

**Monitoring the Social Environment for Forestry:
The Case of National Forest Benefits and Values**

by

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Monitoring the Social Environment for Forestry: The Case of National Forest Benefits and Values

Abstract

This paper describes a new approach for monitoring the social environment for forestry. Computer methods were used to analyze almost 30,000 online news media stories about the national forests for expressions of four main categories of benefits and values. Recreation benefits and values were expressed more often than other categories, both at the national and regional levels, followed by commodity, ecological, and moral/spiritual/aesthetic benefits and values. A slight downward trend was found in expressions of commodity benefits and values at the national level.

Introduction — The Need to Monitor the Social Environment

The job of forest managers and policy makers is growing increasingly complex because of rapid change in the social, political, economic, and scientific environments in which forest management is carried out. For example:

- Environmental attitudes and values have shifted significantly in recent decades (Kempton, et al. 1995, Ladd and Bowman 1995);
- The public and other stakeholders increasingly demand collaborative approaches to natural resource planning and management (Daniels and Walker 1996, Selin and Chavez 1995); and
- Resource management paradigms are shifting from traditional multiple-use to ecosystem-based approaches (Gordon 1994, Bengston 1994).

Managing forests in ways that are responsive to these and other social changes requires continuous monitoring and assessment of relevant trends. But traditional methods for monitoring the social environment such as surveys are slow and expensive.

In this paper we describe a new approach for monitoring the social context for forest management. We developed a social information monitoring system based on computer analysis of almost 30,000 online news media stories about the Forest Service and national forests over the period 1992-96. This approach was applied to examine trends in expressions of four main categories of benefits and values associated with the national forests: recreation, commodity, ecological, and moral/spiritual/aesthetic.

The news media are central to social debates and discourse related to forestry — including national forest benefits and values. These debates occur in forums as diverse as the courts, legislatures, meetings and hearings, confrontations and other contexts (Figure 1). The media provide the means for communicating these debates as well as expressing the values and attitudes of a wide range of stakeholders to the public. In addition to serving as a direct channel for public discourse on natural resources (through editorials, letters to the editor, etc.), the media also report on the debates themselves. Thus, content analysis of the news media allows us to take the pulse of on-going debates and discussions about natural resource issues.

A recent innovation has been the availability of electronic databases of news stories, which makes it possible to rapidly and efficiently analyze tens of thousands of stories on an issue. This large data volume can be used to create quantitative time trends that provide insights into the prevalence and importance of key ideas relative to each other. Using computer analysis of online news media text to develop a monitoring system makes it possible to update information easily, expand to include additional issues, and extend back in time to establish time trends.

The accuracy of analysis of the news media at capturing the social debates and public opinion is seen in successful predictions of time trends of such topics as presidential

elections (Fan and Tims 1989, Fan 1996), opinion toward cocaine and its reported use (Fan and Holway 1994), and Consumer Confidence/Sentiment (Fan 1994). To date, over 55 opinion and behavior time trends have been predicted successfully from media coverage using the methods described in this study.

Outline of Steps in this Analysis

This analysis involved four main steps: downloading news media stories about the Forest Service from online commercial databases; “filtering” the text to eliminate irrelevant paragraphs; developing computer instructions to score the remaining text for the concepts of interest; and checking the validity or accuracy of the analysis. Each step is described briefly below.

1. *Downloading news media stories.* The news items used for this analysis were those discussing the USDA Forest Service and the national forests. All stories were retrieved from the NEXIS and Dialog online commercial databases. Separate analyses were made for the nation as a whole (covering the period 1992-96) and three regions of the United States (covering 1994-96). The full texts of news sources chosen for the analysis were all available on the databases for the entire time period of the study. Since progressively more news sources have entered the databases with time, the national analysis could be extended further back in time than the regional analyses and still retain a large number of news sources representative of the total news structure. A random sample of 28,669 Forest Service and national forest stories were retrieved for the analysis:

National story sample (1992-96):

- 9,995 out of a total of 22,634 stories from 24 newspapers, 5 newswires, and 4 television and radio news transcripts;

Regional story sample (1994-96):

- East (Forest Service Regions 8 and 9): 5,996 out of a total of 10,230 stories from 42 newspapers;

- InterWest (Forest Service Regions 1, 2, 3, and 4): 6,000 out of a total of 7,737 stories from 9 newspapers; and
- West (Forest Service Regions 5 and 6): 6,678 out of a total of 10,184 stories from 10 newspapers. Forest Service Region 10 (Alaska) was not included due to a lack of online news sources during the period being studied.

2. *Filtering text.* The retrieved text was analyzed using the InfoTrend computer software (Fan, 1990, 1994). InfoTrend software can discard paragraphs that do not fit with user specified criteria. The analyst enters criteria customized to the topic in the form of (1) a dictionary of key words and phrases, and (2) a set of rules to relate the key words to each other to give more complex meanings. In this study, paragraphs were discarded that did not discuss the Forest Service or national forests, or only mentioned these topics incidentally, as in murder investigations in which a body was found on a national forest, obituaries of former Forest Service employees, etc.

3. *Scoring paragraphs.* InfoTrend computer instructions were developed to score the remaining paragraphs for each of the four concepts of interest, i.e., to count the number of times each benefit category appears in the text. The benefit categories are broad, encompassing the following:

- Recreation benefits and values includes the full range of recreation activities (e.g., bird watching, off-road vehicle use), recreation resources (e.g., campgrounds, snowmobile trails), and participants (e.g., hunters, mountain bikers).
- Commodity benefits and values includes the full range of commodity-oriented benefits and values associated with the national forests, including the production of various commodities, jobs and other economic benefits associated with commodities, concern over loss of jobs and economic benefits, and language reflecting economic values and goals.

- Ecological benefits and values include a wide range of ecologically oriented benefits, including various ecosystem functions and services, goals related to ecological value and indicators of the achievement of these goals, and expressions of concern about loss of ecological values or damage to ecological functions. Our category “ecological benefits and values” is, in large part, a general measure of ecological or environmental concern.
- Moral/spiritual/aesthetic benefits and values includes a range of benefits, including expressions of the spiritual value or sacredness of nature, responsibility to pass on a healthy and high quality natural heritage to future generations, attachment-orientation to nature, heritage and cultural values, aesthetic value, and expressions of concern about the loss of these values.

In addition to these four categories of benefits and values, we added a fifth category — firefighting benefits — after we had begun to analyze news media stories and observed the prevalence of this concept in the text. During a major fire season, the amount of text dealing with wildfires overwhelms all other media coverage of forestry issues, and much of this text mentions the benefits of firefighting activities. We therefore developed computer instructions to capture expressions of firefighting benefits, which included language describing the Forest Service actively fighting and controlling wildfires and protecting or saving people, animals and buildings.

To illustrate the scoring method, a set of InfoTrend instructions was used to specify that words and phrases with the connotation of *mills* (e.g., sawmills) appearing in close proximity to words and phrases expressing the idea of *closing* (e.g., shut down) combined to create the new meaning of concern over loss of jobs and economic benefits, a dimension of commodity benefits and values. Similar sets of computer instructions were developed to identify and count expressions of each category of benefits and values. In the development stage of the analysis, the computer instructions were applied to random samples of text, the coding decisions were examined, and the computer instructions modified as needed. Table

1 provides examples of news media text coded by our computer instructions for each of the four main categories of benefits and values.

4. *Checking validity.* Following the development and refinement of the content analysis computer instructions, a formal validity analysis was carried out. A content analysis variable is valid to the extent that it measures the concept it was intended to measure (Weber 1990). We examined random samples of paragraphs that were coded using our content analysis rules in order to determine whether or not the rules were able to identify expressions of the four categories of benefits and values accurately at least 80 percent of the time — a rule of thumb sometimes used in content analysis. After final refinements in the dictionaries and rules, the accuracy rates were as follows: recreation: 86 percent; commodity: 88 percent; ecological: 85 percent; and moral/spiritual/aesthetic: 87 percent.

In addition to evaluating validity in content analysis, the reliability or consistency of text classification is a concern when multiple human coders are used. Human coders inevitably introduce variability in how they interpret and apply category definitions or other coding rules. In this study, the use of computer coding eliminates problems with inter-coder reliability — the computer always applies the coding rules consistently.

Discussion of Findings

Figure 2 presents trends in the quantity of discussion of recreation, commodity, ecological, and moral/spiritual/aesthetic benefits and values associated with the national forests. Recreation benefits were discussed more than other categories, nationally and in each region. At the national level, recreation was discussed more often than commodity benefits and values except in the first half of 1992 and the first half of 1993. The peak in expression of commodity benefits and values in the second quarter of 1993 is likely due to media attention to President Clinton's Forest Conference in April of 1993.

The dominance of recreation benefits and values found in our study is consistent with survey results. In a national sample, 62 percent of respondents agreed or strongly agreed (and 22 percent disagreed or strongly disagreed) with the statement “Creating recreation opportunities (boating, hunting, camping, etc.) on public forest lands is important to me” (Hammond 1994). When asked about commodity benefits and values, only 36 percent agreed or strongly agreed (and 47 percent disagreed or strongly disagreed) with the statement “Natural resources in public forests and grasslands should be made available to produce consumer goods.” The National Survey on Recreation and the Environment (Cordell 1997) found that participation in outdoor recreation has continued to grow in the 1990s, and that almost all Americans 16 years of age and older participate in some form of outdoor recreation. Forest Service data on the number of recreation visitor days (RVDs) in national forests show rapid growth in the 1990s, from about 288 million RVDs in 1992 to 341 million RVDs in 1996. (A visitor day equals a 12-hour visit. See the annual *Report of the Forest Service*).

As would be expected, expressions of recreation benefits and values exhibit a clear annual cycle — generally lower in the first and fourth quarters, and higher in the warmer months during the second and third quarters. Nationally, a slight downward trend is evident for expressions of commodity benefits and values, but recreation exhibits no clear trend over this time period. Previous research found a decrease in expressions of commodity-oriented benefits and values associated with the national forests from the early 1980s through the early 1990s (Xu and Bengston 1997).

The regional figures (bottom three graphs in Figure 2) reveal that the largest difference between expressions of recreation and commodity benefits and values is in the East and the smallest difference is in the West. In the West and InterWest, recreation and commodity benefits and values generate roughly equal amounts of discussion during the first and fourth quarters, but recreation jumps ahead during the second and third quarters in most years.

Expressions of ecological benefits and values fall just below commodity values in frequency. This level of discussion indicates a high level of concern about the environment and protecting ecosystems. No clear trend is evident for expressions of ecological benefits at the national level, but there appears to be a slight increase in the East and InterWest. Previous research using computer content analysis found a steady rise in expressions of ecological values from the early 1980s through the early 1990s (Xu and Bengston 1997). Surveys have also found strong ecological value orientations toward forests among the public (e.g., Steel, et al. 1994, Manning, et al. 1997).

Moral/spiritual/ aesthetic benefits and values were expressed less often than benefits and values in the other categories, yet given the intangible nature of these benefits they occur with surprising frequency. No obvious national-level trend can be seen in Figure 2, but a slight increase in expressions of moral/spiritual/aesthetic benefits and values is evident in the East. Hammond (1994) found that 90 percent of the public agreed or strongly agreed with the following statement related to future generations (a dimension of moral value): “The federal government has the responsibility of conserving public forest resources for future generations.”

The fact that moral/spiritual/aesthetic values are expressed less often than other categories of benefits and values does not mean they are unimportant. To the contrary, these “deeper” values help explain why people care so passionately about forestry issues. Schroeder (1994) has argued that moral and spiritual values are critical for understanding conflict over forest policy and management:

Experiential values that do not lend themselves to this kind of measurement and valuation (for example, sense of place and spiritual values) have often been disregarded. Yet it is precisely these kinds of values, rooted in intuitive and emotional experiences, that have motivated many people to take legal and political action against forest managers. For ecosystem management to truly

include humans as a part of ecosystems, these kinds of values must be recognized and dealt with in managing forests. (p. 3).

There appears to be an annual cycle for moral/spiritual/aesthetic benefits and values, with higher levels of expression during the second and third quarters, similar to the annual recreation cycle. This suggests that at least certain types of moral/spiritual/aesthetic benefits are likely to be experienced during recreation activities.

Finally, Figure 3 shows national trends in the expression of firefighting benefits. Not surprisingly, expressions of the benefits associated with fighting wildfires usually peaks — sometimes quite dramatically — in the third quarter of each year. During a major fire season, such as the third quarter of 1994, expressions of firefighting benefits surpass all other benefit categories. A nationwide survey conducted after the 1994 fire season found that 55 percent of the public believe that the Forest Service should extinguish all wildfires, versus 36 percent who would allow more fires to burn themselves out (Smith and Clark 1994). Thus, most people view firefighting as a desirable or beneficial activity, which is consistent with our observation that firefighting is most often portrayed as a benefit in the media. The prevalence of this view suggests that wildfire policies which place less emphasis on suppression and greater emphasis on the role of wildfires in ecosystems may face significant opposition.

Concluding Comments

The method for monitoring the social environment described in this study is a new tool for forest managers and policy makers. It does not replace traditional social science tools for assessing people's values, attitudes, opinions, beliefs, motivations, and other aspects of the human dimensions of natural resource management. Traditional methods for analyzing the social environment — such as surveys, focus groups, interviews, participant observation, etc. — are in fact complementary to the method described in this paper.

But analyzing social debates and discourse using computer content analysis of online media text does have some important advantages over alternative approaches. Our approach can be:

- extended back in time in order to establish time trends for the concepts of interest, i.e., the effects of important events, such as a change in policy or an unusually severe fire season, can be observed;
- updated easily, efficiently, and quickly, i.e., recent news media text can be downloaded and analyzed to update an analysis every year, every quarter, or whatever time frame is of interest to decision makers; and
- expanded to include additional issues and concepts of interest, or to analyze key trends in greater depth.

Social science research is often used indirectly by decision makers, helping them better understand the context in which decisions and policies need to be made, thereby resulting in better informed decisions that are more responsive to the changing social environment (Weiss 1980). The ability of computer content analysis of online media text to identify emerging social trends and track them makes this approach especially useful to strategic planners. Using this approach, decision makers in a crisis situation can have access to information about public response immediately. Other potential uses for this type of analysis — and especially a more detailed social information system using this approach — include:

- bringing an issue to the attention of decision makers;
- formulating new policies or programs;
- evaluating the merit of alternative proposals for action;
- improving existing programs;
- mobilizing support for a position or point of view;
- changing decision makers ways of thinking about an issue; and
- planning new decision-relevant research.

Rapid change in the social environment in which forest management is carried out has become the norm. Managing forests in ways that are responsive to changing social and ecological conditions is the main challenge faced by forest managers today. The method described in this paper provides a new approach to continuously monitor and assess relevant trends in the social environment.

Literature Cited

- Bengston, David N. 1994. Changing forest values and ecosystem management. *Society and Natural Resources* 7:515-533.
- Cordell, H. Ken. 1997. *Outdoor Recreation in American Life*. New York: Sagamore Pub. (in press).
- Daniels, Steven E. and Gregg B. Walker. 1996. Collaborative learning: Improving public deliberation in ecosystem-based management. *Environmental Impact Assessment Review* 16(2):71-102.
- Fan, David P. 1990. Information processing expert system for text analysis and predicting public opinion based on information available to the public. U.S. Patent 4,930,077.
- Fan, David P. 1994. Information processing analysis system for sorting and scoring text. U.S. Patent 5,371,673.
- Fan, David P. 1994. Predicting public opinion from press coverage. *The Public Perspective* (July-August): 21-23.
- Fan, David P. 1996. Predictions of the Bush-Clinton-Perot presidential race from the press. *Political Analysis* 6:67-105.
- Fan, David P. and William B. Holway. 1994. Media coverage of cocaine and its impact on usage patterns. *International Journal of Public Opinion Research* 6(2):139-162.
- Fan, David P. and A.R. Tims. 1989. The impact of the news media on public opinion: American presidential election 1987-1988. *International Journal of Public Opinion Research* 1:151-163.
- Gordon, John C. 1994. The new face of forestry: Exploring a discontinuity and the need for a vision. 1993 Distinguished Pinchot Lecture. Milford, PA: Grey Towers Press. 16 p.
- Hammond, Bruce. 1994. Forest Service Values Poll Questions: Results and Analysis. Report prepared for USDA Forest Service by Kaset International, Tampa, FL.

- Ladd, E. C. and K. H. Bowman. 1995. *Attitudes Toward the Environment: Twenty-five Years after Earth Day*. Washington, D.C.: AEI Press. 55 p.
- Kempton, Willett, et al. 1995. *Environmental Values in American Culture*. Cambridge, MA: MIT Press. 320 p.
- Manning, Robert, William Valliere and Ben Minter. 1997. Values, ethics, and attitudes toward national forest management: An empirical study. *Journal of Forestry* (in press).
- Schroeder, H.W. 1994. Problem analysis: problem one. Research Work Unit FS-NC-4902, Managing Forest Environments for Urban Populations. Chicago, IL: USDA Forest Service, North Central Forest Experiment Station. 6p.
- Selin, Steve and Deborah Chavez. 1995. Developing a collaborative model for environmental planning and management. *Environmental Management* 19(2):189-195.
- Shindler, B., P. List and B. Steel. 1993. Managing federal forests: Public attitudes in Oregon and nationwide. *Journal of Forestry* 91:36-42.
- Smith, Dan and Lance Clark. 1994. Hot views on hot topics: National survey gauges public views on forests, wildfire, and management. *American Forests* 100(11&12):3.
- Steel, B. P. List and B. Shindler. 1994. Conflicting values about federal forests: A comparison of national and Oregon publics. *Society and Natural Resources* 7(2): 137-153.
- Weber, Robert P. 1990. *Basic Content Analysis (2nd ed.)*. Newbury Park, CA: Sage Publications. 96 p.
- Weiss, Carol H. 1980. *Social Science Research and Decision-Making*. New York: Columbia University Press. 332 p.

Xu, Zhi and David N. Bengston. 1997. Trends in national forest values among forestry professionals, environmentalists, and the news media, 1982-1993. *Society and Natural Resources* 10:43-59.

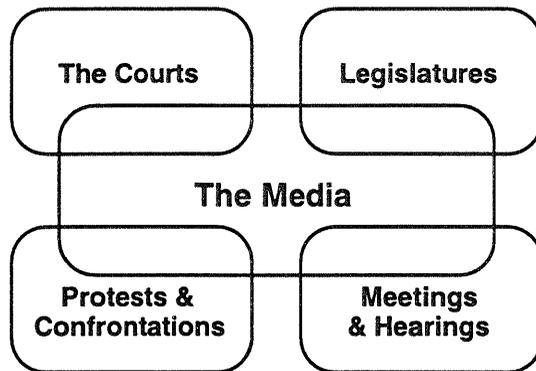


Figure 1. Forums for public debates about natural resource policy and management

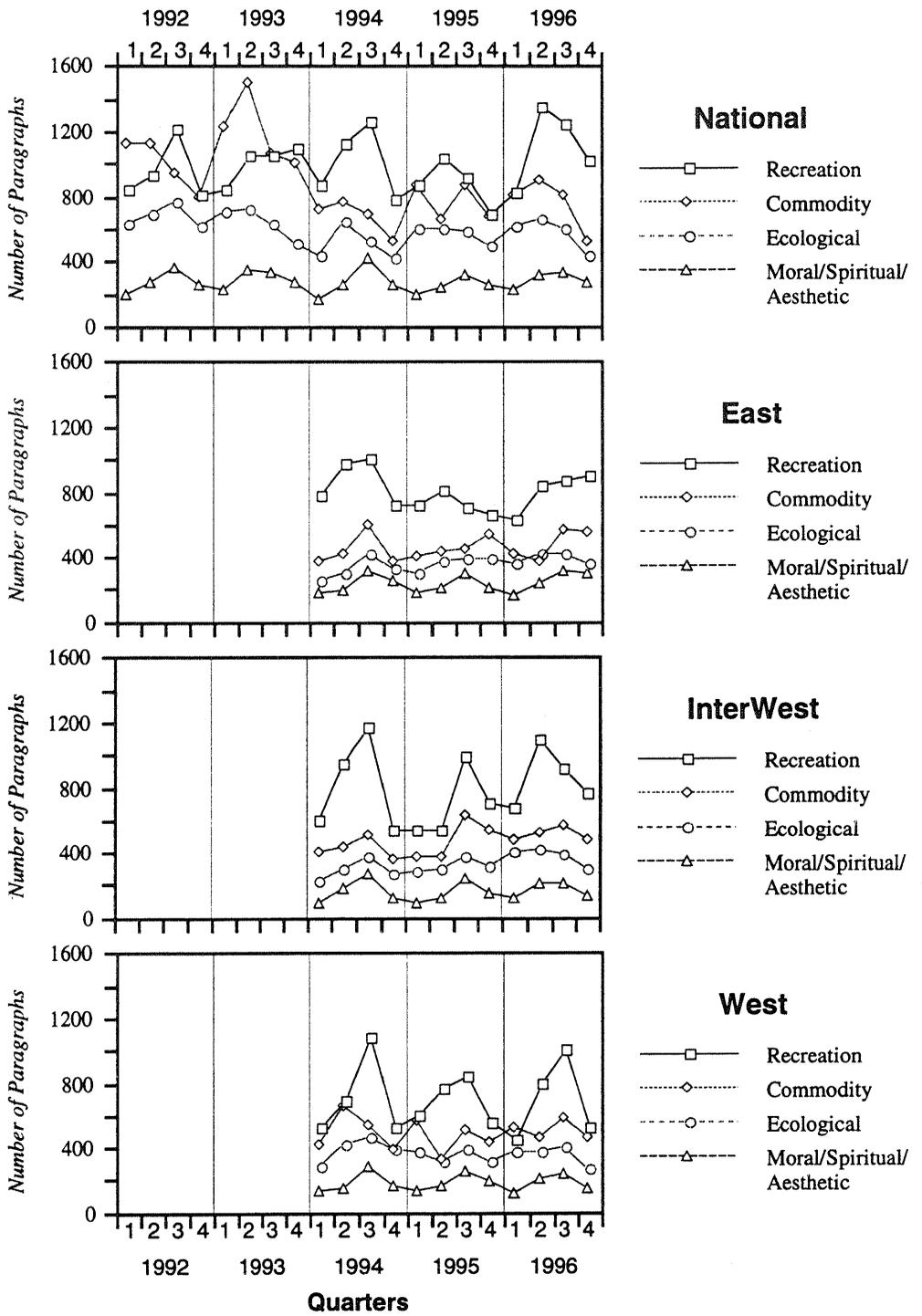


Figure 2. Quantity of discussion of recreation, commodity, ecological, and moral/spiritual/aesthetic benefits and values associated with the national forests, plotted quarterly.

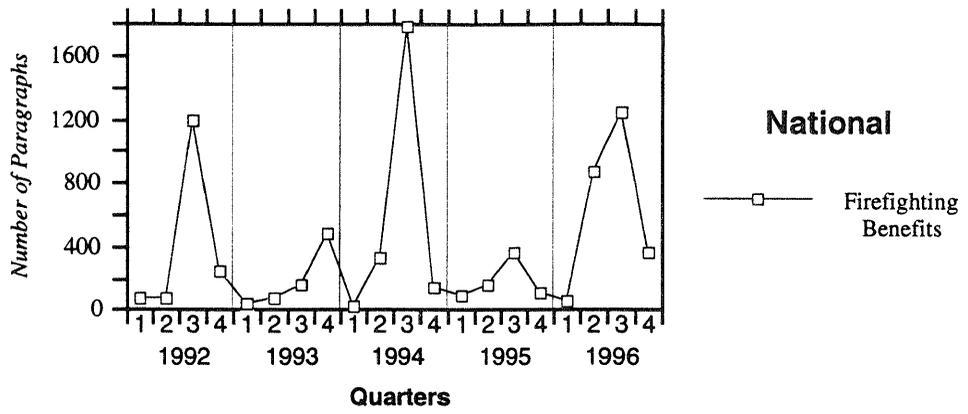


Figure 3. Quantity of discussion of firefighting benefits associated with the national forests, plotted quarterly.

Table 1. Examples of expressions of benefits and values from the news media.

Recreation benefits and values:

... people in Idaho and Montana do not want to cede more of their prime hunting and camping lands to Ursus Arctos Horribilis. (Source: story 5495, file b1, 10-29-95).

... But the region is home to bald eagles, timber wolves, bears and moose and it's treasured by a wide variety of outdoor enthusiasts, including snowmobilers, fishermen, backpackers and canoeists, with often conflicting interests. (Source: story 5409, file b1, 11-6-95).

Commodity benefits and values:

Soon, Comer is speaking confidently with the aide to Oklahoma Sen. Don Nickles. "Ma'am, I work for a lumber mill being shut down because it can't get timber sales loose from the Forest Service. Wonderin' if you knew about it?" (Source: story 12795, file b1, 3-27-94).

... for grazing animals on public land. The 1993 rate will be \$2.04 per animal unit per month. That's down 21 cents from the 1992 rate. An animal unit is the amount of forage needed to sustain one horse, a cow and her calf or five sheep or goats. The rate is pegged to private land lease rates, beef cattle prices and the cost of livestock production. The land is held by the Forest Service and the... (Source: story 17994, file b1, 1-13-93).

Ecological benefits and values:

"Causing these declines is habitat damage caused by human activities," said Willa Nehlsen, lead author of the report. (Source: story 16887, file b1, 4-12-93).

If the project succeeds -- and in this marriage of convenience that is still a big if -- it could have a profound impact on the resolution of other conflicts over endangered species and on the federal government's approach to managing imperiled wildlife. (Source: story 5495, file b1, 10-29-95).

Moral, spiritual and aesthetic benefits and values:

"The 'Path of Life Trail Lands' will remain a wilderness for longer than we can envision," said Vincente Lujan, the tribe's warchief. "For as long as our people exist, the sacred areas will remain a place of prayer for all life, and a place of mediation for our people." (Source: story 12498, file b2, 4-21-94).

Spanning 17 million acres on the rocky shores and numerous islands, the Tongass is the biggest of the national forests, once described by the naturalist John Muir as "an endless rhythm and beauty." (Source: story 13463, file b2, 1-15-94).



United States
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Agriculture

Forest
Service

North Central Forest
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File Code: 4800

Date: March 26, 1998

Dr. Roy Haines-Young, Editor
Department of Geography
The University of Nottingham
Nottingham, NG7 2RD
UK

Dear Dr. Haines-Young:

Enclosed are three copies of a manuscript by David Bengston, David Fan, and Doris Celarier titled "Monitoring the Social Environment for Natural Resource Management: The Case of U.S. National Forest Benefits and Values." This manuscript is being submitted for possible publication in the *Journal of Environmental Management*, and has not been published previously and is not under consideration for publication elsewhere.

Appropriate reviewers for this manuscript would include social scientists with some expertise or familiarity with content analysis, especially computer content analysis methodology. I would be happy to suggest several potential reviewers if that would be helpful.

Correspondence regarding this manuscript should be sent to me at the address shown in the above letterhead, or my e-mail address (bengs001@maroon.tc.umn.edu).

Sincerely,

DAVID N. BENGSTON
Research Social Scientist

Enclosure

Reply To: 4800

Date: February 19, 1998

Mr. Robert D. Day, Editor
Renewable Resources Journal
Renewable Natural Resources Foundation
5430 Grosvenor Lane
Bethesda, MD 20814-2193

Dear Mr. Day:

Enclosed is a copy of a manuscript titled "Monitoring the Social Environment for Natural Resource Management: The Case of National Forest Benefits and Values," by David Bengston, David Fan, and Doris Celarier. We discussed this manuscript on the phone about two weeks ago. The paper describes an analysis of almost 30,000 online news media stories about the national forests.

The manuscript has been reviewed by Dr.s Allen Lundgren and Hans Gregersen of the University of Minnesota, and for the North Central Forest Experiment Station by David Lothner, Assistant Director.

This manuscript is not being considered for publication elsewhere. I hope it is acceptable for publication in the *Renewable Resources Journal*.

Sincerely,



DAVID N. BENGSTON
Social Scientist

Enclosures



United States Forest
Department of Service
Agriculture

North Central Forest Experiment Station
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File Code: 4800

Date: July 9, 1997

Ms. Sally Atwater, Managing Editor
Journal of Forestry
Society of American Foresters
5400 Grosvenor Lane
Bethesda, MD 20814-2198

Dear Ms. Atwater:

Enclosed are five copies of a manuscript by David N. Bengston, David P. Fan, and Doris N. Celarier titled "Monitoring the Social Environment for Forestry: The Case of National Forest Benefits and Values." This manuscript is being submitted for possible publication as a scientific paper in the January 1998 Open Forum issue of the Journal of Forestry.

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Appropriate reviewers for this manuscript would include social scientists with some expertise -- or at least familiarity -- with content analysis methodology. I would happy to suggest several reviewers if that would be helpful.

Correspondence regarding this manuscript should be addressed to me at the address shown in the above letterhead, or my e-mail address (bengs001@maroon.tc.umn.edu). My phone number is (612) 649-5162.

Sincerely,

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Enclosure

