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ATTITUDES AND PERCEPTIONS ABOUT ECOLOGICAL RESOURCES AND HAZARDS OF PEOPLE LIVING AROUND THE SAVANNAH RIVER SITE

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Abstract. Although considerable attention is devoted to environmental monitoring and assessment with respect to both pollutants and the status of particular plant or animal populations, less attention is devoted to assessing people's attitudes about the relative importance of ecological resources. In this paper we examine the attitudes and perceptions about ecological resources of people living around the Department of Energy's Savannah River Site (SRS), in South Carolina. Our overall hypothesis is that people who are directly affected by the possible outcomes and consequences of a particular hazard (i.e., those people employed at SRS) will undervalue the risks and overvalue the potential benefits from future land uses that favor continued site activity, compared to people who live near but are not employed at SRS. We interviewed 286 people attending the Aiken Trials horse show on 14 March 1997. There were few gender differences, although men hunted and fished more than women, women ranked three environmental concerns as more severe than did men, and women were more concerned about the effect of SRS on property values. Maintenance of SRS as a National Environmental Research Park ranked first as a future land use; nuclear production ranked second, followed by hunting and hiking. Only residential development ranked very low as a future land use. There were many differences as a function of employment history at SRS: 1) people who work at SRS think that the federal government should spend funds to clean up all nuclear facilities, and they think less money should be spent on other environmental problems than did non-employees, 2) people who work at SRS ranked continued current uses of SRS higher than did people who never worked at SRS, and 3) people who work at SRS are less concerned about the storage of nuclear material or accidents at the site than are people who never worked at the site.

Keywords: ecological resources, gender, hazardous waste, land use, recreation, risk perception

1. Introduction

Considerable attention has been devoted to environmental monitoring and assessment of pollutants, along with the status and trends of particular plant and animal

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populations. Initially, such assessments were performed in the context of environmental impact statements (NRC, 1986, 1993), but more recently such information has been used in ecological risk assessment (NRC, 1983, 1992; Bartell *et al.*, 1992). Usually the debate arises because of the recognition that global resources are finite (Buttel, 1989), and that humans have a dual nature of being both part of natural ecosystems, yet developing sociological environments beyond nature (Buttel and Humphrey, 1987; Freudenburg and Gramling, 1989)). In many cases, environmental assessment involves selection of indicators, which must both satisfy cultural interests, yet measure ecosystem health. Such indicators should operate on a regional as well as a local scale (Hunsaker *et al.*, 1990a, 1990b; Kreman, 1992). Increasingly, risk assessment is being used as a basis for environmental decisions and regulations (EPA, 1984; Norton *et al.*, 1992; Keeman and Gilford, 1993; Lucier, 1993), but to be effective the process should be transparent and understandable to both the public and policy-makers (Goldstein, 1996).

Risk assessment, and the resultant governmental risk management decisions, are both stimulated and influenced by the attitudes and perceptions of people who are affected (stakeholders). This relationship has been recognized formally by the President's Commission on Risk Assessment and Risk Management (1996) which recently placed stakeholders in the center of other risk assessment and management processes. Agencies such as the Department of Energy (DOE) increasingly are including stakeholders in decision-making processes (Bradbury, 1994). Further, White (1996) noted that developing means of reconciling the diverse communities and values was one of three key issues in global environmental policy. While considerable attention has been devoted to understanding environmental attitudes and risk (Hance *et al.*, 1989; Dunlap, 1991; McDaniels *et al.*, 1995), much of it has been devoted to understanding attitudes and perceptions about chemical or nuclear risks (Kunreuther *et al.*, 1990; Slovic *et al.*, 1991a, 1991b; Kraus *et al.*, 1992; Mitchell, 1992; Kivimake and Kalimo, 1993). Slovic and colleagues have devoted considerable attention to the methodology of evaluating perceptions about risks (Slovic, 1987, 1993), but only recently has attention been focused on perceptions of ecological risk (McDaniels *et al.*, 1995).

Knowledge about how people perceive and value ecological resources is critical to future land use decisions, yet the two are seldom examined together. In particular, ecological resources are seldom examined in terms of recreational or consumptive uses. We embarked on a project to understand the perceptions and attitudes of people living in the vicinity of the Savannah River Site (SRS) about ecological resources, environmental hazards, and future land use of SRS. Our overall study design involved three populations: 1) the general public living in the general region (mainly central South Carolina; Burger *et al.*, 1997), 2) hunters, fisherman and other sportsmen living in the general region, and 3) the public living close to the site. We predicted that these populations would differ in their recreational rates, valuations of ecological resources, and perceptions of future land use for SRS.

In this paper we examine the attitudes and perceptions of people living in the immediate vicinity of the SRS (mainly within 20 km). The SRS is a Department of Energy facility (Gibbons, 1993), and is one of the largest and most contaminated of the DOE sites. We were particularly interested in whether recreational rates, environmental perceptions, and future land use preferences were similar to those of other groups examined. We tested the null hypotheses that there were no differences in perceptions or attitudes with respect to gender or to employment history at SRS. The latter hypothesis could only be tested in a population living close enough to make employment a viable option.

2. Methods

The SRS is located in southwestern South Carolina, 30 km southeast of Augusta, Georgia (33.1°N, 81.3°W, Gibbons, 1993). It covers 780 square km and borders the Savannah River which separates South Carolina from Georgia. SRS is a nuclear production and research facility owned by the U.S. Department of Energy. There are nearly 3,000 buildings on site. Most nuclear activities have ceased, except for tritium production. At present, employees are mainly working on environmental restoration and maintenance, with support staff. SRS is the largest employer in the area, with approximately 14,000 people on site. While about 5% of the population in the four adjacent counties is directly employed by SRS, about 20% of the population is directly or indirectly dependent on SRS (Greenberg and Mayer, 1996).

The site includes bottomland hardwood forests, pine sandhills, swamps, streams, and Carolina Bays (73% of the site), in addition to the lakes (reactor cooling ponds, Gibbons, 1993). The SRS is bounded on the southwest side by the Savannah River which was used as a source of cooling water for reactors (Fig. 1). Vegetation communities on the SRS are typical of the Upper Coastal Plain of South Carolina (Workman and McLeod, 1990). The 1,130 ha abandoned reactor-cooling reservoir, Par Pond, received cooling-water effluent periodically contaminated with ^{137}Cs (radiocesium) and smaller amounts of other radionuclides from 1954 to 1964. Par Pond is also known to contain elevated levels of mercury, most likely originating from Savannah River water pumped through the reservoir. In 1972 the Atomic Energy Commission designated the SRS as the U.S.'s first National Environmental Research Park (NERP), defined as an outdoor laboratory for studying the effects of energy production and development on ecosystems.

On 14 March 1997 we interviewed 286 people who attended the first event of the Aiken Trials horse show. Approximately 10,000 people attended this event, and most (68%) were from Aiken. 94% of the people interviewed were white, reflecting the attendance at the horse show. Aiken is the closest major city to SRS (about 20 km from SRS), and many people living in the city and its environs work or have worked at SRS. Thus their attitudes might be more influenced by the site

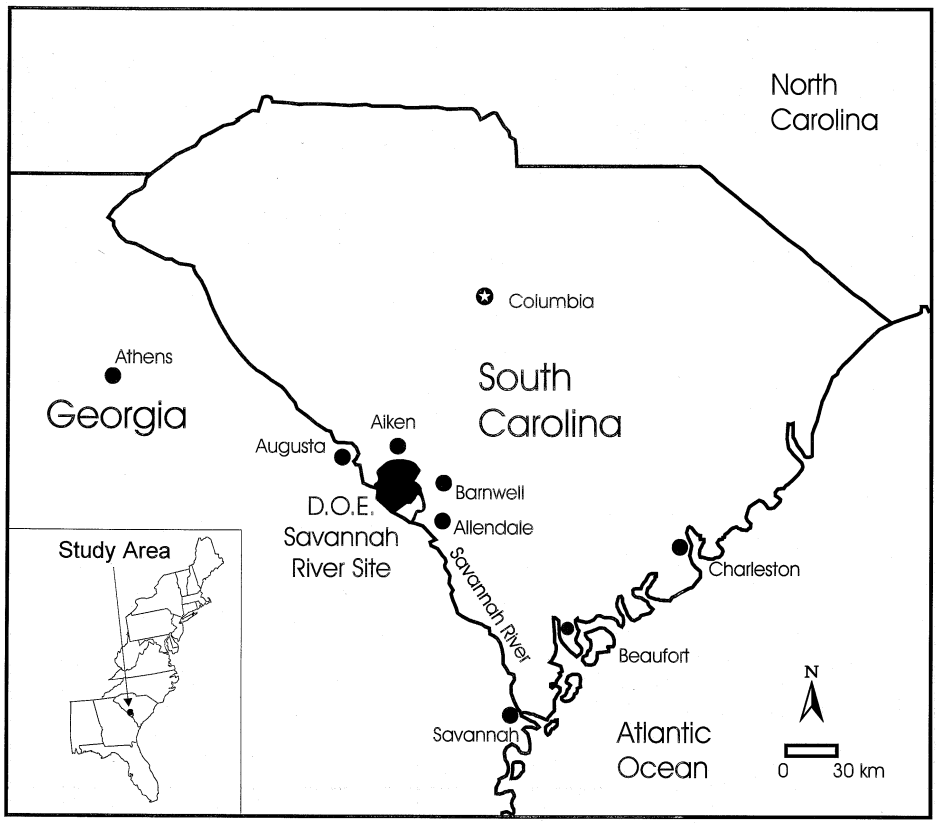

Figure 1. Map of the Savannah River Site, showing location of survey at Aiken Trials, SRS, and other nearby sites.

than are those of people living farther away. Further, a substantial proportion of Aiken attend the Trials.

Subjects were interviewed while they waited for events. The show lasted all day, even though the horses were raced for a total time of less than an hour. Thus there was considerable time to conduct the interviews. People were relaxed, seemed very willing to talk to us, and many continued to discuss the various issues with us long after the interview was completed. The sample was not selected strictly randomly, but there is no reason to believe it was not representative of those attending the exhibition. Nearly everyone (96%) we approached agreed to answer the questions; exceptions were people who were deeply engaged in discussion or were high level DOE or Westinghouse administrators, who declined to respond. The people interviewed were clearly stakeholders because they live in a town that is significantly impacted by SRS, and many work at the site.

The questionnaire was divided into six parts dealing with demography, hunting and fishing activities, future land use at SRS, severity of selected environmental

problems, willingness to expend federal funds for these problems, and evaluation of concerns about SRS. This latter series of questions was added for the population living within the vicinity of SRS because they were likely to have concerns, while those living elsewhere in the state were not. Hunting and fishing questions dealt with days spent in these activities, how many guns and fishing rods they possessed, whether they ever hunted or fished at SRS, whether they would pay to do so, and whether they believed that the deer and fish on SRS were safe to eat.

Respondents were then asked to rank the desirability of future land uses for SRS on a scale of 1 (=never desirable) to 5 (=most desirable). Land use options included recreational, residential, commercial, nuclear, and preservation or research activities. For the questions on severity of environmental problems and use of federal funds, subjects were asked to rank them from 1 (=strongly disagree) to 5 (=strongly agree). Strongly agree means the subject ranked the problem as very severe, or that federal funds should definitely be spent to mitigate the problem. These two sections were not linked, and the order in which the environmental problems were presented was not the same in each section. This section included ecological problems, contaminants, Superfund sites and Department of Energy sites. Superfund sites are hazardous waste sites that meet the U.S. Environmental Protection Agency's criteria for inclusion on the National Priorities List of Hazardous Waste sites requiring remediation to protect public health. The protocol was the same used for the other population cohorts studied (Burger *et al.*, 1997, in press).

We then asked the respondents to rank concerns on a scale of 1 (no concern) to 5 (high level of concern). Concerns were loss of jobs, storage of additional nuclear material, hazardous spills or accidents on site, storage of current nuclear material, changes in property values, loss of hunting opportunities, loss of recreation, and safety of the game from SRS. This list was generated from detailed telephone interviews of more than 70 hunters and fishers who used SRS extensively (Sanchez and Burger, in press), and in-person interviews with the general public at Columbia, South Carolina (Burger *et al.*, 1997).

We used ANOVA with Duncan Multiple Range Test to determine whether there were differences as a function of gender and work history, and to determine differences between future land use preferences. Given in the text and figures are means and standard errors.

3. Results

There were few significant gender differences in recreational rates, attitudes about federal spending and future land use preferences or concerns at SRS (Table I). As might be expected, men engaged in significantly more hunting and fishing than did women, and ranked hunting and fishing more highly as preferred future land uses than did women. There were few differences in preferences for federal funding, except for environmental problems that ranked relatively low (ozone, pesticides

TABLE I

Gender differences in recreation, attitudes about federal funding, future land use at SRS, and a ranking of concerns. Given are means ± one standard error. NS = not significant by Kruskal-Wallis test.

	Female	Male	χ^2(p)
Number	129	157	
Age	39.87±1.34	39.82±1.21	0.0004 (NS)
Grade in school	14.76±0.21	14.25±0.20	2.17 (NS)
Recreational activities (days/year)			
Photograph	29.67±4.57	22.81±3.61	2.11 (NS)
Fish	8.30±3.65	23.67±5.02	23.89 (0.0001)
Hunt	2.58±1.29	8.87±2.63	20.83 (0.0001)
Hike	5.45±2.91	6.21±2.54	0.31 (NS)
Camp	6.37±1.88	5.54±1.42	0.38 (NS)
Federal Funding			
Clean SRS	4.49±0.09	4.46±0.09	0.02 (NS)
Clean DOE sites	4.45±0.10	4.49±0.09	0.09 (NS)
Clean Rocky Flats, CO	4.43±0.09	4.34±0.09	0.30 (NS)
Preserve rain forests	4.39±0.10	4.16±0.11	1.90 (NS)
Make drinking water safe	4.30±0.12	4.18±0.11	0.47 (NS)
Clean Hanford, WA	4.34±0.10	4.08±0.11	1.82 (NS)
Clean ocean trash	4.06±0.12	3.85±0.12	1.32 (NS)
Removed lead from drinking water	3.99±0.12	3.78±0.12	1.38 (NS)
Clean superfund sites	3.79±0.14	3.80±0.12	0.0004 (NS)
Fix ozone depletion	3.74±0.14	3.31±0.14	3.97 (0.05)
Reduce pesticide levels in environment	3.45±0.13	2.92±0.13	7.99 (0.05)
Remove radon from homes	2.59±0.14	2.39±0.13	1.70 (NS)
Reduce high voltage power lines	2.63±0.13	2.01±0.11	16.29 (0.0001)
Future land use at SRS			
National Environmental Research Park	4.79±0.05	4.79±0.05	0.08 (NS)
Continue nuclear material production	3.81±0.15	4.02±0.13	1.61 (NS)
Hiking	3.85±0.13	3.62±0.13	1.44 (NS)
Hunting	3.39±0.14	3.74±0.13	4.36 (0.04)
Camping	3.42±0.14	3.58±0.12	0.67 (NS)
Fishing	3.11±0.14	3.66±0.12	9.13 (0.003)
Preserve only	2.91±0.15	2.80±0.13	0.32 (NS)
Building factories	2.57±0.15	2.75±0.14	0.60 (NS)
Increase nuclear waste storage	2.31±0.15	2.66±0.14	2.96 (NS)
Only hunting & fishing	1.69±0.12	1.95±0.12	2.25 (NS)
Building houses	1.45±0.09	1.66±0.10	1.17 (NS)

TABLE I
Continued.

	Female	Male	χ^2(p)
Concerns at SRS			
Loss of jobs	4.26±0.11	4.18±0.10	0.52 (NS)
Storage of additional nuclear material	4.08±0.14	3.81±0.13	2.28 (NS)
Accidents or spills at site	3.70±0.15	3.58±0.14	0.50 (NS)
Storage of current nuclear material	3.78±0.15	3.41±0.15	2.63 (NS)
Changes in property values	3.71±0.14	3.11±0.13	11.32 (0.0008)
Loss of hunting opportunities	1.80±0.11	2.06±0.11	1.29 (NS)
Loss of recreation on site	1.90±0.11	1.95±0.11	0.01 (NS)
Eating game at SRS	1.78±0.12	1.96±0.11	1.007 (NS)

and power lines). Similarly, there were no gender differences in ranking of overall concerns at SRS, except that females were significantly more concerned about the effect of SRS on property values.

There were almost no differences in recreational rates as a function of employment history at SRS (Table II), except that people who were employed at SRS fished significantly more than those who were never employed at SRS. There were, however, significant differences as a function of employment history with respect to federal funding, future land use, and concerns about SRS (Table II). Where there were differences about the ranking of federal spending, people who were employed at SRS ranked cleaning up nuclear sites (regardless of their location) higher than people who were never employed at SRS, and they ranked all other problems lower (removing lead from drinking water, removing radon from homes, reducing pesticide levels, reducing the number of high voltage power lines).

The highest ranked future land use for SRS was as a National Environmental Research Park, followed by continued nuclear production, hiking, hunting, camping and fishing. Low ranked future land uses were hunting and fishing only, and residential use (Table II). People who worked at SRS (now or in the past) ranked nearly all future land uses higher than did those who were never employed at SRS (Table II). Using SRS for hunting and fishing was the only future land use that people employed at SRS ranked lower than non-employees.

Before we asked respondents to rank specific concerns, we asked them what they considered to be the major issue at SRS. In general, people were equally concerned with economics and environmental issues (Table III). While most people were concerned with the local economy and loss of jobs (40%,) a few people (4%) felt SRS was spending too much money or was ineffective, or that people employed there did not work very much. Primary environmental concerns dealt with waste, safety from environmental spills, and cleaning up the site.

TABLE II

Differences in recreation, attitudes, and perceptions as a function of employment at SRS (now or in the past) compared to never working at SRS. Given are means ± one standard error. NS = not significant by Kruskal-Wallis test.

	Employed at SRS	Never employed at SRS	χ^2(p)
Number	91	189	
Age	41.56±1.27	38.40±1.15	4.59 (0.03)
Grade in school	14.71±0.22	14.40±0.19	1.15 (NS)
Recreational activities (days/year)			
Photograph	22.43±5.22	27.73±3.68	0.32 (NS)
Fish	16.07±5.37	13.37±3.22	3.97 (0.05)
Hunt	7.09±2.28	5.38±2.09	1.83 (NS)
Hike	4.11±1.33	6.50±2.79	0.23 (NS)
Camp	8.80±3.03	4.50±0.96	0.36 (NS)
Federal Funding			
Clean SRS	4.78±0.06	4.31±0.09	8.73 (0.003)
Clean DOE sites	4.67±0.09	4.39±0.08	3.93 (0.05)
Clean Rocky Flats, CO	4.56±0.09	4.27±0.09	3.02 (NS)
Preserve rain forests	3.94±0.15	4.40±0.09	8.87 (0.0003)
Make drinking water safe	3.92±0.16	4.37±0.09	7.38 (0.007)
Clean Hanford, WA	4.60±0.10	4.02±0.10	12.50 (0.0004)
Clean ocean trash	3.60±0.17	4.12±0.10	6.53 (0.01)
Removed lead from drinking water	3.61±0.16	4.00±0.10	4.93 (0.03)
Clean superfund sites	3.79±0.15	3.84±0.11	0.30 (NS)
Fix ozone depletion	3.37±0.17	3.59±0.12	1.13 (NS)
Reduce pesticide levels in environment	2.84±0.16	3.33±0.11	5.77 (0.02)
Remove radon from homes	2.08±0.15	2.66±0.12	7.20 (0.007)
Reduce high voltage power lines	1.86±0.11	2.48±0.11	7.63 (0.006)
Future land use at SRS			
National Environmental Research Park	4.80±0.06	4.76±0.05	0.31 (NS)
Continue nuclear material production	4.28±0.14	3.76±0.12	7.03 (0.008)
Hiking	3.78±0.16	3.69±0.12	0.13 (NS)
Hunting	3.99±0.14	3.37±0.12	7.04 (0.008)
Camping	3.42±0.16	3.52±0.11	0.37 (NS)
Fishing	3.70±0.15	3.25±0.12	4.02 (0.04)
Preserve only	2.53±0.18	2.96±0.12	3.97 (0.05)
Building factories	2.95±0.19	2.53±0.13	3.72 (0.05)
Increase nuclear waste storage	2.92±0.18	2.31±0.13	7.62 (0.006)
Only hunting & fishing	1.48±0.11	2.04±0.11	9.90 (0.002)
Building houses	1.69±0.14	1.52±0.08	0.79 (NS)

TABLE III
Continued.

	Employed at SRS	Never employed at SRS	χ^2(p)
Concerns at SRS			
Loss of jobs	4.40±0.12	4.13±0.10	2.21 (NS)
Storage of additional nuclear material	3.47±0.18	4.15±0.11	11.83 (0.0006)
Accidents or spills at site	3.17±0.19	3.85±0.12	9.49 (0.002)
Storage of current nuclear material	3.04±0.19	3.83±0.12	9.65 (0.002)
Changes in property values	3.49±0.18	3.35±0.12	0.90 (NS)
Loss of hunting opportunities	1.78±0.12	1.98±0.10	0.79 (NS)
Loss of recreation on site	1.86±0.13	1.95±0.10	0.17 (NS)
Eating game at SRS	1.96±0.13	1.95±0.10	1.90 (NS)

Loss of jobs ranked the highest as a concern about SRS, and there were no differences with respect to employment history. The other high ranking concerns, in order of concern, were: storage of additional nuclear material, accidents or spills, storage of current nuclear material and change in property values (Table II). All other concerns ranked very low. There were differences in the ranking of concerns as a function of employment history, with people employed at SRS being significantly less concerned about storage of nuclear material (current or additional) and accidents or spills. People were equally concerned about property values, and they mentioned that values dropped as SRS laid off people.

4. Discussion

4.1. Overall risk evaluation

The people who were interviewed in this study showed some inconsistent evaluations. They ranked concern for both current and additional storage of nuclear waste relatively high, yet they ranked nuclear production as a relatively high future land use and they ranked storage of nuclear waste as an intermediate future land use. This inconsistency could result either from past knowledge that the handling of nuclear waste by SRS has been safe, from optimistic biases about their own vulnerability to potential risks from SRS (Weinstein *et al.*, 1989), or to a relative ranking of the certainty of an adverse outcome of local job losses compared to the lower potential for future nuclear accidents or spills. Thus, high probability/medium impact outweighed low probability/high impact outcomes.

TABLE IV

Responses by interviewees when asked about the most important issue at SRS. Total interviewed was 286 (85% responded). Words given under each category are those used by respondents, but the three categories are ours.

	Number	Percent of those responding
Economic issues		
Jobs	80	33
Economy	17	7
Efficiency/inefficiency or excessive cost	11	4
Overall[a]		**41**
Environmental issues		
Waste/waste storage	33	14
Safety	25	10
Clean-up the site	25	10
Contamination	14	6
Environment	11	5
Overall[a]		**44**
Political/mission issues		
Defense missions	14	6
Politics of site	7	3
Mission	3	1
Others	10	5
Overall		**15**

[a] Some people listed more than one of these.

Many people did mention, however, that they were very unhappy about waste from elsewhere being brought to SRS. The question of the safety of nuclear technology is not a matter of objective or scientific, historic data, but is elusive, and true risks must be predicted based on inadequate data (Flynn *et al.*, 1994). Verplanken (1989) found that beliefs and attitudes of people in the Netherlands toward nuclear energy changed dramatically following the Chernobyl accident. They viewed the probability of a catastrophic accident as higher, and rated the perceived benefits as less probable. A similar thing may be happening for people living near SRS. Since there has never been a highly publicized major accident, they rank the benefits high and the probability of a catastrophic accident lower. Even so, they continued

to rank concerns about nuclear accidents and additional storage high because of a common general dread or fear of high level nuclear waste (Slovic *et al.*, 1991b).

In the sample we interviewed, people ranked cleaning up Department of Energy sites very high (mean of 4.7 out of 5), yet they ranked cleaning up Superfund sites lower (mean of 3.8). These differences may reflect the direct applicability of clean-up operations to their own economic well-being. Many people noted that cleaning up SRS and other DOE sites would help preserve jobs in Aiken and the surrounding communities. Thus, for the community living directly around SRS, the risk evaluation may not be among accidents, spills and other potential dangers from nuclear and chemical activities on site, but among these risks, jobs and local economic prosperity. In this risk evaluation, the entire community is involved because SRS plays such an important economic role in the community regardless of direct employment at the site (Greenberg, unpubl data). Continued clean-up of SRS or other DOE sites was viewed by those questioned as clearly linked to jobs in the region.

4.2. GENDER DIFFERENCES

Gender differences in environmental attitudes and ranking of risks have been shown for a number of hazards (Blocker and Eckberg, 1989; Steger and Witt, 1989; Fischer *et al.*, 1991; Kraus *et al.*, 1992; Flynn *et al.*, 1994). In general, women are more concerned about environmental hazards than men. It is more complicated in that race also enters into the equation; Flynn *et al.* (1994) found that white men perceived environmental risks as smaller than did white women and black men and women. Gender differences are particularly great for nuclear and other technologies that are seen as posing risks of contamination (Davidson and Freudenburg, 1996). Further, in a review of available research, Davidson and Freudenburg (1996) suggest that women tend to express greater concern than do men about the health and safety implications of any given level of technological risk. Greenberg and Schneider (1995) also found greater female than male concerns about local technological, behavioral and land use hazards in good neighborhoods, but there was no gender difference in stressed neighborhoods.

In the present study we found that the levels of concern were relatively similar among men and women. There were significant gender differences for environmental problems that ranked lower overall (i.e., ozone, pesticides, and high tension power lines). In all cases, females ranked these higher than did men, corroborating previous studies. Similarly, females were more concerned than men about the effect of SRS on property values.

In some respects, the lack of gender differences for many aspects of recreational rates, preferences for federal funding and future land use, and concerns at SRS are interesting because these results differ from general observations elsewhere (Flynn *et al.*, 1994). We attribute these differences to the general relevance of the questions asked on this survey. Most of the questions dealt with issues that directly affected

people living close to SRS; most of the people interviewed, or a close relative, were employed by SRS, and would be affected by economic changes in the community caused by loss of jobs at SRS.

4.3. Differences as a function of employment history

The null hypotheses of no differences in recreational rates, federal funding preferences, future land use preferences, or concerns at SRS as a function of employment history were rejected for some aspects of each (Table II). In general, however, there were few differences with respect to recreational rates, but there were differences related to funding, future land use, and overall concerns. The differences can largely be explained by the following: 1) people who work at SRS think that the federal government should spend funds to clean up all nuclear facilities, and they think that less money should be spent on other environmental problems than did non-employees, 2) people who work at SRS ranked current uses of SRS higher than did people who never worked at SRS, and 3) people who work at SRS are less concerned about any storage of nuclear material or accidents at the site than are people who never worked at the site. Overall, these conclusions suggest that people working at the site want to keep the *status quo*, continue spending money on clean-up of DOE sites, and are less worried about potential problems with accidents or spills on site than are people who never worked for SRS.

Although everyone ranked loss of jobs as the primary concern about SRS, the people who worked there clearly recognized the connection between continued clean-up activities on site and jobs. People working at SRS ranked all current usages high, and ranked additional future uses higher than non-employees, suggesting that employees emphasize a connection between increased use of SRS and jobs. Given their concern for jobs and continuation of the *status quo*, it is remarkable that employees ranked storage of nuclear material (both current and additional) and spills so high as a concern. The employees of SRS, and to a lesser extent all the people interviewed in this survey, may be making a tradeoff between their direct social or economic benefit and the technological risk (Starr, 1969). Additionally, people may be exhibiting optimistic biases about their personal risks (Weinstein *et al.*, 1988; Weinstein, 1989).

Kadvany (1995) made a distinction between ranking risks and ranking the solutions to risk problems. In the context of our data from interviewing people living near SRS, we suggest that people rank nuclear production and accidents as a significant risk, but they rank cleaning up SRS or increased nuclear production activity as a solution to the risk of job loss or decreases in the local economy (even if they themselves do not work for SRS). The risks from loss of jobs, or declines in the local economy, are more immediate and clearer risks, while the potential for nuclear accidents or spills is more distant and uncertain, particularly since there is no local history of such accidents. Thus, it may not be inconsistent to rank concerns

about nuclear activity and spills high and to rank nuclear activity as a preferred future land use.

The overall concern with storage of nuclear waste, whether current waste or waste brought in from elsewhere, shows up as an important worry for most people in the nation (Slovic *et al.*, 1979). The transport of radioactive waste through local communities engenders even more concern, and the concern often is focused around the lack of trust of DOEs performance (Binney *et al.*, 1996), despite the fact that DOE transported nuclear weapons components among sites for many years. The lack of public trust is not limited to DOE, but also extends to the Superfund program (Mitchell, 1992).

4.4. Comparisons with other South Carolina populations

Our initial objective in conducting this study was to determine whether there were differences in attitudes and perceptions as a function of residence for people living in the same state with a large, contaminated, Department of Energy facility. The question of spatial scale is just as important when considering attitudes and perceptions as it is when examining the risks themselves. Just as the scale for risk analysis can be so large that it misses crucial aspects of local variation (Jasanoff, 1993), so too can perception analysis miss critical aspects if the scale is too large. It is for this reason that we initially designed our overall study to include both local residents around SRS and the population at large in South Carolina.

One of our initial assumptions was that environmental attitudes and perceptions would be incorporated into the valuation of future land use for SRS. Considerable attention has been devoted to future land use on the Department of Energy sites, both across the complex, and at individual sites (NRC, 1995; DOE, 1996). This process has involved stakeholders at every level (DOE, 1996), although it is unclear whether recreational rates and attitudes of specific recreational groups were taken into account.

Research with all the populations examined in South Carolina (Burger *et al.*, 1997; Burger, 1997, in press, this study) indicates that recreational rates are higher than the 14-day recreational rate assumption in the Department of Energy's future use report (DOE, 1996). The rates for people living in the vicinity of SRS, taken from this survey, were higher for both photography and fishing, suggesting that if SRS opens land for these uses, the exposure assumption they use will underestimate potential use.

We compared attitudes about future land use of the general population (people interviewed at a Mayfest in Columbia, SC) to people living close to SRS (Figure 1). The general public ranked NERP the highest, followed by hiking, camping, preserve only, hunting, nuclear production, factories, housing, and storage of nuclear waste (with the lowest ranking, Burger *et al.*, 1997). People living adjacent to the site ranked NERP, hiking, camping, and housing similarly, but ranked preserve only, lower. They also ranked nuclear production, fishing and hunting, factories,

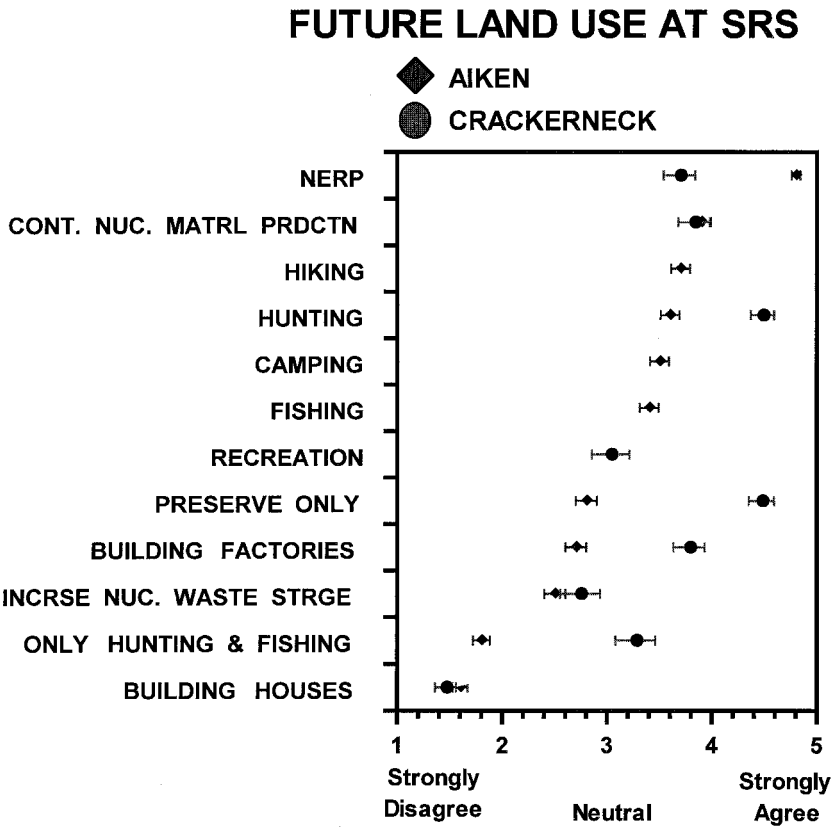

Figure 2. Comparison of future land use preferences of people interviewed at the Aiken Trials with men who actually hunted and fished on SRS in the Crackerneck area.

and storage of nuclear waste higher than did the general public. Thus, people living near the site ranked the current uses higher than did the general public, and ranked making it a preserve, which would limit other multiple uses, lower.

These data indicate that people living close to SRS consider that there could be more expanded industrial and nuclear usage at SRS, while those living farther away in the state see the recreational and conservation potential of the SRS lands as attractive. Partly this can be explained by perceived risk; any spills or accidents at the site would be most likely to affect the surrounding community, as would the creation of additional industry or nuclear usage. People living farther away would be less affected by the creation of jobs or by small nuclear mishaps, but would be positively affected by the creation of recreational facilities (such as hiking and camping) that they could use.

We also compared the sample interviewed at Aiken with men who actually used the SRS site for hunting and fishing (Sanchez and Burger, in press, Figure 2). Overall, the future land use preferences for these two populations were remark-

ably similar with five exceptions. People who actually hunted and fished on the Crackerneck section of SRS ranked hunting, preserving the site, building factories, and using only for hunting and fishing higher than did the population living around SRS, and they ranked a NERP lower. These differences partly reflect the desire of the users to maintain SRS at a *status quo*, with hunting and fishing being the primary external land uses. Thus, except for the importance of hunting and fishing, the user population held similar preferences for future land use to the population sampled at the Aiken horse show.

4.5. CONCLUSIONS

Taken altogether, our study shows that there are differences in perceptions about preferences for federal funding, future land use, and overall concerns as a function of distance from the Savannah River Site. People living directly around the site are more interested in expanding the activities that would have a direct economic impact locally (increasing nuclear production and storage, increasing industry), while those living farther away are interested in increasing recreational usage on site. People who live some distance from the site presumably would not derive much direct economic benefit, since they do not work at the site nor provide services for people who do. However, they could drive to the site to hunt, hike, or camp.

Even within the local population there are differences as a function of employment, with people who work (or worked) at SRS being less concerned about the dangers from nuclear activities and more in favor of spending federal dollars to clean up DOE sites, with the emphasis on jobs rather than risk reduction. Their lack of concern for the dangers of nuclear activities may be due to familiarity, and the knowledge that they have worked there for many years without apparent problems. Our data can largely be explained by personal interest in the benefits and risks rather than in general environmental concerns.

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