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CHANGING NATIONAL FOREST VALUES

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The evolution of forest values is currently being widely discussed and debated in the forestry community. It is often claimed that a fundamental shift in forest values has taken place in recent decades. For example, historian Samuel Hays (1988:550) suggested, "New values have emerged about what the forest in America is and what role it ought to play in modern society." Shands (1991) stated that managing the national forests in ways that are responsive to changing public values is the core problem faced by the USDA Forest Service. Gordon (1993) argued that a shift in public values is part of the explanation for the declining influence of the multiple-use sustained-yield paradigm of forest management. It is increasingly recognized that the values people hold about forest ecosystems are an important part of the social underpinning of ecosystem management, the emerging forest management paradigm. Grumbine (1994:34) went further, arguing that "Ecosystem management is an early stage in a fundamental

reframing of how humans value nature." Thus, ecosystem management can be viewed as a response to changing values or as a driving force that is creating value change. In either case, values play a critical role in identifying ecosystem management goals, setting the context for decision-making, and guiding our choices.

Forest values are defined here as relatively enduring conceptions of "the good" related to forests and forest ecosystems. Value in this sense is sometimes referred to as an ideal or a held value. A more systematic understanding of recent changes in forest values is needed to develop resource management approaches that are responsive to changing forest values and to anticipate the future evolution of forest values. Several recent studies have analyzed forest and related value systems at a particular point in time (e.g., Holler, 1990; Steel, Ust, & Shindler, 1994; Vining & Ebreo, 1991). But there has been little research on how forest values—or environmental values in general—have changed over time. This is

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due in part to the limited number of approaches available to analyze the evolution of abstract constructs such as values. . . .

In this study, we used computer-coded content analysis to empirically analyze the evolution of forest values in the United States from 1982 through 1993. We developed a classification system that identifies four broad categories of forest values: economic/utilitarian, life-support, aesthetic, and moral/spiritual values (Bengston, 1994). A content analysis procedure was developed to identify expressions of these values related to public forests in databases of text representing the views of three groups: the general public, forestry professionals, and mainstream environmentalists. The value system of each group was quantitatively summarized, and changes in value systems—i.e. changes in the relative frequency of expression of forest values—were tracked over time. Our main working hypotheses in this study were that 1) forest value systems have shifted over the study period, and 2) significant differences exist between the forest value systems of the three groups. In a concluding section, we discuss the implications of this study for ecosystem management.

METHODOLOGY

The basic idea of content analysis is that the large numbers of words contained in a piece of text are classified into content categories of interest. This requires the development of a coding scheme—a system for classifying text designed to achieve the objectives of a particular study. The coding scheme is the heart of any content analysis. The first step in developing a coding scheme is to define the content categories, which in this study are the four types of forest value described above. Therefore, our objective was to produce a set of reliable and valid indicators of the expression of our four broad categories of forest value.

A second step in developing a coding scheme is to define the basic unit of text to be classified. Individual words and phrases, sentences, paragraphs, and whole texts may be

used as the unit of text for analysis. Choice of an appropriate unit of text depends on the specific research questions of interest. For certain purposes, large units of text are quite appropriate. But Weber (1990) noted that it is often difficult to achieve high reliability when coding large units of text. In this study, we have chosen to use individual words and phrases as the basic unit of text to be classified. This approach is most appropriate given the interweaving of forest values. For example, the sentence, "The production of goods and services is essential, but it does not preclude maintaining the natural beauty of forests" expresses both economic/utilitarian value (as indicated by the phrase "goods and services") and aesthetic value (as indicated by the word "beauty"). By classifying individual words and phrases rather than larger units of text, our content analysis procedure can account for multiple expressions of forest values within a given unit of text.

The third step is to develop lists of words and phrases—"dictionaries" in the nomenclature of content analysis—associated with each of the content categories. These words and phrases serve as indicators of the concepts of interest. Forest values are abstract concepts not capable of being directly observed. The dictionaries enable us to indirectly observe and quantify expressions of forest values. Development of the forest value dictionaries involved an iterative process.¹ Initial dictionaries were developed for each value category by examining forestry related texts that clearly express a particular type of value. Texts that emphasize a particular value are common in forestry. Classic examples include the writings of Gifford Pinchot, which tend to emphasize the economic/utilitarian value of forests, in striking contrast to the writings of John Muir, which frequently and strongly express aesthetic value. Articles by forest economists, traditional foresters, and others focusing on the economic or utilitarian value of forests were examined to identify an initial list of words and phrases expressing economic/utilitarian value. Similarly, the writings of forest ecologists and others focusing on ecological functions and values were examined

to identify words expressing life support value; the writings of landscape architects, aestheticians, environmental philosophers, and others were examined to identify indicators of aesthetic value; and the writings of environmental philosophers, environmental psychologists, Native Americans and others were examined to identify indicators of moral or spiritual value. Almost 80 documents were examined to develop the initial forest value dictionaries.

The initial value dictionaries were then sent to subject matter specialists for review and refinement. A landscape architect, who conducts research on the aesthetic value of forests, reviewed the initial aesthetic value dictionary, an environmental psychologist, involved in research on the spiritual value of forests, reviewed the moral/spiritual value dictionary, and so on. The subject matter specialists were asked to comment on the dictionaries and suggest additional words and phrases that express forest values within their area of expertise.

The next step—examining the use of the words and phrases in our databases of text—was crucial in refining the value dictionaries and ensuring their validity. Weber (1990:15) noted, “A content analysis variable is valid to the extent that it measures the construct the investigator intends it to measure.” Using three databases of text on the national forests, we examined computer-generated key-word-in-context (KWIC) lists to determine which of the words and phrases contained in the draft value dictionaries were accurate indicators of the expression of the four values. Table 1 illustrates KWIC records for selected words from each of the value categories. Words and phrases found to be used ambiguously or incorrectly for this study were dropped from the dictionaries. For example, the word “spirit” was originally included in the moral/spiritual value dictionary, but we found it was used as an expression of the moral or spiritual value of forests only about 16 percent of the time. We also found phrases such as “a spirit of compromise” and “a cooperative spirit,” which do not express the moral/spiritual value of forests. The word “spirit” was

therefore dropped from the moral/spiritual value dictionary. We could cite many other examples of words and phrases that were dropped because they were found to be inaccurate indicators of the expression of particular values.

The process of refining the dictionaries by applying them to a large sample of text, assessing the accuracy of coding in context, and revising the dictionaries as needed was repeated until a satisfactory level of validity was achieved. We defined a “satisfactory level” as correct usage 80 percent of the time or more. A final validity check of each of the four dictionaries on a representative, random sample of text from each of the three databases revealed that the dictionaries accurately captured expressions of value with a minimum of 80 percent accuracy, and most of the words and phrases contained in the dictionaries were valid value indicators 90 to 95 percent of the time.

In addition to concerns about validity in content analysis, the reliability or consistency of text classification is a concern when multiple human coders are used. Despite a well-conceived set of coding rules and careful training of human coders, people inevitably introduce variability in how they interpret and apply category definitions or other coding rules. In this study, we used computer coding to avoid problems with coder reliability—the computer always applies the coding rules consistently.

Table 2 shows the final forest value dictionaries. Words and phrases in the economic/utilitarian value category include participants or actors that fill various roles related to utilitarian values (e.g., logger, tree farmer), various objects of utilitarian value (e.g., goods and services, raw materials), ends or goals related to utilitarian value (e.g., economic development, economic growth), and various means to achieve these ends (e.g., exports, intensive management).

The life support value dictionary shown in Table 2B includes both the specialized language of ecologists and many words used by non-ecologists to describe various ecological functions and to express life support value. Included are actors that fill roles related to life

Table 1 Key-Word-in-Context Records Illustrating the Expression of Each Value

<i>Economic/Utility Value Expressions</i>	<i>Aesthetic Value Expressions</i>
... at least some insulation of the plan from legal challenges in order to quickly get more timber moving through the pipeline in economically depressed communities. A third reason for concern about the decay of biodiversity is purely economic. Intensive management must be increased to meet our projected population increases which will bring about a 75 percent increase in timber demand in the next three decades.	Of all the leafless trees, I think the most beautiful against the winter sky is the little flowering dogwood with its graceful horizontal limbs that reach skyward at their tips and form a fine lace pattern ... spectacular areas of natural beauty — national parks, forests and historic sites. . . . Finally, and most gloriously, trees: More than 130 flowering trees and fourteen native conifers, as many total species as are to be found in all of Europe
<i>Life Support Value Expressions</i>	<i>Moral/Spiritual Value Expressions</i>
It is a subsidy for which Americans pay dearly. An obvious cost is in the degradation of streams and the rich terrestrial ecosystems that border them. Like any other timber cut, salvage sales punch roads into hitherto roadless areas, compact and erode soil, wound watersheds, and fragment forests. The values of southern forested wetlands to society relate to each of the three major wetland functions—habitat, hydrology, and biogeochemical cycling.	At one time, the chestnut occupied a cherished, seemingly unshakable place in the landscape It is fresh and new-looking, a dark slash through the forest, a desecration, as out of place among these old trees as. . . . First and foremost, my forester must have a land ethic. They must feel the same bond to the land that they feel for one close to them.

NOTE: Abridged from the original.

support values (e.g., restoration ecologist, landscape ecologist), various ecosystem functions (e.g., carbon storage, soil stabilization, water purification), ends or goals related to life support value and indicators of the achievement of these goals (e.g., biodiversity, ecosystem health, keystone species), and various indicators of problems with environmental functions and loss or degradation of life support value (e.g., acid rain, erosion, degradation, fragmentation, unraveling). Creighton (1983:153) noted that one of the strategies for communicating values is prediction of dire consequences of a certain course of action: "The kind of consequence they fear will reflect their values. The man from the Chamber of Commerce will predict a loss of jobs, while the preservationist will predict a total disruption of the ecosystem." Our experience developing forest value dictionaries

confirms Creighton's observation: Words expressing negative, undesirable consequences were outstanding value indicators.

Table 2C, our aesthetic value dictionary, includes words such as "ugly," which expresses aesthetic value by calling attention to a loss or lack of aesthetic value, as in the phrase "clear-cuts are ugly scars on the land." This word list should pick up both personal reflections on the aesthetic value of forests as well as expressions of aesthetic value found in the research literature on forest aesthetics. Our aesthetic value dictionary is based on fairly traditional notions of forest aesthetics, but it does reflect the wide range of senses, intellectual powers, and emotions involved in the perception and appreciation of aesthetic beauty, not just visual perception (e.g., words like emotive, fragrant, musical, orchestral, poetic, savor).

Table 2 Value Dictionaries

A: Economic/Utilitarian Value Dictionary			
benefits of timber	harvest level	market price	timber plantation
bid price	harvest timber	market value	timber-producing
commercial	harvest tree	market system	timber production
commodity,	harvesting timber	non-market, nonmarket	timber sale
commodities	harvesting trees	monetary	timber shortage
crops of tree, tree crop	harvesting of timber	monetizing	shortage
dollars in timber	harvesting of trees	monetization	of timber
earning, earnings	timber harvest	plantation	timber supply
economic, economical	tree harvest	processed timber	timber supplies
economically	housing market	profits, profitable	supply of timber
economic analysis	industrial forest	rangeland	timber value
economic development	industrial forestry	raw log, raw materials	timberland
economic effect	industrial land	scarcity	tree farmer
economic growth	industrial interests	stumpage	tree farming
economic impact	intensive culture	supply and demand	tree plantation
economic sense	intensive forest	supply-demand	utilization
economy, economies	management	timber harvest	utilize, utilized
exports, exporter	intensive forestry	timber-dependent	underutilized
exporting	intensive management	timber export	wage
exploited	intensively managed	timber industry	willing to pay
firewood	log price	timber job	willing-to-pay
forest product	log export	timber loss	willingness to pay
goods and services	lumber price	timber management	willingness-to-pay
grazing fee	limber product	timber operation	workforce
B: Life-Support Value Dictionary			
absorb air pollutants	biotic diversity	soil-binding	degrading
absorption of pollutants	ecosystem diversity	buffer strip, buffer zone	detritus
air purifier	genetic diversity	carbon cycle	downstream habitat
air purity	landscape diversity	carbon dioxide	ecological
air purifying	species diversity	carbon fixation	ecological benefits
air and water	structural diversity	carbon sequestration	ecological communities
air quality	biological diversity	carbon sink	ecological community
assimilative capacity	biological health	carbon storage	ecological diversity
waste assimilation	biological integrity	CO ₂ fixation	ecological functions
aquatic life	biological legacy	CO ₂ sequestration	ecological health
aquatic zone	biological legacies	CO ₂ sink	ecological integrity
breakdown of pollutants	biological processes	CO ₂ storage	ecological processes
acid drainage	biological systems	climate amelioration	ecological restoration
acid precipitation	biological wealth	climate ameliorate	ecological services
acid rain	biosphere, biospheric	climate ameliorating	ecological values
biodiversity	biota, biotic	climate buffer	ecologically valuable
bio-diversity	binding of soil	degrade, degradation	ecologically complex

(Continued)

Table 2 (Continued)

B: Life-Support Value Dictionary (Continued)			
ecosystem diversity	erosion	landscape ecologist	self-sustaining
ecosystem complexity	eutrophication	life-support	siltation
ecosystem functions	exotic species	life-supporting	species abundance
ecosystem functioning	extinct species	life supporting	species loss
ecosystem health	extinction	life-sustaining	species-poor
healthy ecosystem	endemic species	life sustaining	species-richness
ecosystem integrity	endangered species	life-cycle	soil conservation
ecosystem maintenance	filtration	life cycle	soil erosion
ecosystem processes	flood control	material cycling	soil formation
ecosystem resilience	controlling flooding	mycorrhizae	soil movement
ecosystem restoration	flood mitigating	mycorrhizal	soil nutrients
ecosystem services	flood mitigation	nature's services	soil structure
ecosystem structure	storm abatement	nitrogen cycle	generation of soil
ecosystem sustainability	food chain	nitrogen cycling	topsoil loss
ecosystem values	food level	fixation of nitrogen	unstable soil
energy value	food web	nitrogen-fixing	solar energy
energy capture	forest health	nitrogen-fixation	solar equivalents
energy cycling	fragment	nutrient cycle	solar radiation
energy exchange	fragmentation	nutrient-cycling	streamside buffers
energy flow	fragmented	nutrient export	stream sedimentation
flow of energy	fragmenting global	nutrient uptake	threatened species
energy flux	change	old growth corridor	trophic activity
energy transfer	global climate	ozone depletion	trophic flow
environmental cost	global warming	ozone hole	trophic functioning
environmental concern	greenhouse effect	ozone layer	trophic interactions
environmental degradation	greenhouse gases	stratospheric ozone	trophic level
environmental function	groundwater	pollution	trophic organization
environmental health	ground water	oxygen production	trophic specialization
environmental impact	ground-water	production of oxygen	trophic structure
environmental processes	groundwater	photosynthesis	trophic transfer
environmental quality	contamination	radiation balance	trophic web
environmental restoration	habitat	radiation flux	unraveling
environmental services	habitat protection	restoration ecologist	water cycle
environmental toxin	habitat loss	restoration ecology	water-purification
environmental value	habitat fragmentation	restored	water-purifier
environmentally beneficial	wildlife habitat	ecosystem	water-quality
environmentally sensitive	fish habitat	riparian	water purification
environmentally sustainable	homeostasis	riparian area	water purifier
erode, eroded	homeostatic	riparian boundary	water quality
erodible, eroding,	hydrologic cycle	riparian communities	watershed
	hydrological cycle	riparian system	watershed stabilization
	indicator species	riparian zone	watershed stabilizer
	integrity of ecosystem	revegetate	wetland restoration
	jeopardized species	self-maintenance	valuable wetland
	keystone species	self maintenance	wildlife habitat
	landscape ecology	self-replicating	wildlife population
		self-sustaining	wildlife support

C: Aesthetic Value Dictionary

adorn, adorned	evocatively	natural setting	spectacular
aesthetic	evocation exhilarate	noble	splendor
aesthetically	exhilarated	orchestral	splendorous
affective	exhilarating	ornate	splendorous
artistic	exhilaration expansive	ornament	stunning
artist, artist's	exquisite	ornamented panorama	stunningly
awe, awesome	exquisiteness	panoramic	stupendous
awe-inspiring	fragrance	poetry, poems	sublime
beauteous	fragrant	pristine	sublimely
beautiful	glory, glories	rapture, rapturous	sublimeness
beautifully	glorify, glorious	resplendent	sublimity
beauty	graceful	restorative	sumptuous
natural beauty	grandeur	rustic	sumptuousness
breathtaking	harmony	savor, savored	superb
breathtakingly	harmonious	savory	symphony
captivate, captivating	heart-stopping	scenery	symphonic
charming	hue	scenic, scenically	towering
dazzling	landscape architecture	scenic beauty	ugly
delight	landscape architect	scenic value	unspoiled
delights	lavish	sensibility	untrammeled
delightful	lovely	sensibilities	vast expanse
delighted	lush	sensory	vast wilderness
ecstasy, ecstatic	luxuriant	sensual, sensually	visceral
elegant, elegance	magnificence	sensualness	vista, vistas
emotive	magnificent	sensuous	visual
enthrall, enthralling	majestic, majesty	sensuously	visual quality
evoke	marvelous	sensuousness stately	visual resources
evocative	musical	stateliness	woodland realm

D: Moral/Spiritual Value Dictionary

ancient forest	eden, edenic	legacy	reverential
ancient tree	environmental ethics	meditate	reverently
anthropocentric	exalted	meditation	rights and duties
nonanthropocentric	exaltation	meditative	sacred
bio-centric	exaltedness	morals	sacredness
cathedral	exaltedly	morality	sanctity
cathedrals	future generations	mythic	sanctuary
cherish	good steward	mythical	sanctuaries
cherished	heritage	mythological	sanctum
cherishing	holier, holy, holiness	mythology	shrine, enshrine
consecrate	immortal, immortality	national treasure	spiritual
consecrated	inherent value	natural treasure	stewardship
consecration	intrinsic value	normative	tabernacle
desecrate	inspiration	paradise	transcendence
desecration	inspirational	posterity	transcendent
dignity	inspire	profaned, profaning	transcendental
divine, divinity	inspired	religion, religious	transcending
duties and obligations	inspiring	revered	venerate
ecocentric	irreplaceable	reverence	venerable
	land ethic		

NOTE: Abridged from the original.

The final moral/spiritual value dictionary is shown in Table 2D. This dictionary contains words and phrases found to be good indicators of the expression of the moral and spiritual value of forests, such as the following: biocentric, cherish, future generations, heritage, irreplaceable, land ethic, revered, sacred, and venerate. Although moral value and spiritual value are usually expressed in distinctive language, we combined them into a single category because they are closely related values and they are expressed relatively infrequently in the text we analyzed. This dictionary also includes words such as "desecrate" and "profaned," which indicate a loss or abuse of spiritual value.

It should be noted that the four value dictionaries do not each contain the same number of words and phrases. The life support value dictionary is the largest due to the inclusion of technical terms describing ecological functions and services, and the moral/spiritual value dictionary is the smallest. In developing these dictionaries, we found that their relative size has little impact on their ability to capture the bulk of the expressions of forest value contained in text because many of the words and phrases, while accurate indicators of the expression of values, are used infrequently. The results of our analysis would not change significantly if we limited each dictionary to the ten most frequently used words and phrases expressing a particular value. Therefore, we have focused on the quality of the words and phrases contained in each of our value dictionaries rather than on the quantity.

In the course of developing our four value dictionaries, we quickly discovered that the words and phrases in the economic dictionary were good indicators of the expression of economic/utilitarian value for forestry professionals and the public or news media, but they were poor indicators when applied to environmentalists. We found that in the environmental literature, economic/utilitarian words and phrases were usually cast in a negative or skeptical light; environmentalists frequently use economic words and phrases while expressing concern about the harmful environmental impacts of economic activities, rather than in positive expressions of economic/utilitarian value. For example, we found many phrases such as "destructive logging practices,"

in which the word "destructive" appearing in close proximity to the word "logging" clearly indicates the perceived negative consequences of an economic activity. To handle simple cases such as this example, it would be possible to develop a set of transition rules as part of a content analysis procedure, which describe how two ideas in the text, represented by individual words or word groups, are combined to give a third idea. For example, the use of words such as "abuse," "devastating," "indiscriminate," "misuse," and "ravaged" in close proximity to certain economic words would be counted as expressions of negative economic value.

We developed a set of transition rules to capture negative expressions of economic/utilitarian value, but found that negative expressions of this value were much more subtle in most instances and could not be captured by a simple set of rules. The complexity and nuances of the language exceeded the ability of our transition rules to capture more than a small portion of the negative or skeptical expressions of economic/utilitarian value. For example, the phrase "... harvest levels are higher than what is sustainable on a long-term basis" (Watson, 1990:25) expresses concern about an economic activity rather than positively expressing economic value. But no word or phrase within this phrase indicating this attitude of concern can be generalized to a large body of text.

To account for the negative expressions of economic/utilitarian value in the environmental literature, we conducted a human-coded content analysis on a representative random sample of our database. This involved examining the text in which economic/utilitarian words and phrases were used and coding it into two categories: positive and negative expressions. . . . We found that the use of words and phrases from our economic/utilitarian dictionary was associated with positive value only 25 percent of the time in the environmental literature, and the remainder of the uses was clearly negative or skeptical. This percentage was found to be stable over the time period covered by our data and was used as a correction factor to adjust the computer-coded counts of expressions of economic/utilitarian value in the environmental literature.

We also found many qualified expressions of economic/utilitarian value in the environmental literature, i.e., expressions of economic value that were positive but which clearly ranked economic value below other values, such as the following example: "While the forests can and should help serve the immediate commodity needs of American citizens, this should not be allowed to compromise those priceless assets which are becoming increasingly unique to the national forests—and are no less real than our economic demands for lumber and paper, oil and iron" (The Wilderness Society 1983:33,38). Qualified but positive expressions of economic value such as this were coded as positive expressions.

Once the value dictionaries and coding rules were finalized, expressions of forest values were measured by applying them to databases of text, i.e., using the InfTrend software;² we searched our databases for the words and phrases contained in the four dictionaries. Each use of one of the words or phrases that was found counted as one expression of the particular value. For example, the sentence "Of all the leafless trees, I think the most *beautiful* against the winter sky is the little flowering dogwood with its *graceful* horizontal limbs that reach skyward at their tips and form a fine lace pattern" (Borland, 1984:5) would be counted as two expressions of aesthetic value because of the use of the words "beautiful" and "graceful," which are included in our aesthetic value dictionary. The sentence "At one time, the chestnut occupied a *cherished* seemingly unshakable place in the landscape" (Toner, 1985:27) would be counted as one expression of moral/spiritual value due to the presence of the word "cherished," which is included in our moral/spiritual dictionary. The value expressions were then aggregated by each type of value, database, and year to develop time trends.

DATA

We developed databases of text on the national forests for three populations of interest: 1) the general public, 2) forestry professionals and 3) environmentalists. The content

of newspaper articles was used as a proxy for the expression of public forest values. Kellert, in his landmark study of wildlife values and attitudes, argued that newspaper articles "... can be relatively good indicators of generally held views and interests" (Kellert, 1985:20). Others have argued that, rather than reflecting the attitudes and values of their readers, the news media shape the opinions and attitudes of the public (Fan, 1988). We argue that there is some truth to each of these positions—the news media both reflect and shape public values to some degree—and therefore the news media may serve as a rough proxy for the values of the public. It is important to recognize that the use of news media text to identify expressions of national forest values for the public is a proxy and not a direct measure. Therefore, the value trends for this group should be interpreted more cautiously than trends for the other two groups.³

News media stories were obtained from the NEXIS electronic database, which contains the full texts of a large number of major and minor newspapers from all regions of the United States and a large number of national regional and state news services. Stories included in our database were located using the search command "national forest." For the period 1982 to 1993, NEXIS was found to contain more than 15,000 stories that included the phrase "national forest." and out of this total population, we randomly retrieved 2,000 stories for inclusion in our database.

To minimize the inclusion of irrelevant text, the retrievals did not include the full text of stories. Only text within 100 words of the phrase "national forest"—50 words on either side—was downloaded. This greatly reduces the amount of irrelevant text that would have been retrieved from stories that mention the national forests only in passing and helps ensure that the measured expressions of value are linked to national forests as opposed to other types of owners or land. Experience with many electronic text retrievals from news media sources on a wide range of topics has shown that text outside of a 50- to 100-word window around the search words is often not relevant to the topic of interest.⁴ The public/news media database consists of 5.5 megabytes of text.

The values of forestry professionals were represented in a second database consisting of two components: 1) the complete text of keynote and general session papers presented at the Society of American Foresters National Conventions from 1982 through 1993, and 2) the complete text of articles in the *Journal of Forestry* that dealt specifically with national forests over the same period. This database was constructed by using an optical scanner to enter the text of the papers and articles. The database representing the views of forestry professionals consists of 415 articles and 6.7 megabytes of text.

Similarly, a database to represent the values of mainstream environmentalists was constructed by scanning in the complete text of articles dealing with the national forests from magazines published by three major forest-related environmental groups: the National Wildlife Federation's magazine *National Wildlife*, the Sierra Club's *Sierra*, and the Wilderness Society's *Wilderness*. The National Wildlife Federation was the largest U.S. forest-related environmental organization in 1993 with 6,200,000 members (Hendee & Pitstick, 1994). The Sierra Club and the Wilderness Society were also among the largest forest-related environmental groups in 1993, with 650,000 and 310,000 members, respectively. Taken together, text from the magazines published by these three groups should contain a good cross-section of expressions of the values held by mainstream environmentalists about the national forests. This database contains the full text of 238 articles and 3.1 megabytes of text.

RESULTS

A generalized logit model was used to test hypotheses concerning differences in forest value systems between the three groups and to test for a shift in forest value systems over time. . . . To mention just one example of the latter, the trends in relative frequency of life support value are almost a mirror image of the economic/utilitarian trends. The trends for environmentalists and forestry professionals are upward and fairly dramatic. The public/news

media group seems to be lagging behind the other groups, with no discernible trend until the upturn in the expression of life support value in the early 1990's. . . .

To facilitate comparison between groups in recent years, Figure 1 summarizes the forest value system of each of the three groups for the last four years of our data (1990–93). This figure shows the average relative frequency of expression of each value, to portray only the current value system of each group. Economic/utilitarian value clearly still dominates the forest value systems of forestry professionals and the public/news media, accounting for more than half of the value expressions in recent years. Environmentalists place much less emphasis on the economic/utilitarian value of the national forests. Expressions of life support value clearly dominate the value system of environmentalists, and life support value is a strong second for the other groups. Life support value accounts for about 40 percent of total value expressions in recent years for forestry professionals and about 30 percent for the public/news media.

The aesthetic value of the national forests is expressed least often relative to the other values among forestry professionals and significantly more often in the news media and environmental literature in recent years. Finally, Figure 1 reveals that moral/spiritual value plays a significantly larger role in the current value system of environmentalists than for the other groups, and it plays the smallest role in the value system of forestry professionals.

DISCUSSION

The trends revealed in this study suggest that a gradual shift has been occurring in the structure of national forest values in the United States since the early 1980's, at least among forestry professionals and mainstream environmentalists. Given our definition of forest values as relatively enduring conceptions of what is good or desirable about forests and forest ecosystems, we would expect gradual change. If this analysis had found dramatic shifts in forest values over this short span of time, it would

be reasonable to conclude that we were measuring something other than values, such as attitudes or opinions, which tend to be more variable. Value systems are relatively stable and change slowly. But, as our results suggest, even gradual shifts in the relative importance of values may eventually result in a significant reordering of priorities among values. . . .

The decline in the relative frequency of expression of economic/utilitarian value and concomitant increase in life support value among forestry professionals and environmentalists are the most striking aspects of the shift in national forest values revealed by our analysis. The shift away from economic/utilitarian value is especially noteworthy for forestry professionals, because the philosophical base of traditional forestry is utilitarianism and the forestry profession has been heavily influenced by economic concepts of value (Kennedy, 1985; McQuillan, 1993). Thus, the decline in economic/utilitarian value suggests a fundamental change in the culture of forestry professionals. . . .

Finally, our finding that the life support value of the national forests plays a prominent and growing role in the value systems of

forestry professionals, environmentalists and, in recent years, the public/news media suggests that this concept of what is good about forests is now widely recognized and appreciated. The importance of life support value that we found tends to confirm environmental historian Donald Worster's observation about the influence of ecology on our culture: "So influential has their branch of science become that our time might well be called the 'Age of Ecology'" (Worster, 1994:xiii). The increase in the expression of life support value that we observed suggests that ecosystem management—often characterized as being based on ecological principles and placing greater emphasis on ecological values than traditional forest management—may indeed be an idea whose time has come.

NOTES

1. The iterative process we used is similar to what David Fan . . . [calls] successive filtrations. [He] explained the method as follows: "From biochemistry, I learned that the study of complicated materials frequently benefits from a series of

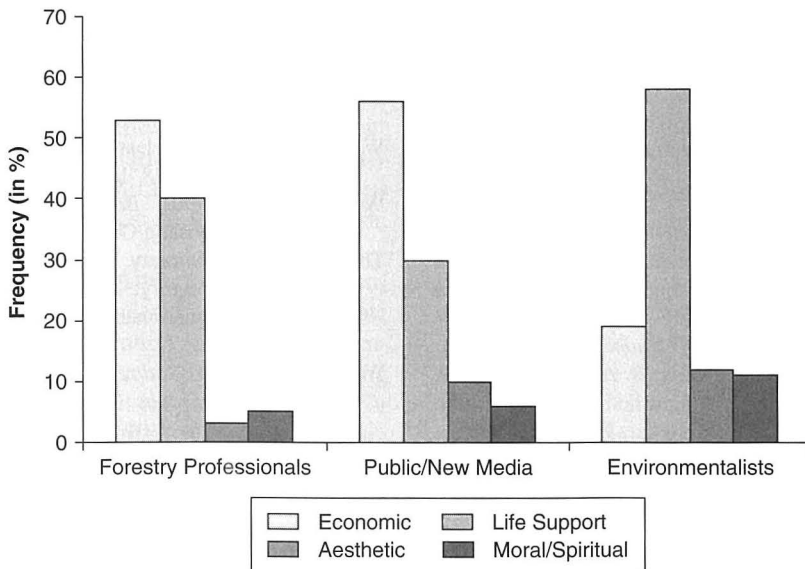


Figure 1 Forest Value Systems by Group, 1900–1993

purification steps, each one removing extraneous components to yield progressively more homogeneous preparations enriched in relevant materials. This logic led to the strategy of successive 'filtrations' during the text analyses" (Fan, 1988:xvii) [Editors' note: See also reading 7.6, this volume].

2. The computer software to generate the KWIC lists and carry out the actual content analysis was InfoTrend, developed by Prof. David Fan, Department of Genetics and Cell Biology, University of Minnesota.

3. Strictly speaking, the databases of text for forestry professionals and environmentalists are also indirect reflections of the values of these groups, because the included texts are the outcome of editorial decisions by people in leadership positions rather than a random sample of the populations of interest.

4. Personal communication, David Fan, University of Minnesota, February 15, 1994.

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