5% significance level then, a two-tailed test was used to examine which value themes were different, as well, the rank sums[3] for each value theme were provided indicating which participant group ranked those values more importantly (i.e. a lower rank sum or to the left).

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[3] A rank sum is the aggregated total of value rankings given by participants.

Non-parametric Tests with Participants' Perceptions

These tests were also applied to reveal differences and similarities with the perceptions of each group's rankings of another's forest value themes. The Friedman test was conducted sixteen times, in order to determine whether significant differences exist across the ranking of value themes within a participant group's perceptions regarding either their own organization's, or of another organization's ranking of value themes. For instance, tests were conducted for ENGO participants' perceptions about their organization's ranking of value themes, and for the remaining other organizations. For the Sign test, an order of importance of values was determined for each group's perceptions of their own organization's and the other organizations' ranking of value themes. Again, it was conducted sixteen times. The Kruskal Wallis test revealed whether the perceptions about a group's ranking of a forest value theme was significantly different across the four groups. For instance, it was determined whether differences existed for the ranking of Economic Impact across the perceptions from each group.

4.0 Forest Value Themes and Participants' Ranking of Personal Forest Value Themes

4.1 Forest Values Universe

As previously discussed in Section 3, three stages of hierarchical clustering were used to identify ten dominant forest value themes. Each theme consisted of five sub-themes that are comprised of forest value categories[4], and the forest value categories are composed of the individual forest values that participants wrote on their 3CM cards. Hence, our Forest Values Universe comprises of ten themes, fifty sub-themes, forest value categories, and the individuals' forest values. The ten themes along with their sub-themes are shown in Appendix 1.

4.2 The Participants' Ranking of Personal Forest Value Themes

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[4] As stated earlier, forest value categories refer to the forest values combined as a result of the second stage of hierarchical clustering

The ranking of forest value themes are compared using non-parametric statistical tests to analyze the differences and similarities within each participant group, as well as across the participant groups. Results from these tests and the analyses are discussed now.

4.2.1 Results of the Friedman Test and the Sign Test

The Friedman test, as previously discussed, was used to determine whether the rankings of the forest value themes by participants within each group are statistically similar or different. A summary of the results from the Friedman test for each participant group is given in Table 1. At a 5% significance level, the test statistic (F) observed was found to be greater than χ^2 critical (16.919) for each participant group, suggesting that within each group the ranking of the forest value themes are significantly different. It can be concluded then, that participants within each group indicated a set of preferences for the different value themes, and as a result, they are indicating a preference for different management objectives.

Since the Friedman test indicated differences in the ranking of forest value themes, the Sign test was used to determine the order of ranks with the value themes for each group. The rankings based on the results of the Sign test for the four participant groups are given in Table 2, and the rankings for each group are displayed in Figure 1 to Figure 4. The forest value themes that are joined, for example, Economic Impact and Recreation in Figure 1 were not significantly different from each other; yet, they were significantly different from the value themes that are shown separately.

As expected forest industry participants ranked Economic Impact as being the most important, however, Recreation and Spirituality are also ranked of equal importance (Figure 1). Tests were conducted at a 5% significance level with a Z score[5] of 1.96. When comparing Recreation with Economic, the observed Z for Recreation is –1.486, using the absolute value (i.e. 1.486) is less than 1.96 and thus, the rankings of the two value themes – Recreation and Economic are not significantly different. The same is true for other value themes that are shown jointly in Figure 1, such as Societal Benefits and Environment. The observed Z score for Economic and Environment is 2.228 (in its

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[5] A Z score is a standardized score that tells how many standard deviation units above or below the mean a value falls.

absolute value, which is greater than 1.96), indicating that the ranking of these two themes is different at a 5% significance level. Thus, their ranking of value themes is the following, Economic Impact with Recreation and Spirituality ranked first, followed by a combination of Environment and Societal Benefits, then Personal Values, and subsequently, another combination with Tourism and Uses, and the final combination with Aboriginal Values and Education.

The order of importance of forest value themes for Aboriginal participants is found in Figure 2. Naturally, the theme Aboriginal Values was of greatest importance, however Environment was found to be as well. Subsequently, the value themes, Spirituality[6], Economic Impact, and Recreation were not significantly different from one another at a 5% significance level. Following is Uses, and the remaining themes that are not significantly different - Tourism, Education, Societal Benefits and Personal Values[7].

Figure 3 presents OMNR participants' ranking of the forest value themes. Spirituality and Environment were combined and ranked to be their leading value themes, followed by Recreation then a combination of the themes Economic, Societal Benefits and Personal Values. Subsequent to this is Education and after, is a combination of the themes Tourism and Uses, and finally, Aboriginal Values.

ENGO participants' ranking of the forest value themes are presented in Figure 4. Spirituality and Environment were ranked to be the most important followed by the themes Recreation and Personal Values, which were not significantly different at 5% significance level. Third is Education, with the combination Economic, Societal Benefits, Tourism and Uses followed, and finally the theme Aboriginal Values was ranked last.

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[6] Aboriginal spiritual values such as Spiritual Connection, Place of Praying and Ceremonies etc. are found within Aboriginal values opposed to Spirituality & Senses.
[7] The theme Personal Values should not be confused when discussing a participants' personal values. When it is capitalized then it is referring to the value theme found in the Forest Values Universe, when it is not capitalized then it is referring to a participant's personal forest values.

Table 1: Friedman Test Statistics for the Ranking of Forest Value Themes by the Four Participant Groups

	Industry Participants	OMNR Participants	Aboriginal Participants	ENGO Participants
Number of Participants (N)	31	36	34	20
Test Statistic (F)	103.889	121.446	59.137	85.760
Degrees of Freedom	9	9	9	9

Note: At a 5% significance level, rejection region is $F > \chi^2$ critical, where F is the test statistic at k-1 degrees of freedom, and k is the number of treatments i.e. number of value themes. The χ^2 critical (for 9 degrees of freedom and 5% significance level) is 16.919.

Table 2: Ranking of Forest Value Themes by Four Participant Groups

Participant Group	Econ.	Env.	Spirit.	Soc.	Pers.	Uses	Educ.	Abor.	Tour.	Rec.
Forest Industry	1	2	1	2	3	4	5	5	4	1
Aboriginal	2	1	2	4	4	3	4	1	4	2
OMNR	3	1	1	3	3	5	4	6	5	2
ENGO	4	1	1	4	2	4	3	5	4	2

Figure 1: Order of Importance of Forest Value Themes for Forest Industry Participants

ECON | REC | SPIRIT | ENV | SOC | PERS | TOUR | USES | EDUC | ABOR
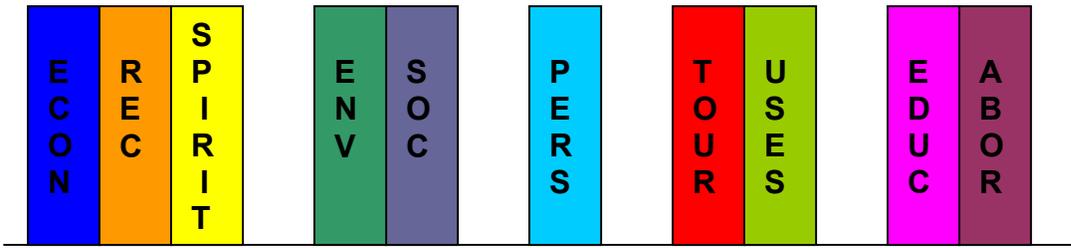
Figure 2: Order of Importance of Forest Value Themes for Aboriginal Participants

ABOR | ENV | SPIRIT | REC | ECON | USES | PERS | SOC | TOUR | EDUC
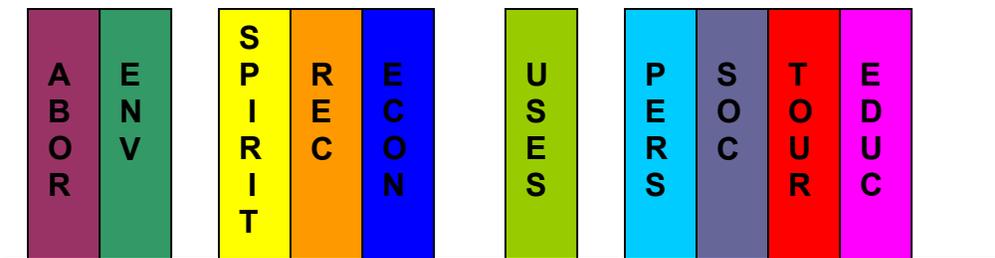
Figure 3: Order of Importance of Forest Value Themes for OMNR Participants

SPIRIT | ENV | REC | ECON | SOC | PERS | EDUC | TOUR | USES | ABOR
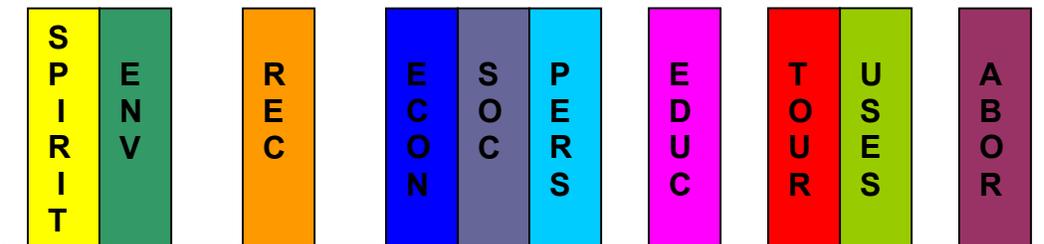
Figure 4: Order of Importance of Forest Value Themes for ENGO Participants

SPIRIT | ENV | PERS | REC | EDUC | USES | ECON | SOC | TOUR | ABOR
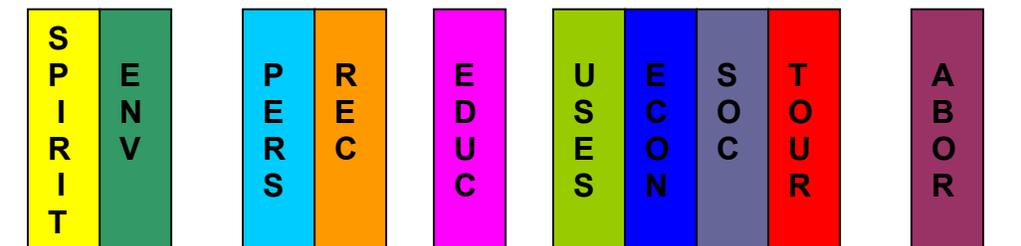
4.2.2 Observations Regarding the Rankings of Forest Value Themes

On the basis of these results, three general observations can be drawn. First, although each group has its own specific order of preference for different forest value themes, there are some common features across the groups. All groups rank the themes Environment, Spirituality, and Recreation as being within the two most prominent value themes. Economic Impact and Aboriginal Values however, were ranked also first by the groups industry and Aboriginal respectively. Similarities are also present in the value themes that were ranked last, for instance, Tourism and Education were ranked either fourth or fifth.

Second, the results provided enough evidence that participants' personal ranking of the forest value themes are not typical, that is, they differ from the general understanding regarding each participant group. For instance, industry participants ranked Recreation, Economic Impact and Spirituality first, and Environment and Societal Benefits as second, which diverge from the ranking of forest value themes that one would commonly assume for industry participants. As well, Aboriginal participants were found to rank Environment with greater importance than Economic Impact.

Third, it is important to observe the total number of ranks each participant group identified. OMNR participants distinguished the ten forest value themes into six combinations, while industry and ENGO participants differentiate five and Aboriginal participants indicated four combinations. In the case of forest industry and OMNR participants, combinations of forest value themes had no more than three themes, while the maximum number of forest values themes in a combination was four for ENGO and Aboriginal participants. This suggests that OMNR, ENGO and industry participants distinguish a greater diversity of value themes important to them, while Aboriginal participants recognise only those value themes critical to their cultural existence.

It should be mentioned that although some value themes were ranked similarly across the participant groups, the value items identified by each participant group may vary for that theme. For the value Recreation ENGO participants included items such as 'hiking' and 'canoe tripping', contrary to industry participants whom included more mechanized and consumptive items such as 'hunting', 'fishing' and 'snowmobiling'. Items for Spirituality were similar between OMNR and ENGO participants, however,

differed for industry participants. In particular, OMNR and ENGO participants included items such as 'connection to nature' and 'serenity', while industry participants included 'solitude', 'peace' and 'relax'.

4.3 Comparative Study of Participants' Ranking of the Forest Value Themes across the Participant Groups

4.3.1 Results from the Kruskal Wallis Test and the Wilcoxon Test

The Kruskal Wallis test was used to test whether the ranks of the same forest value theme (e.g. Economic) across the four participant groups are statistically same or different. A summary of the results from this test is presented in Table 3. At a 5% significance level, the test statistic (F) is greater than critical value, 7.814, for all the forest value themes excluding Tourism and Education. Hence, all the value themes, except for Tourism and Education, were ranked significantly different at a 5% significance level, across the four participant groups. It can be concluded that participants, across four groups, indicate a different order of preference for the value themes with the exception of Tourism and Education.

Next the Wilcoxon test was used to determine the differences in the ranks of each theme between two participant groups. Tables 4 to 9 present the results from the Wilcoxon test, and only those values that were significantly different between the two participant groups are presented in Figures 5 to 9. It should be noted that comparisons between participant groups involve personal values of the participants within that group, and it is not the values held by the organisations.

Forest Industry and OMNR: At a 5% significance level, Economic Impact and Environment were ranked significantly different between forest industry and OMNR participants. This is illustrated in Figure 5. It is evident that industry participants ranked Economic more importantly than OMNR participants, because industry participants have a rank sum[8] of 705.5 (the rank sum of W for industry participants in Table 4), while the rank sum for the OMNR participants is 1572.5. For the remaining forest value themes, the ranks by forest industry and the OMNR participants were not significantly different at 5% significance level.

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[8] Previously, it was mentioned that the lower the rank sum the greater importance placed on that value because values were ranked with one being most important.

Forest Industry and Aboriginal: Figure 6 illustrates four value themes, Economic Impact, Spirituality, Recreation and Aboriginal Values that were ranked significantly different at 5% significance level, between these two groups. Forest industry participants ranked these value themes more importantly than Aboriginal participants, excluding Aboriginal Values. It should be noted that spiritual related values for Aboriginal participants are incorporated within the theme Aboriginal Values, which may be why Spirituality has a lower rank sum for industry participants (Table 5). At a 5% significance level, no differences were found in the ranking for the theme of Environment, which is important to be aware of, as neither group would initially assume that the environment is valuable to the other group.

Forest Industry and ENGOs: At a 5% significance level, significant differences in the ranking of the themes Economic, Environment, Personal Values and Uses are observed (Table 6 and Figure 7). ENGO participants ranked these value themes with greater importance excluding Economic Impact. As well, no significant differences were found in the ranking with Spirituality and Recreation, suggesting similarities between two such distinct groups.

OMNR and Aboriginal: At a 5% significance level, four value themes Societal Benefits, Spirituality, Recreation, and Aboriginal Values were ranked significantly different between OMNR and Aboriginal participants (Table 7 and Figure 8). OMNR participants ranked these value themes more importantly with the exception of Aboriginal Values. No significant differences were found with Environment or Economic Impact, contradicting many beliefs and assumptions each group has of the other's forest values.

OMNR and ENGOs: At a 5% significance level, no values were ranked significantly different (Table 8). This suggests that OMNR and ENGO participants have no significant differences with their ranking of forest value themes.

Aboriginal and ENGOs: ENGO participants ranked the value themes, Spirituality, Environment and Personal Values more importantly than Aboriginal participants, while Aboriginal ranked Aboriginal Values more significantly (Table 9 and Figure 9). In addition, no significant differences were observed with value themes such as Economic Impact, Societal Benefits and Recreation, suggesting similarities to exist.

Table 3: Kruskal Wallis Test Statistics for the Ranks of Forest Value Themes across Four Participant Groups

	Econ.	Soc.	Spirit.	Env.	Pers.	Rec.	Tour.	Uses	Educ.	Abor.
Test Statistics (F)	34.417	8.666	16.425	13.823	13.048	12.685	1.794	8.350	7.676	66.289
Df	3	3	3	3	3	3	3	3	3	3
Significance	0.000	0.034	0.001	0.003	0.005	0.005	0.616	0.039	0.053	0.000

Note: At a 5% significance level, the rejection region is $F > \chi^2$ critical at k-1 degrees of freedom. The χ^2 critical (for 3 degree of freedom) is 7.814.

Table 4: Rank Sums of Forest Value Themes and Z values for Forest Industry and OMNR Participants

	Econ.	Soc.	Spirit.	Env.	Pers.	Rec.	Tour.	Uses	Educ.	Abor.
W (Industry)	706	1147	1121	1280	1068	1036	1048	1090	1178	1033
W (OMNR)	1572	1131	1157	998	1210	1242	1230	1188	1100	1246
Z	-4.46	-1.28	-0.86	-2.89	-0.19	-0.22	-0.18	-0.66	-1.92	-0.75
Sig. (2- tail test)	0.000	.202	.389	.004	.851	.823	.854	.506	.055	.451

Note: In Tables 4 to 9, rejection region at 5% significance level is $|z| > 1.96$, where z is the standard normal deviate. W is the sum of the ranks of different forest value themes within a participant group.

Table 5: Rank Sums of Forest Value Themes and Z values for Forest Industry and Aboriginal Participants

	Econ.	Soc.	Spirit.	Env.	Pers.	Rec.	Tour.	Uses	Educ.	Abor.
W (Industry)	673.5	955.5	873.5	1130	941.5	797	1035	1115.5	1021	1383
W (Aboriginal)	1471.5	1189.5	1271.5	1015	1203.5	1348	1110	1029.5	1124	762
Z Value	-4.718	-1.105	-2.082	-1.44	-1.238	-3.06	-.341	-1.607	-.039	-5.349
Significance (2-tail test)	0.000	.269	.037	.149	.216	.002	.733	.108	.969	.000

Figure 5: Significant Differences in the Ranking of Forest Value Themes – Forest Industry and OMNR
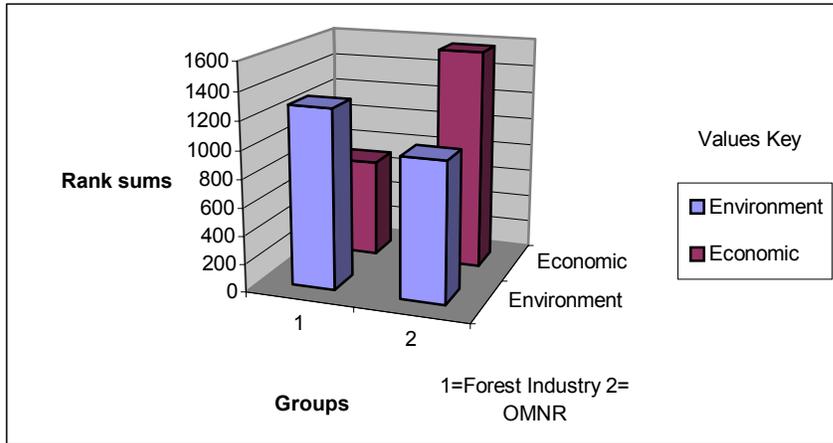
Figure 6: Significant Differences in the Ranking of Forest Value Themes – Forest Industry and Aboriginal
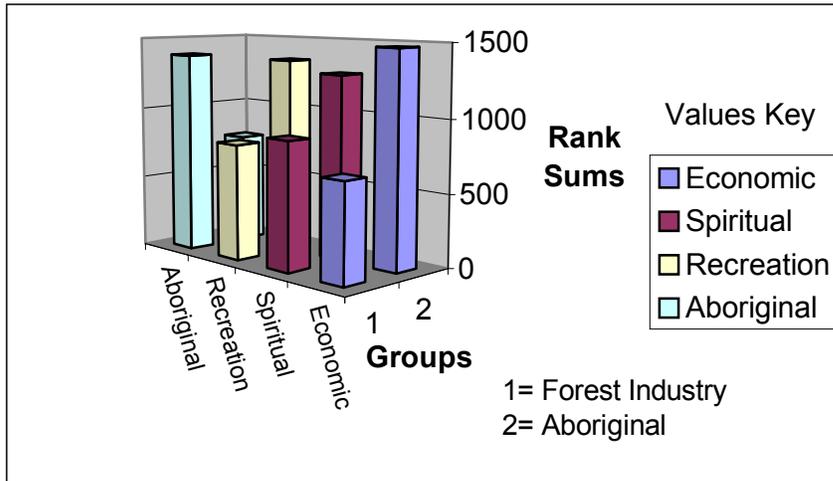
Table 6: Rank Sums of Forest Value Themes and Z Values for Forest Industry and ENGO Participants

	Econ.	Soc.	Spirit.	Env.	Pers.	Rec.	Tour.	Uses	Educ.	Abor.
W (Industry)	232.5	363.5	433.5	474	480	333	397	450	431.5	380
W (ENGOs)	547.5	416.5	346.5	306	300	447	383	330	348.5	400
Z Value	-4.29	-.569	-1.53	-2.70	-3.00	-1.36	-.908	-2.35	-1.73	.000
Significance (2-tail test)	.000	.570	.126	.007	.003	.175	.364	.019	.084	1.00

Table 7: Rank Sums of Forest Value Themes and Z Values for OMNR and Aboriginal Participants

	Econ.	Soc.	Spirit.	Env.	Pers.	Rec.	Tour.	Uses	Educ.	Abor.
W OMNR	1194	1083.5	1035	1148.5	1179	1030	1299	1343.5	1149	1705
W Aboriginal	1291	1401.5	1450	1336.5	1306	1455	1186	1141.5	1336	780
Z Value	-1.07	-2.59	-2.97	-1.54	-1.36	-3.01	-.553	-.983	-1.91	-5.86
Significance (2-tail test)	.283	0.010	.003	.123	.174	.003	.580	.325	.057	.000

Table 8: Rank Sum of Forest Value Themes and Z Values for OMNR and ENGO Participants

	Econ.	Soc.	Spirit.	Env.	Pers.	Rec.	Tour.	Uses	Educ.	Abo.
W OMNR	338	332	397	393.5	426	315	398.5	426.5	410.5	380
W ENGO	442	448	383	386.5	354	465	381.5	353.5	369.5	400
Z Value	-1.33	-1.55	-.485	-.386	-1.349	-1.88	-.989	-1.494	-1.0	0.00
Sig. (2-tailed)	.184	.122	.628	.699	.177	.060	.323	.135	.317	1.00

Figure 7: Significant Differences in the Ranking of Forest Value Themes – Forest Industry and ENGOs
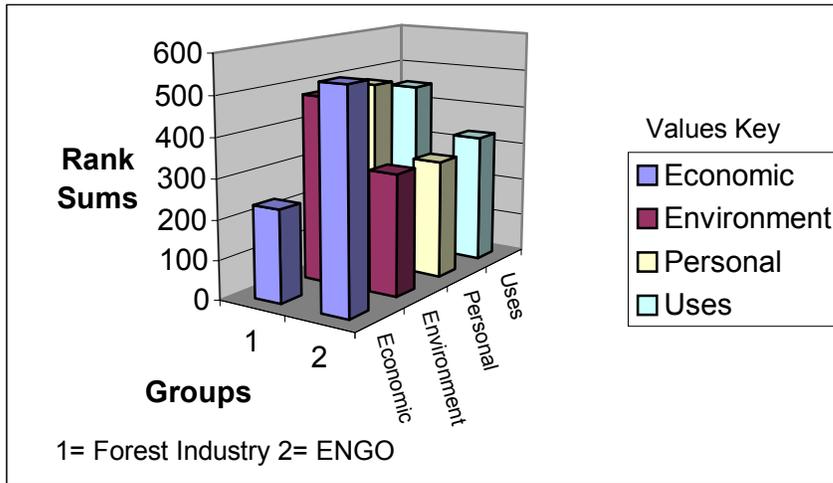
Figure 8: Significant Differences in the Ranking of Forest Value Themes – OMNR and Aboriginal
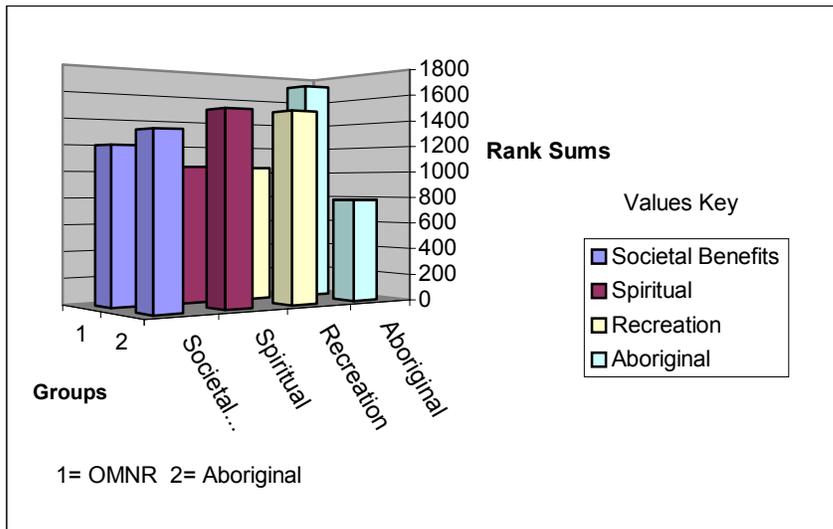
Table 9: Rank Sums of Forest Value Themes and Z Values for Aboriginal and ENGO Participants

	Econ.	Soc.	Spirit.	Env.	Pers.	Rec.	Tour.	Uses	Educ.	Abor.
W Aboriginal	355.5	379.5	509.5	489	468	394.5	398.5	409.5	434.5	250
W ENGO	424.5	400.5	270.5	291	312	385.5	381.5	409.5	434.5	530
Z Value	-.803	-.018	-3.76	-3.10	-2.65	-.437	-.989	-.930	-1.87	-4.36
Significance (2-tail test)	.422	.986	.000	.002	.008	.662	.323	.352	.061	.000

Figure 9: Significant Differences in the Ranking of Forest Value Themes – Aboriginal and ENGOs
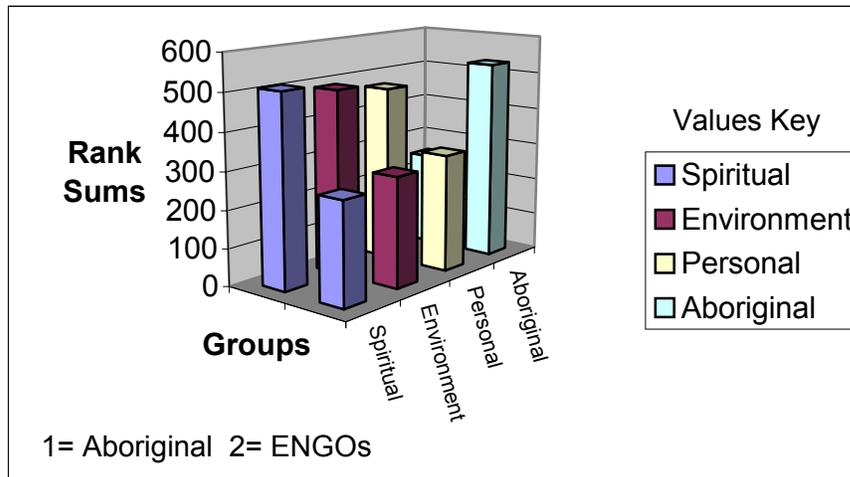
4.3.2 Some Observations about the Comparative Rankings of Forest Value Themes by the Four Groups

Several outcomes of these results are worth noting. First, the three most prominent value themes, Environment, Spirituality and Recreation were ranked significantly different, at a 5% significance level between any two participant groups. Although all four groups included these three value themes as their top two themes, it does not mean that they have attached a similar importance. For example from the Wilcoxon test, Recreation was ranked second by participants from the OMNR and Aboriginal, however, their rank sums were significantly different at a 5% significance level with Aboriginal participants providing a greater rank sum. This suggests that OMNR participants attached a greater importance to Recreation compared to Aboriginal participants. Second, the results from the Kruskal Wallis test indicated that Education and Tourism were not significantly different across the groups, supporting the results from the Sign test as these themes were similarly ranked. Third, ENGO and OMNR participants possessed no significant differences across all value themes. This is imperative to distinguish because at numerous times these groups conflict with one another and both most likely believe that their forest values are distinct. If these similarities could be communicated between the two groups, then possibly forest management issues could be better understood between them, clarifying misperceptions of one another. While, Aboriginal and ENGO participants have several themes that were significantly different including Spirituality, Personal Values, Environment, and Aboriginal Values, suggesting a need for more communication among these groups to understand each others' perspective. These results coincide with the conversations being held during the interview process, as several Aboriginal participants expressed uncertainty with what ENGOs do. Finally, some differences that are found between two participant groups would be obvious to an outsider who may possess a preconceived notion regarding the values of these groups, however, for other participants these differences may not be so clear. For instance, a comparison between OMNR and industry participants resulted in the themes Economic and Environment being ranked significantly different, with Economic being more important to industry participants. During the 3CM exercise however, several industry participants indicated how OMNR

primarily values the forest for economic purposes, thus assuming that the ranking of this value would be similar.

5.0 Participants' Perceptions about the Forest Values of their Own Organization and other Organizations

Participants' perceptions of the forest values of their own organization differ from participants' personal forest values (i.e. their own forest values). For instance, an industry participant's personal forest values consist of those values that are important to the individual, while his or her perception of the industry's values involves those values that he or she perceives the industry as an organization to deem important. Consequently, participants' perceptions about other organizations' forest values are the values held by the organizations and not by the members of those organizations.

5.1 Inter-Group Comparison of Participants' Perceived Ranking of the Forest Value Themes for the Four Participant Groups
5.1.1 Results of the Friedman Test and the Sign Test

As discussed in Section 3, each participant expressed his/her perceptions about each organization's forest values and their ranking. As a result, there are sixteen combinations in total with members from all four participant groups expressing their perceptions regarding each group's ranking of forest value themes (4x4). The Friedman test was used to determine whether significant differences exist for each participant group's perceived ranking of the ten forest value themes, for each group. The results of the test are given in Table 10. The test statistics (F) for all sixteen combinations is greater than the critical value of F (16.919) at 5% significance level. Thus, the ranks of the ten forest value themes are significantly different at 5% significance level for the sixteen combinations.

Once, the Friedman test indicated significant differences in the perceived ranking of the value themes, the Sign test was used to determine the perceived order of importance of themes for all sixteen combinations. The results are summarized in Tables 11 to 14. In order to observe a complete comparison across the perceptions of each participant group, the tables include all participant groups' perceptions for each group's

ranking of forest value themes, their perceptions of their own group or organisation's[9] ranking, as well as the ranking of their own personal forest value themes. Forest value themes that are hyphenated within the tables are not significantly different from each other, however they are significantly different from the value themes separated by commas.

Perceptions Regarding the Forest Industry's Rankings of the Forest Value Themes

Differences exist between each participant groups' perceptions of how industry ranks the value themes, particularly between industry participants' personal ranking[10] of the forest value themes and their perceptions regarding the forest industry's ranking of the value themes. Participants from all four groups perceived Economic Impact to be industry's leading value theme, while industry participants also ranked Economic as their leading theme within their personal rankings. All participant groups perceived Societal Benefits as either the primary or secondary theme of importance with Economic Impact, contrasting with industry participants' personal ranking where Societal Benefits was also ranked second however, along with Environment. It should also be observed how Aboriginal and ENGO participants perceived forest industry to not distinguish value themes beyond Economic Impact and Societal Benefits. In addition, within industry participants' perceptions they ranked Environment second following Economic Impact and Societal Benefits, while the remaining values were not significantly different. Evidently, industry participants' personal ranking of forest value themes differs from how members of other organisations perceive the rankings of industry's forest value themes.

Perceptions Regarding Aboriginal People's Rankings of the Forest Value Themes

All participant groups perceived Aboriginal People's most significant forest value theme to be Aboriginal Values similar to their personal ranking of value themes, however

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[9] Perceptions of Aboriginal People were based on the People and not the Aboriginal political organizations, while other participants groups included their perceptions of their organization's values.

[10] Personal ranking of value themes refers to when participants identified their personal forest values and then ranked them in the order of importance. This should not be confused with the value theme Personal Values.

Environment was also ranked first. In addition, all groups perceived that Economic Impact is second and is similar to their own rankings, however Economic was ranked comparably to the themes Spirituality and Recreation. It should be observed that Environment was perceived to be second by OMNR and forest industry participants, third by ENGO participants, and fourth by Aboriginal participants, however within Aboriginal participants personal ranking the theme Environment was ranked first.

Perceptions Regarding the OMNR's Rankings of Forest Value Themes

All participant groups perceived that OMNR's most critical forest value themes are Economic Impact and Societal Benefits, while OMNR participants' personal ranking indicate Spirituality and Environment as their leading value themes followed by Recreation. Further, Environment was perceived to be third by all participant groups, while Economic Impact was ranked third within OMNR's participants' personal values. Consequently, participants' perceptions were comparable across the groups, however their perceptions deviated considerably from OMNR participants' personal ranking of the value themes. A possible rationale for this is because people are basing their perceptions on the government body, that is, the OMNR organization and it is clear that the values of the organizations vary substantially with the employees'. This contradicts thoughts as to why people choose to work for certain organizations, for instance, one would assume an individual joins an organization based on values similar to his/her own values. It was said by an ENGO participant that: "Several of the government employees start out working for the government believing that they can make a difference with policies towards the environment, however they become caught by the legislations and regulations." For many, this is true as OMNR participants' personal ranking of their values indicate Environment as their primary forest value theme, however it seems that is the institution of the government that drives economics as their first priority.

Perceptions Regarding ENGO's Rankings of Forest Value Themes

Environment was ranked first within the perceptions of all participant groups and it is the same for ENGO participants' personal ranking of the value themes, however Spirituality was ranked similarly. The theme Societal Benefits was perceived to be

second by all participant groups, however, this was ranked fourth along with Uses, Tourism, Aboriginal Values, and Economic Impact in ENGO participants' personal rankings. Economic Impact was ranked second or third by OMNR, Aboriginal People, and forest industry participants, while ENGO participants' perceptions ranked it fourth, suggesting that ENGO participants perceive their organization to not value the economic benefits as importantly as others perceived. Further, it is interesting that industry participants would perceive Economic Impact as the third value because when talking with them during the 3CM exercise, several of them expressed: "ENGOs are a political group from down south who are so far removed from the situation, forests and people's needs." In addition, industry participants believed that ENGOs to be indifferent with the economic benefits from forestry and they were not fond of an organization based in Toronto, affecting and influencing forest management decisions in northwestern Ontario. Again, revealing a need for ENGOs to develop new agencies based in the north.

Table 10: The Friedman Test Statistics (F) for Participants' Perceptions about the Ranking of Forest Value Themes by the Four Organisations

	OMNR Participants	Industry Participants	ENGO Participants	Aboriginal Participants
*Perceptions about Forest Industry	229.690	228.875	150.083	188.312
Perceptions about Aboriginal People	147.228	134.861	84.739	133.538
Perceptions about OMNR	176.444	153.806	106.228	166.871
Perceptions about ENGOs	137.056	101.258	78.269	130.831
N	36	31	20	33
DF	9	9	9	9

Rejection region is $F > \chi^2$ (at k-1 degrees of freedom and a 5% significance level). At 9 degrees of freedom, critical χ^2 is 16.9190 for 5% significance level.

* This row summarizes the participants' perceptions from the OMNR, forest industry, ENGO, and Aboriginal People respectively, concerning the forest industry's ranking of the forest value themes. Similarly, the following three rows include the perceptions about each group Aboriginal People, OMNR, and ENGOs rank the forest value themes. Hence, the rows designate the perceptions about each participant group and the column specifies which group is giving the perceptions.

Table 11: Perceived Rankings of the Forest Value Themes for the Forest Industry

Participant Group	Order of Importance of Forest Values
Industry Participants Individual's Own Values	Economic – Recreation – Spirituality, Environment – Societal Benefits, Personal Values, Tourism – Uses, Education – Aboriginal
Industry Participants' Perceptions	Economic – Societal Benefits, Environment, Spirituality – Personal – Recreation – Tourism – Uses – Education – Aboriginal
Aboriginal Participants' Perceptions	Economic, Societal Benefits, Spirituality – Environment – Personal – Recreation – Tourism – Uses – Education – Aboriginal
OMNR Participants' Perceptions	Economic, Societal Benefits, Environment, Recreation, Spirituality – Personal – Tourism – Uses – Education – Aboriginal
ENGO Participants' Perceptions	Economic, Societal Benefits, Environment – Spirituality – Personal – Recreation – Tourism – Uses – Education – Aboriginal

Table 12: Perceived Rankings of the Forest Value Themes for Aboriginal People

Participant Group	Order of Importance of Forest Values
Aboriginal Participants' Own Values	Aboriginal – Environment, Spirituality – Economic – Recreation, Uses, Personal – Societal Benefits – Tourism – Education
Aboriginal Participants' Perceptions	Aboriginal, Economic, Societal Benefits, Spirituality – Personal – Uses – Environment – Recreation – Tourism – Education
Industry Participants' Perceptions	Aboriginal, Economic, Environment – Recreation, Personal, Tourism – Education – Societal Benefits – Uses – Spirituality
OMNR Participants' Perceptions	Aboriginal, Economic, Environment – Recreation, Spirituality, Societal Benefits – Personal – Tourism – Education – Uses
ENGO Participants' Perceptions	Aboriginal, Economic – Environment, Spirituality, Societal Benefits – Personal – Education – Recreation – Tourism - Uses

Table 13: Perceived Rankings of the Forest Value Themes for OMNR

Participant Group	Order of Importance of Forest Values
OMNR Participants' Personal Values	Spirituality – Environment, Recreation, Economic – Societal Benefits – Personal, Education, Tourism – Uses, Aboriginal
OMNR Participants' Perceptions	Economic – Societal Benefits, Environment – Recreation, Tourism – Personal, Education, Spirituality, Uses – Aboriginal
Industry Participants' Perceptions	Economic – Societal Benefits, Environment, Tourism, Spirituality – Personal, Recreation – Uses – Education – Aboriginal
Aboriginal Participants' Perceptions	Economic – Societal Benefits, Environment, Spirituality – Personal – Education – Recreation – Tourism – Aboriginal – Uses
ENGO Participants' Perceptions	Economic – Societal Benefits, Environment, Spirituality – Uses – Personal- Education – Recreation – Tourism – Aboriginal

Table 14: Perceived Rankings of the Forest Value Themes for ENGOs

Participant Groups	Order of Importance of Values
ENGO Participants' Personal Values	Spirituality – Environment, Personal – Recreation, Education, Economic – Societal Benefits – Tourism – Uses, Aboriginal
ENGO Participants' Perceptions	Environment – Societal Benefits, Spirituality, Recreation, Personal – Economic – Tourism – Uses – Education, Aboriginal
Industry Participants' Perceptions	Environment, Societal Benefits – Spirituality, Economic, Recreation – Personal, Tourism – Uses – Education – Aboriginal
Aboriginal Participants' Perceptions	Environment, Economic – Societal Benefits – Spirituality, Recreation – Personal – Tourism – Uses – Education – Aboriginal
OMNR Participants' Perceptions	Environment, Societal Benefits, Economic, Recreation – Spirituality, Personal, Education, Tourism – Uses – Aboriginal

5.1.2 Observations Regarding the Perceived Order of Importance of the Forest Value Themes of Each Participant Group

Overall, participants' perceptions from the four groups about each participant group were generally similar. In particular, the two most prominent themes were the same across the perceptions. For instance, all participant groups' perceptions regarding the forest industry's ranking of the value themes consisted of Economic and Societal Benefits as being the top two themes. It is evident that participants' personal ranking of the forest value themes differs substantially with their perception of their own group's rankings. Aboriginal participants' personal rankings included the themes Aboriginal Values and Environment as the two most important themes, however in their perceptions about Aboriginal people Economic was second and Environment was fourth along with six other value themes. Consequently, Aboriginal participants perceive themselves as more economically driven. Although perceptions for a particular group may be similar across the participant groups, they differ with that group's participants' personal ranking of the value themes. Furthermore, from these results it is shown that ENGOs need to have a greater presence in the north, as the perceptions for them varied more than the perceptions for the other groups.

5.2 Comparative Study of Participants' Perceptions Regarding the Ranking of Forest Value Themes across the Participant Groups

The Kruskal Wallis test as discussed in Section 3, was used to test the differences in the perceived rankings of the same value theme for a particular group, by all the participant groups. For example, it was tested whether the perceived rankings of Economic Impact for the forest industry are significantly different across the four groups. The results for the Kruskal Wallis test are given in Table 15, and the group-wise results are discussed next.

5.2.1 Results from the Kruskal Wallis Test

Perceptions of the Forest Industry's Ranking of Forest Value Themes: At a 5% significance level, the perceived rankings of the Environment value theme were different across the participant groups, but no significant differences were found with the

remaining value themes, suggesting that these values were ranked comparably across the four groups' perceptions.

Perceptions of Aboriginal People's Ranking of Forest Value Themes: Significant differences exist in the rankings for Economic Impact across participant groups, at a 5% significance level, but no differences were found with the rankings of the remaining values.

Perceptions of OMNR's Ranking of Forest Value Themes: At a 5% significance level, the rankings for Environment and Recreation value themes differ significantly across the participant groups, but no differences were found with the rankings of the remaining values.

Perceptions of ENGOs' Ranking of Forest Value Themes: At a 5% significance level, the perceived rankings of Economic Impact, Societal Benefits, Recreation, and Spirituality were significantly different across the groups..

Table 15: Comparison of the Rankings of Forest Value Themes by Participant Groups

		Econ.	Soc.	Spirit.	Env.	Pers.	Rec.	Tou.	Uses	Edu.	Abo.
Perceptions about Forest Industry	F	5.15	6.95	0.00	14.85	2.87	2.94	1.49	2.87	1.92	3.08
	Sig.	0.16	0.07	1.00	0.00	0.41	0.40	0.68	0.41	0.59	0.38
Perceptions about Aboriginal	F	7.82	1.77	0.29	2.54	1.88	0.68	3.86	5.22	1.31	4.64
	Sig.	0.05	0.62	0.96	0.47	0.60	0.88	0.28	0.16	0.73	0.20
Perceptions about OMNR	F.	2.15	4.60	4.11	13.22	4.60	8.39	3.64	1.54	5.05	0.39
	Sig.	0.54	0.20	0.25	0.004	0.20	0.04	0.30	0.67	0.17	0.94
Perceptions about ENGOs	F	9.21	7.98	19.01	3.74	4.05	22.48	0.32	6.25	4.53	1.63
	Sig.	0.03	0.05	0.00	0.29	0.26	0.00	0.96	0.10	0.21	0.65
Degrees of Freedom	3	3	3	3	3	3	3	3	3	3	

At a 5% significance level, the rejection region is F observed is greater than F critical. Thus, F > 6.251 at k-1 degrees of freedom, where k is the number of participant groups, 4.

5.2.2 Some Observations about All Participant Groups' Perceptions of Each Organization

These results coincide with those from the Sign test. The value themes that were significantly different here were consistent with the themes that were ranked differently across participant groups in the Sign test. Perceptions for the forest industry for instance, indicated Environment and Societal Benefits to be significantly different across the groups, which coincide with the Sign test as others are constantly misperceiving these values. From the Sign test the value theme Societal Benefits was ranked second across the participant groups, however, from the Kruskal Wallis test it was ranked significantly different. This is because although it was ranked second in the Sign test it does not mean that the rank sums are also similar across the groups, which is why it is significantly different in the Kruskal Wallis test. Furthermore, these results strengthen the indication of the need for ENGOs to have a greater presence in the north, as they are the only participant group that had more than two value themes to be perceived significantly different.

6.0 Sustainable Forest Management: A New Policy Frontier
6.1 Conclusions

Forest management has evolved to incorporate a wider range of forest values. Foresters are no longer working in a single resource context that focused primarily on implementing forest policies designed to maintain a supply of timber. Now, they are required to acknowledge and incorporate a broader range of values. In northwestern Ontario, co-management is seen as a means to assemble diverse groups and their forest values, however, the process of doing so is complex, and an understanding of each group's forest values and their perceptions regarding others' forest values are a valuable tool necessary to build relationships and identify SFM goals.

In order to assist this process, past value studies have attempted to identify and integrate various forest values into forest management planning, however, these studies possessed a common limitation, how to measure these values to incorporate them into the planning process. Since abstract values such as 'spiritual values' cannot be measured, this study ranked people's values with 3CM to externalize their preferences relative to

other values. Management objectives then can be identified through understanding people's ranking of forest values.

Identification of the value themes found in the Forest Values Universe is the first step in increasing each groups understanding of others perspectives regarding SFM (Kearney et al. 1998). Not only does this typology increase understanding among the groups, it also offers other value themes that are not present in previous studies. Since, the Forest Values Universe was developed through participants' forest values it has externalized the themes important to people in northwestern Ontario, particularly those involved in forest management. Specifically, values such as 'timber cruising', 'family events', and 'windbreak for the home' are values that stem from people who live and work within the forest, and commonly are not found in past literature. Hence, a forest values typology particular to a geographical area is important in developing a co-management framework, as it provides a foundation on which to identify similarities and differences, while simultaneously clarifying preconceived notions of each other's forest values.

Generally, comparable rankings were found across the participant groups' personal ranking of the value themes. The dominant three value themes that were consistent across the groups were Recreation, Environment, and Spirituality, while Aboriginal Values were included by Aboriginal participants and Economic Impact was included by industry participants. These commonalities are valuable information that can be used to assist in developing a co-management framework. While, organizational values may differ, the similarities across personal values could as a minimum provide a foundation on which to base a discussion.

In the context of co-management, conflict is inevitable, and results from this study provided insight into the importance of forest values, as they may assist in both clarifying misperceptions of groups and illuminate similarities in values and thus, SFM goals. It is observed that personal values for some participants within a group consisted of the customary values one assumes for them because of their affiliation to that group, however they are ranked different to one's assumptions. Results from the Sign test showed that industry participants ranked Spirituality and Recreation no different than Economic Impact, and Environment was ranked similarly with Societal Benefits. It is evident that

values held by the members of the forest industry have evolved, and industry participants and other individuals who are unaware of this progression need to be informed to prevent misunderstanding, and to highlight similar goals. An additional clarification from this test revealed that the majority of Aboriginal participants indicated within their personal ranking of value themes to rank 'clean air and water' with great importance, while participant groups as well as themselves perceive that they primarily want economic development for their communities. Although this claim is not inaccurate, Aboriginal participants ranked Environment similarly to Aboriginal Values and Economic Impact was ranked second with Spirituality and Recreation. This is indicative that Aboriginal People are not as economically oriented as everyone perceives. In addition, the Sign test revealed similarities between OMNR and ENGO participants' personal ranking of the value themes, which neither group may be aware of this.

Differences also existed when comparing each participant group's perceptions concerning the ranking of the value themes, and that group's personal rankings. For instance, perceptions regarding the ranking of OMNR's forest value themes consisted of both Economic Impact and Societal Benefits being ranked first across all groups, contrary to OMNR participants' personal rankings which consisted of Spirituality and Environment being ranked first. Comparable results were found with the other groups. Participants seem to base their perceptions on stereotypes of that group or misperceived notions that are possibly shaped from working or interacting with one another. Results from the Sign test with participants' perceptions indicated that for each group the two eminent value themes were similar across the perceptions, however, these differed with participants' personal values.

Such inconsistencies between personal values and perceptions may be a product of an administrative theory, based on a rational bureaucratic model developed by Weber (cited in Bullis and Kennedy 1991). In this model, professionals such as OMNR and industry participants are described as being involved in organisations based on rationality, where values are not related to work. This does not propose that professionals disregard their personal values, but they are separate from work. Foresters and other professionals would unlikely find this result to be groundbreaking, however, for others such as ENGO participants would find this separation challenging. One ENGO

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participant asked why she needed to include her perception of her organisation's forest values because theirs would be similar to her own. After explaining to her the differences found between personal values and perceptions of one's own group, she said, "It must be so unsatisfying and unfulfilling to work where you can't have your personal values be a part of your work." Consequently, participants misperceive individuals possessing values different from their organization, creating obstacles when distinguishing the objectives that would be acceptable across the groups.

When different groups or parties are involved in collaborative decision-making such as in co-management, peoples' perceptions of other's values will differ. This study suggests perceptions are conceptualized from stereotypes of the groups, not only by other participants but also by members within the group. Forest industry participants for instance, were portrayed as an economically oriented group by others, results however, confirm that although economic factors are clearly salient to them additional values such as Recreation and Spirituality are also of importance. Thus, whether these common stereotypes are perceived by others or individuals within the group, they are inaccurate with people's personal values. Such misleading stereotypes can create impediments to the development of trust, relationship building and effective communication (Kearney et al. 1998).

Further, an understanding of value themes assists in identifying similarities and differences between groups. Results from the Wilcoxon test indicated comparable rankings with Spirituality and Recreation between forest industry and OMNR participants. As well, no significant differences were found between OMNR and Aboriginal participants' ranking of Environment and Economic Impact, contradicting many beliefs and assumptions each group has of the other's forest values. OMNR and ENGO participants also have no significant differences with their ranking of the value themes coinciding with the results from the Sign test. Knowledge of this would assist in negotiation through obtaining forest management objectives that is acceptable to both groups. From this, they can establish a new setting where they can build a basis on an appreciation of similar importance placed on their forest values, and thus management objectives.

From both the Kruskal Wallis and the Sign tests with participants' perceptions, it is evident that all participant groups misperceive ENGOs considerably, as they are the only group to have as many values ranked significantly different. This may reinforce that ENGOs need to communicate their forest values and objectives more in the north, because these misperceptions are creating a distorted representation of them. In addition to communicating their objectives, ENGOs could demonstrate their commitment to the people by having a greater presence in the north through opening an office there to demonstrate their commitment to not only the environment, but also to the communities within the north. Several participants expressed resentment towards an organisation based in Toronto implementing decisions without understanding the needs of northern communities. In particular, some participants' perceptions of ENGOs would include values such as 'wanting attention', 'needing a cause or focus in life', or 'for donations'. If ENGOs were to make their forest values and objectives clear as well as show their commitment to people in the north, there may not be such bitterness felt towards them.

Naturally, increasing or learning of an overlap in values will not ensure agreement among the groups, or eliminate conflict. Conflict is deemed as an important component of the social process of decision-making and managing the forest ecosystem (Brandt cited in Bengston 1994). An improved understanding of forest values however, may assist in highlighting the true nature of forest management conflicts, while also helping foresters and others to distinguish between fundamental value differences (Bengston 1994; Kearney et al. 1998), for which these prospects of resolution are much brighter. Thus, by directly confronting value differences it is assumed that contesting groups are able to gain insight that will contribute to less conflict and mutually beneficial relationships.

A possible strategy to assist with collaborative work in forest management is to bring in a neutral party outside of the groups to contribute in managing conflicts and confrontations of value differences. This strategy is known as third party consultation, and they could provide problem solving workshops or experiment with a pre-negotiation process with the groups prior to decision-making (Druckman et al. 1988). Pre-negotiation allows for people to explore value differences among the groups, learn about one another and begin building a relationship without tension or mistrust that may occur during the decision-making process. An additional possibility is to have a neutral

facilitator who could aid in disagreement, keep focus on the topic and not diverge to other matters. The facilitator may act as a guide and provide encouragement when needed. Or in the beginning of the negotiation process, Fisher (cited in Druckman et al. 1988) proposed to deal with smaller issues first, allowing people to attain settlements and create the feeling of optimism, and thus, pave the way for discussion of the larger issues.

6.2 Advantages of 3CM and its Limitations

In this study, 3CM offered a means to gather information about the structure and content of people's forest values. The process of creating one's cognitive map was for some participants almost automatic and for others it was an arduous discovery process. Understanding the structure of one's forest values is an important step in problem solving and subsequently, decision-making. Familiarity and use of cognitive maps provides policy-makers a potentially useful tool for coming to an understanding of individuals' unique ways of thinking and associating concepts (Austin 1994). Thus, this approach to co-management in northwestern Ontario could benefit and assist negotiators who are striving to improve communication among such distinct groups. Communication is improved because 3CM organizes information and communicates it effectively to specific groups or individuals.

3CM has also demonstrated its capacity to be applied to individuals of different cultures and does not require extensive written language skills, which was imperative because of the diverse groups being involved. Finally, 3CM allows participants to generate those values that are meaningful to them, as opposed to alternative techniques that have predetermined concepts to which they are asked to respond. Consequently, this identified other forest value themes that may not already be included in past forest value typologies.

Furthermore, 3CM allows for both a qualitative and quantitative analysis of the forest value themes. Although, the data collected was qualitative the information from the ranking of the forest values made it possible for a quantitative comparative analysis using non-parametric statistical tests. Thus, strengthening the conclusions made in this study.

Although commonalities in forest value themes and thus, SFM goals were identified, this overlap will not automatically ensure agreement on problem solutions. This study focused primarily on people's forest values, which in turn allowed for an externalization of management preferences or goals, however, it did not provide suggestions on how to obtain similar methods to achieve these goals. A limitation of this study is the lack of public involvement. Although, the interests of public citizens are often assumed to be represented by organized groups such as ENGOs (McFarlane and Boxall 2000), a more direct means of involving other public citizens would have been beneficial. Specifically, they could have been an additional group in this study. As well, incorporating this addition would allow for forest managers and professionals to better predict people's responses to management plans (Bengston 1994).

3CM offers numerous advantages when using this methodology, however, limitations do exist. If the sample is exceptionally large it is difficult to apply 3CM as it is time consuming. Group interviews can be conducted as they were in this study, however there are some disadvantages of doing so. For instance, if others are around people may feel the need to conceal their personal values or just exclude them, preventing to provide a comprehensive list of forest values. As well, in a group there may be an influence of others when writing their values or perceptions if a person were to accidentally offer an idea or thought, or people may become distracted when others are talking. Finally, because there are more individuals it is difficult for the interviewer to observe all participants when they become astray with their values or perceptions. When providing perceptions, some participants would include their perceptions of the group opposed to their values.

This study confirms the importance of both forest values and perceptions in forest management planning, and particularly in developing a co-management framework. As well, differences in values were more often seen in participants' perceptions of one another opposed to people's personal values. Forest management planning in Ontario could benefit greatly if there was a mutual understanding of people's forest values.

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Appendix 1

Forest Values Universe

Dominant Themes	Sub-themes
Economic Impact	• Economic Spin Offs • Personal to Work • Career Satisfaction • Societal Employment • Business Opportunity
Societal Benefits from Forest Management	• Societal Benefits • Resource • Construction • NTFP[16] • Renewable
Spirituality and Senses	• Senses and Connection • Quietness • Solitude • My Connection • Relax
Environment	• Wildlife and Environment • Global Health • Natural Cycles • Faunal and Flora Benefits • Forest Composition and Aesthetics
Personal Values	• Individual Values • Fun • A Good Way of Life • Enjoyment • Hobbies
Recreation	• Hiking • Outdoors • Consumptive Recreation • Camping

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[16] Non-timber forest products

	• Fishing
Tourism	• Tourism • Consumptive Tourism • Non-Consumptive Tourism • Eco-Tourism • Remote Tourism
Uses	• Non-industrialized Use • Protection for Home • Travel • Necessities • Medicines
Education and History	• Education • Science • Learning and Culture • Canadian Heritage • Canadian History
Aboriginal Values	• Heritage • Who We Are • Traditional Way of Life • Livelihood • Spirit