

Characteristics People Consider when Evaluating Forest Landscape Attractiveness: Fuel Management Implications

Melinda Merrick and Joanne Vining
Department of Natural Resources and Environmental Sciences
University of Illinois, Urbana/Champaign, IL (jvining@uiuc.edu)

Introduction

The management of public land depends highly on the relationship managers have with the public. An effective relationship requires a good understanding of both how people experience natural environments and how they perceive various forest and land management strategies. Understanding public perceptions of visual beauty, attractiveness, and the relative health of national forests is important because many of these elements contribute to the public's acceptance of or resistance to manager's practices and policies. In fact, the public's initial visual reaction to forest environments can play an important role in the development of attitudes and values about forest management.

In this paper¹, we will discuss research findings on specific elements people consider when making decisions about the relative attractiveness of differently managed forest environments. By recognizing which indicators people use when judging the overall attractiveness of a forest, managers will gain a more comprehensive understanding of how the public perceives and interacts with federally managed land. This understanding can help managers design fuels treatments and ecosystem restoration projects that are more likely to meet with public approval while still achieving management objectives.

Key Findings

We were interested in the psychological processes—observations, knowledge, feelings, and emotions—by which participants were making decisions on forest management scenarios. We analyzed transcripts from research participants from northern Minnesota and Illinois who were asked to think aloud while choosing between different computer-generated forest management depictions. This research technique, known as process-tracing, enabled us to uncover the overall cognitive and emotional processes that participants experienced while completing the decisionmaking exercises and provided a rich source of contextual meaning for participants' decisions.

¹ The findings of this paper are part of a larger study in which our goal is to identify and examine knowledge, feelings, evaluation, and decision processes on fuels treatment scenario preferences using qualitative data collection techniques. Our qualitative findings are meant to complement the quantitative computer-simulated conjoint choice experiments (being simultaneously conducted by Terry Daniel at the University of Arizona and Brian Orland at Penn State University) by adding contextual meaning and depth to the survey findings. Because the larger project is ongoing, we will present only the qualitative findings in this paper, which we found to offer many insights about the public's perception of management techniques.

We identified nine elements of forested environments that people observe when making decisions about the relative attractiveness of a forest. In descending order of frequency of comments, they are:

- Specific characteristics of the vegetation, particularly those related to forest health.
- The experiential potential (i.e., what experiences the scene afforded).
- Human/environment interactions.
- Characteristics of the forest undergrowth.
- Nonvegetative scenery elements, such as the sky.
- Wildlife considerations.
- The naturalness of the setting.
- Familiar forested environments.
- Nature's cycles.

Understanding how these elements shape aesthetic preferences can guide managers as they develop fuels management programs. Managers can better adapt to public preferences either by highlighting how a treatment supports key values, such as forest health, or by adjusting treatments to take into account key concerns, such as access and valued places.

Although only one of our participants mentioned fire specifically, their overall favorable disposition toward active forest management may include management for fire as well. Because the scenarios the participants reviewed were based on fire management outcomes, the comparison with quantitative data mentioned above will help with this sort of interpretation. *However, it is important to note that fire does not appear to be anywhere near uppermost in our participants' thoughts.* This may have implications for fire management programs in which recognition of fire danger is prominent.

Detailed Findings

Specific Vegetative Characteristics

The most frequently occurring category that participants mentioned involved the **characteristics of the forest, trees, and plant life**. One of the most important findings was the emphasis placed by many participants on **forest health**. Three-fourths of the participants mentioned the **health of the forest** and trees as criteria for making their decisions.

I like the top one again. It's the same reason. The trees look healthier.

Because fire management strategies are often undertaken with forest health as a primary goal, it is clear from our data that this is an important objective to emphasize to the public. However, what “healthy”

means seemed to vary among individuals. It is important to examine public interpretations of the meaning of a healthy forest in future research.

Almost all of our participants (19 out of 20) mentioned the **amount of life and quality of growth** depicted in the images as contributing to their preferences. This category included comments on growth, death, lushness, damage, fertility, development, survival, disappearance, and burned trees.

Well, seemingly the more growth apparently the healthier the environment all around, that's my impression.

Almost all of the participants (19 out of 20) mentioned the **spacing** of the trees and vegetation as indicators of why they were choosing one scenario over the other. We coded all references to more, fewer, thicker, thinner, dense, full, dwindling, crowded, well-spaced, individuality, clumping, neater, tidier, symmetrical, and messy trees under this category. Out of 163 text sections coded for this category,² 93 indicated that more dense trees and fuller forests were preferred over less thick, sparse forests as in the following quote from a participant.

Well, seems like more vegetation, the greater the chance of more healthy undergrowth and animal health.

This finding is in contrast to decades of scenic preference studies that have shown that people prefer more open and park-like forests. However, many of the responses (67) indicated a preference for less crowded, tidier forests as in this quote.

Again, I like the top one. The bottom one's too overgrown. I like the more open look.

Moreover, other comments about accessibility, line of sight, and recreation may point to the desire for a more open forest. This seeming “conflict” in findings may reflect the tension between visual preferences (an open forest) and the importance of forest health (more growth may be seen as healthier). Of course, additional research would be needed to test this hypothesis.

Also mentioned in this category was the **identification of particular species of trees**, such as birch or elm trees, and **types of trees**, such as deciduous, or evergreen. Many participants also noticed details of the **different components of the trees** depicted in the simulations, such as tree trunks, branches, and leaves. Participants frequently discussed the **age and size of trees** as well as a variety of different types and species of trees in the simulations. The following quote exemplifies the comments of many of these different characteristics of the trees and forests.

² In 3 of the 163 text units coded in this category, it was unclear if the participant preferred more or less density of trees.

Now that the trees have grown to their full size it seems, I can't see much of a difference other than the types of trees that are planted. And I'm definitely seeing a lot more pine trees on the top slides and so I would have to choose the bottom slides but I do not like the random trees. And I don't know if this could be due to nature and the wear down of the trees but I really don't like how there's some tree trunks where there's no leaves or branches but they're just tall, skinny, gray tree trunks so they look very out of place. Because they seem like they're, out of all them, they kind of stick out because they look like they're old and something happened to them. And I definitely do not like that pine tree on the first slide of the bottom half. Because now there's no leaves and it just looks very prickly and very out of place. So I'd have to give the bottom one a 70 because there's a difference but not that large of a difference in preference.

Other characteristics of the forest, trees, and plants that participants discussed included the openness of the forest, the concept of trees as a natural resource, the differing height of trees, the incidence of fallen trees, the attribution of emotions to trees, the interaction of different types of trees, and the indigenous nature of the depicted forest scenes.

Experiential Potential

The next most frequent metacategory of responses was based on the participants' **perceptions of how they would experience the forest**. Many times, participants put themselves in the forest scene and described how they would interact with the various components of that setting. Participants most frequently discussed the **sensory experience**, which included comments on visual beauty, pleasantness, scenic beauty, aesthetics, amount and shade of greenness, amount of vividness, quality of colors, color scheme, contrast of colors, attractiveness, hearing of forest noises, and physical feelings.

I really think that the colors in this particular one are more vivid. And the trees look a little bit more alive than they did in the top level.

Several participants also expressed **emotions** as they commented on the visual images. Most of the comments on emotions dealt with specific emotions including happy, strangeness, love, fear, anxiety, claustrophobia, overwhelmed, lost, safe, calm, comforted, upset, refreshing, and uncomfortable.

Trees have an amazing spirit when they get that old, just lovely to be around. [There is a] very calming effect and a comfort when you walk in an old growth forest. It's like something goes beyond you the human, something you know has been there, weathered the tides, and is probably going to keep on growing providing no one cuts it down, and keeping track of the planet even after we die, fade, we have very short life spans compared to some of the trees.

Several participants also mentioned **ease of travel** and **ease of vision** mostly in terms of recreation and enjoyment of the forest.

Well, at this particular time in the forest, for ease of getting around in the forest for recreational activities, I would pick the top one. It looks like I could get through it a lot easier and see things.

Other experiential characteristics included personal experiences, access to forested areas, perception and distance to the forest, amount of shade, and spirituality.

Human/Environment Interactions

Half of our participants discussed the **level of management** of the forest in terms of the forest looking like it had been managed well or appearing as though a more hands-off approach had been taken. The majority of the comments (22 out of 35) in this category favored management. Participants often preferred one forest scene to another because it looked like it had been cared for and properly managed.

We're going right to plan A because it looks like they've actually come and done something, and Plan B it looks like they're just, they're letting it continue growing, where plan A they came and actually took a bunch of trees out.

In this set of pictures, a lot of trees grew on the bottom set of slides. I guess that was the one that was replanted. Well, I'm all for reforestation rather than letting it come up naturally so I'm going to switch over to the bottom.

Only one comment favored a hands-off approach to the management of forests. Twelve of the comments in this category were observational or neutral comments, such as this one.

Now in this one I really like, we got a little fairy book story forest on the top here so it looks very not taken care, in the sense of being taken care of by humans, but tidy nonetheless.

About one-fourth of the participants also mentioned **logging issues**. Of the 22 comments we coded for logging, 15 favored logging, one opposed it, and six were merely observations that the scene looked as if it had been logged recently. The following quote is an example of a logging supporter.

I don't like the size that they're letting the trees get in plan B so we're going with plan A because they aren't quite as big yet. And I go back to the same thing. I don't think our forests should be let to get as old as they get to till they fall down due to age rather than taking them out through logging.

Many participants discussed the ease of travel for recreation through the forest, and many favored logging at some level, which may indicate that participants did not oppose management of forest environments. The latter is supported by the fact that 22 out of the 35 comments that specifically addressed forest management favored ongoing forest management practices rather than a hands-off approach. However, this finding should be interpreted with caution because of the small number of participants, as well as the fact that half of the participants were from the Grand Marais, Minnesota area, where timber extraction is a source of financial welfare.

Other comments related to human/environment interactions were about human interventions, the forest as an economic asset, responsibility and understanding toward nature, development in forested areas, and fire prevention actions. Although this comment is not representative of the majority of the opinions of the participants, it captures many aspects of human/environment interactions.

My main consideration I think is keeping the forest as natural as possible, nature knows what she's doing. However, the more man involves himself in disrupting the ecosystem, perhaps the more responsible we are in trying to maintain its natural state. Do we or do we not interfere with the natural life course of the buffalo shall we say? Do we let them die and starve or do we go in there and manage and support their life through intervention?

Characteristics of the Forest Undergrowth

This category included comments on less, more, bushy, thick, and more open groundcover. More than half the participants mentioned the quantity of **undergrowth** as factoring into their preferences of the forested environments.

There is less brush, underbrush, up in the upper picture. Makes it easier to walk through.

Now definitely we're starting to see a change here, and I am definitely more for the upper slide simply because here we're getting a lot less undergrowth and which just means that obviously there are trees in this management plan that do not promote that undergrowth.

A few participants also commented on the health of the undergrowth.

Remaining Elements

Participants also talked about **characteristics of the scenes** that were not directly related to the forest, or directly manageable, such as the sky, terrain, soil, weather, landscape, and water as affecting their decisions.

With the blue sky and with the white clouds against the dark background, it makes it a little more vivid.

Only a few participants mentioned **wildlife** in terms of habitat, specific species, health, variety, migration, and quantity. Participants also occasionally mentioned the idea that they preferred one scene to the other because of an inherent **quality of naturalness**.

I like the top one. It looks fuller, better taken care of, more natural. I like the natural look.

Less than half (8) of the participants mentioned **specific sites** in their comments about the forest management images. These included Yellowstone, east/west coast, Minnesota, Gunflint Trail, Grand Marais, and California. There was also some mention of **natural cycles** in participant comments involving ecosystems, birth/life/death cycles, seasons, and environmental cycles.

Finally, only one participant mentioned **fire** specifically, as follows:

The same way with fighting forest fires, do we just let it happen, and it's my understanding that the more we try to, or in the past, the more we tried to manipulate the forest, the more harm we can bring to it because we weren't completely aware of the system itself. Whereas nature doesn't need to think about it, she just proceeds for its own benefit. If we were to cut out all the underbrush due to fire threat, what would that do?

Background Information

The perceptions, values, and motives of land managers and members of the public are derived from different personal and professional backgrounds and are thus likely to differ significantly. For example, forest managers report less emotion and are more likely to endorse commodity-based forest management goals than either the general public or environmental group members (Vining 1992, Vining and Ebreo 2002).

The specific contributions of knowledge, feelings, and beliefs that determine individual environmental policy preferences in the minds of either trained managers or the lay public is complex and difficult to capture. In this study, we were interested in the processes by which participants were making decisions about their preferences of forest management scenarios. Therefore, we were not solely interested in the particular choices of the management plans, but in the types of observations, knowledge, feelings, and emotions that contributed to those decisions.

To learn about this decisionmaking process, we used a technique called process-tracing (Ericsson and Simon 1984, Justin and Montgomery 1999). This is a procedure by which a participant completes a

decisionmaking task while speaking about any thoughts, opinions, feelings, memories, and previous knowledge that the particular exercise is eliciting. Researchers then analyze these processes to help reveal motives, values, emotions, and choices among tradeoffs that are typically unable to be measured by more conventional data collection techniques, such as quantitative-based questionnaires. The process-tracing technique enables researchers to view the overall cognitive and emotional processes that participants experience while completing decisionmaking exercises and provides a rich source of contextual meaning to the decisions participants are making.

We identified nine elements of forested environments that people observe when making decisions about the relative attractiveness of a forest. We did this by analyzing the content of participants' process-tracing transcripts. The results of this study reflect some of the thoughts and mental processes that contribute to public perceptions of managed forests and preferences for certain types of management over others. Most participants successfully performed the process-tracing task. Only one participant had difficulty with the task (either he didn't speak into the recorder or spoke so softly we could not understand his comments) and his results were not used in our analyses. Although process-tracing data take time to analyze, we believe this approach has good potential for further studies of public responses to management scenarios and forest features.

Methods

Instrument. Our instrument was a self-guided computer-based questionnaire, which used SmartForest, a forest visualization application developed at Penn State University (see Orland and Ursavas this volume). This protocol was developed to visually simulate various forest management scenarios over an 80-year period. The exercise required the participants to choose between two different forest management options at five separate points (2, 12, 22, 52, and 82 years) throughout the 80-year timeframe based on only visual changes in the forest. They then evaluated the same management options overall based on a computer-simulated sequence showing the full 80-year projection of conditions for each treatment. The questionnaire led the participants through several choices of simulated panoramic forest scenes and required them to rate their overall preference on a percentage-based scale that forced them to prefer one of the scenarios over the other in varying degrees of their choice. The self-administered questionnaire included an introduction that described the goals of the study and a very detailed set of instructions and examples for participants.

Participants. Participants were 10 residents of the Gunflint Trail/Boundary Waters Canoe Area Wilderness region in Minnesota as well as 5 Illinois residents and 5 University of Illinois students. We recruited Minnesota residents by contacting a random selection of residents from the region of interest and

posting announcements at various locations and on a homeowner's association e-mail list. Illinois residents were volunteers from a local not-for-profit group not affiliated with forest management or environmental issues. We randomly selected the University of Illinois students to participate in the study. All participants were given a small stipend for their participation in the study.

The sample size for this study—20 participants—is typical for qualitatively oriented studies, such as process-tracing. Because the data we received from each participant are so rich and detailed, process-tracing results from 20 participants provided us with a rather large dataset. Another indication that 20 subjects was an adequate sample size is that we began to recognize many of the same themes and found no new themes as we reviewed the last group of participants' transcripts, leading us to conclude that most participants were experiencing similar cognitive and emotional processes while completing the decisionmaking exercise.

Procedure. We conducted the process-tracing procedure at various locations most convenient to Minnesota participants, mostly in the homes of the individual participants. Illinois participants completed the experiment at the Human Nature Research Laboratory on the University of Illinois Urbana/Champaign campus. We gave each participant a short description of the study by stating we were interested in people's perceptions of different forest management scenarios. We also told the participants we were specifically interested in the processes that lead people to decide between the different forest management scenarios. After this explanation, we introduced the concept of process-tracing and explained that we would like the participants to think aloud while they were completing the questionnaire. We instructed them to say anything that came to their minds even if they didn't think it was related to the survey. We mentioned to the participants that they should feel free to speak about any thoughts, feelings, memories, previous experiences, or anything they were thinking about while making their decisions. After ensuring the participants understood their task and how to operate the laptop and tape recorder, we left the room so the participants had complete privacy.

Each tape was transcribed verbatim in its entirety and analyzed by using the QSR N6 text analysis program for qualitative data analysis. Three researchers independently read the transcripts to determine themes that participants talked about while taking the survey. We developed a coding scheme from these analyses and coded each section of text using the QSR N6 software program. This program allowed us to attach various codes to each section of transcribed text and to keep track of the occurrence and frequencies of the categories of coding.

Detailed Results

In table 1, we depict the frequencies of the themes that emerged from the text of participant responses. The first column describes the coding category. The next three columns signify the frequency of occurrence that MN (Minnesota residents), IL (Illinois public residents), and ST (student participants) mentioned in each coding category. The “total” column gives the total amount of times each coding category was mentioned by all participants. It is important to clarify that these numbers do not indicate the number of participants who mentioned these various categories. They indicate the frequency in which participants mentioned each category throughout the duration of the exercise. The last column, “#Par,” indicates the number of participants who mentioned each coding category. For example, the quantity and spacing of trees and vegetation, the first coding category listed, was mentioned 163 times by 19 participants. The 163-time frequency is broken down by type of participant, MN, IL, or ST.

As table 1 indicates, nine categories emerged from the analysis of participant responses. Remember that participants were discussing the reasoning and thought processes that contributed to visually identifying which forest management scenario they preferred. Because these categories emerged from participant responses and not from a previously conceived coding pattern, they help us better understand which elements in forested environments people observe when evaluating the relative attractiveness of a forest.

Table 1.—Frequency of themes by subject group, conjoint choice process-tracing analyses

Characteristics of the forest/trees/plant life	MN text units	IL text units	ST text units	Total text units	#Par. N=20
Quantity/spacing of trees/vegetation	55	30	78	163	19
Amount of life/quality of growth	39	13	55	107	19
Health of forest/trees	24	23	46	93	15
Species of trees	49	6	23	78	11
Type of trees	27	7	33	67	14
Qualities of different components of trees				66	
Qualities of tree trunks	1	4	19	24	9
Qualities of braches	4	3	6	13	4
Qualities of leaves	0	0	29	29	4
Age of forest/trees	47	2	17	66	12
Size of trees	32	4	22	58	14
Variety of trees/plant life	14	2	11	27	11
Openness	9	10	7	26	9
As a resource	17	4	2	23	6

MN = Minnesota residents; IL = Illinois residents; ST = student participants.

Table 1.—Frequency of themes by subject group, conjoint choice process-tracing analyses (continued)

Characteristics of the forest/trees/plant life	MN text units	IL text units	ST text units	Total text units	#Par. N=20
Height of trees	2	2	17	21	7
Fallen trees	10	1	3	14	5
Emotion attributed to forest trees	3	2	0	5	3
Interaction (compatibility) of different types/species of trees	1	0	0	1	1
Indigenous nature of forest/trees/plants	1	0	0	1	1
Experiential characteristics of the scene	MN	IL	ST	Total	#Par
Sensory experience	32	32	54	118	18
Emotional qualities				30	
Gut feeling	1	0	1	2	2
Emotional attachment	1	0	0	1	1
Specific emotions	5	1	20	26	7
Idealism	1	0	0	1	1
Ease of vision	5	1	21	27	6
Ease of travel	12	2	8	22	8
Recreation	11	2	1	14	5
Enjoyment	7	2	2	11	7
Personal experiences	0	3	3	6	3
Access	2	1	0	3	2
Perception/distance to forest	1	1	0	2	2
Shade	1	0	0	1	1
Spirituality	1	0	0	1	1
Human/environment interactions	MN	IL	ST	Total	#Par
Level of management	24	8	3	35	10
Logging issues	20	0	2	22	5
Human interference/intervention	4	0	1	5	3
Economic impact/issues	2	0	1	3	3
Responsibility towards nature	1	0	0	1	1
Understanding nature/patience towards nature	1	0	0	1	1
Development/human growth/property issues	1	0	0	1	1
Fire prevention actions	1	0	0	1	1
Characteristics of underbrush/undergrowth/shrubbery	MN	IL	ST	Total	#Par
Quantity of underbrush/vegetation on forest floor	28	3	4	35	11
Presence of underbrush	6	3	6	15	10
Health of underbrush	1	2	2	5	5

MN = Minnesota residents; IL = Illinois residents; ST = student participants.

Table 1.—Frequency of themes by subject group, conjoint choice process-tracing analyses (continued)

Characteristics of other parts of the scene	MN	IL	ST	Total	#Par
Sky	4	8	15	27	11
Mountains/terrain	1	1	9	11	6
Soil	4	2	0	6	2
Weather	1	0	3	4	2
Landscape	0	0	4	4	3
Water	1	0	0	1	1
Wildlife (nonhuman animals) aspects	MN	IL	ST	Total	#Par
Wildlife habitat	2	3	3	8	4
Specific mention of wildlife	3	0	0	3	2
Wildlife health	3	0	0	3	2
Variety of wildlife	2	0	0	2	1
Wildlife migration	2	0	0	2	1
Amount of wildlife	1	0	0	1	1
Natural/unnatural	MN	IL	ST	Total	#Par
By virtue of definition	0	6	0	6	1
Natural regrowth vs. planned regrowth	5	0	0	5	2
Natural phenomena	3	0	1	4	3
Qualities of nature	1	0	0	1	1
Sites mentioned	MN	IL	ST	Total	#Par
Subject mentioned a specific site	7	3	5	15	8
Systems/cycles	MN	IL	ST	Total	#Par
Ecosystem	3	0	0	3	1
Cycle of birth/death/life	2	0	0	2	2
Seasonal cycles	0	1	1	2	2
Environmental	1	0	0	1	1

MN = Minnesota residents; IL = Illinois residents; ST = student participants.

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