

Risk Concerns, Land Use, Stewardship, and the Idaho National Engineering and Environmental Laboratory: Attitudes of the Shoshone–Bannock and Other American Indians

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This paper examines the attitudes and perceptions of 277 American Indians about hunting and fishing, risk, and future land use of the Idaho National Engineering and Environmental Laboratory (INEEL) in southeastern Idaho. Nearly half of our sample were Shoshone–Bannock tribal members living on the nearby Fort Hall Reservation, and half were American Indians from elsewhere in the western United States. We also interviewed an additional 44 White people. We examine the hypothesis that there are differences in environmental concerns and attitudes toward future land use at INEEL as a function of tribal affiliation (ethnicity), educational level, gender, and age. Such perceptions are important because of the existence of tribal treaties that govern the legal and cultural rights of the Shoshone–Bannock. Returning INEEL to the Shoshone–Bannock Tribes, hunting, fishing, camping, hiking, and a National Environmental Research Park ranked as the highest preferred future land uses, whereas continuing nuclear materials reprocessing and increasing the storage of nuclear wastes ranked as the lowest. There were tribal differences in land use preferences, with those of the Fort Hall Indians being more similar to those of the local Whites than to other American Indians. All groups ranked storage of nuclear material, storage of additional nuclear material, and spills and accidents as the most serious of a list of concerns provided about the site. Fort Hall Indians answered an open-ended question with concerns for population levels and migration routes of game animals and other wildlife, more than hunting and human health. The Shoshone–Bannock from Fort Hall showed an environmental sensitivity for the well-being of wildlife and the health of the ecosystem and were interested in long-term stewardship, in addition to

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INTRODUCTION

Conservation focus is shifting from single-species management to ecosystem management on many public lands. Ecosystem management, rather than management for specific threatened or hunted species, requires the effective incorporation of people's viewpoints into management plans (Jacobson and Marynowski, 1997). Humans are central components of ecosystem management, and human values guide both the protection of ecosystem integrity (Grumbine, 1994) and the future land use (Burger *et al.*, 1997). Ecosystem management schemes should integrate planning, research, public involvement, and a range of management options into the decision-making process (Slocombe, 1993), and this is possible only with knowledge about public attitudes and values. Knowledge about perceptions and attitudes is particularly crucial when agencies are expanding or changing their management directions (Jacobson and Marynowski, 1997) and when there are differences in attitudes and perceptions among affected groups of people.

The Department of Energy (DOE), with facilities in 34 states, holds vast quantities of land that were used for national security missions, notably nuclear weapons production. With the ending of the Cold

War, the DOE has devoted considerable attention both to its future mission and to future land use on its sites (DOE, 1996). In addition, the DOE must remediate huge quantities of chemical and radioactive wastes. Its facilities are in various stages of cleanup (DOE, 1995), and the costs, worker and public safety risks, and ecological risks are enormous (Grumbly, 1996). Involving stakeholders in every level of decision making concerning cleanup at the Department of Energy is critical (NRC, 1993, 1995). Knowledge of the various stakeholder attitudes and values is a necessary step to forging agreements among diverse groups of people about land use and resource management (Grumbine, 1994; Commission on Risk Assessment, 1996), as well as the wise stewardship of these lands.

In this paper we examine the attitudes and perceptions of American Indians about environmental concerns, risk, and future land use of the Idaho National Engineering and Environmental Laboratory (INEEL), based on interviews conducted at an annual festival or "pow wow" at the Fort Hall Reservation in southeastern Idaho. We use the term "American Indians" throughout because people that we interviewed at the festival expressed a preference for this term rather than "Native American." Nearly half of our sample were Shoshone-Bannock tribal members living on the Fort Hall Reservation, half were from elsewhere in the United States west of the Mississippi, and a small sample identified themselves as Whites. Hereafter we use Ft. Hall for Fort Hall. The closest borders of the Shoshone-Bannock Reservation and INEEL are about 37 km apart. Lands of the site were part of the aboriginal homelands of the Shoshone and Bannock Peoples. We test the hypothesis that there are differences in concerns about INEEL, risk, and future land use related to tribal affiliation, educational level, gender, and age. Information on the perceptions and attitudes of the Shoshone-Bannock are important because of tribal treaties that affect cultural rights and land use of INEEL. Information on perceptions of the Shoshone-Bannock are particularly necessary because of commitments made by DOE obligating the federal department to "avoid endangering the Tribes environment" (Working Agreement between the Shoshone-Bannock and DOE-ID, 1992). This agreement defines the interactions between the INEEL and the Shoshone-Bannock. There are some sacred and religious lands of the Shoshone-Bannock that are within the boundaries of INEEL, and the Shoshone-Bannock are interested in access and preservation of these sites and in the stewardship of their "ancestral" lands.

Many risk communication scientists have noted that people's attitudes and judgments about environmental hazards are influenced by their experiences and values (Lowrance, 1976; Slovic *et al.*, 1979; Slovic, 1987; Barke and Jenkins-Smith, 1993). Perceptions are correlated with factors such as age, gender, and ethnicity, as well as trust and optimism (Taylor, 1989; Stern *et al.*, 1993; Flynn *et al.*, 1994; Arp and Kenny, 1996). One of the conceptual issues relevant to many studies of perceptions and behavior is that it is difficult to separate the effects of ethnicity, economic status, and education because of inter-correlations and a failure to obtain information on all three aspects from subjects. Recently Burger *et al.* (1999a) examined risk perceptions and fishing in urban New Jersey and found that some of the variations in responses were accounted for by both ethnicity and income. In a study of fishing behavior in South Carolina, all three factors accounted for some of the variations (Burger *et al.*, 1996b). The relationships were similar for blacks and whites, but the curves were displaced.

Although researchers have devoted considerable attention to examining differences as a function of gender and race (Carney, 1971; Bullard and Wright, 1986; Pillisuk and Acredolo, 1988; Steger and White, 1989; Slovic *et al.*, 1989, 1995; DeJoy, 1992; Gutteling and Wiegman, 1993; Spigner *et al.*, 1993; Stern *et al.*, 1993), most of these studies have dealt with White versus Black, or White versus Non-White, and have not included American Indians. Environmentalists have embraced America's native peoples, believing that the American Indians traditionally lived in harmony with nature (Callicott, 1989; Huffman, 1992) and can provide lessons for the wider culture. Some authors have proposed that these views derive from the bison hunt, especially for the Shoshone-Bannock (Murphy and Murphy, 1960). Yet, American Indians are not one people with one way of relating to nature. Conflicts over ecological services and land use occur, both among groups of American Indians and between Indians and others (Smaby, 1975; Huffman, 1992). There is a recent trend to examine the ecological views of the American Indians by asking for their point of view. This perspective has been shown to differ substantially from that of white males (Zinn, 1995).

Located on 2308 km² of federally owned and administered land on the upper Snake River Plain, the INEEL was established in 1949 as an isolated facility at which to build, test, and perfect nuclear reactors. Because the INEEL's roads and facilities occupy only about 6% of the land area, the restricted-access site represents an important example

of the sagebrush-steppe biome (DOE, 1994). The ecological importance of the site was recognized by DOE when it was declared a National Environmental Research Park (NERP) in 1975. About 8000 people are employed at the INEEL. Lands immediately beyond the boundaries of the INEEL are desert, foothills, or agricultural fields. Livestock grazing is allowed on the peripheral 60% of the INEEL, away from the major facilities that are centrally located. Most of the nearby farming is concentrated northeast of the INEEL. Larger areas of agricultural land are farmed adjacent to the Snake River, but these regions are more distant from the INEEL (Mitchell *et al.*, 1997). Along the Snake River to the southeast of INEEL is the Ft. Hall Indian

Reservation, with a land area of about 2200 km². The reservation was established by a 1867 Presidential Executive Order and was confirmed by the Fort Bridger Treaty of 1868. The population of the Ft. Hall Reservation is 2932: the Shoshone-Bannock Tribe membership numbers 4118 (Shoshone-Bannock Tribal Enrollment Office, pers. commun., Dec. 4, 1997).

METHODS

We interviewed 321 attendees at the 34th Annual Shoshone-Bannock Indian Festival in Ft. Hall, Idaho (August 7–10, 1997; Fig. 1). This pow-wow was attended by about 8000 people from Idaho and

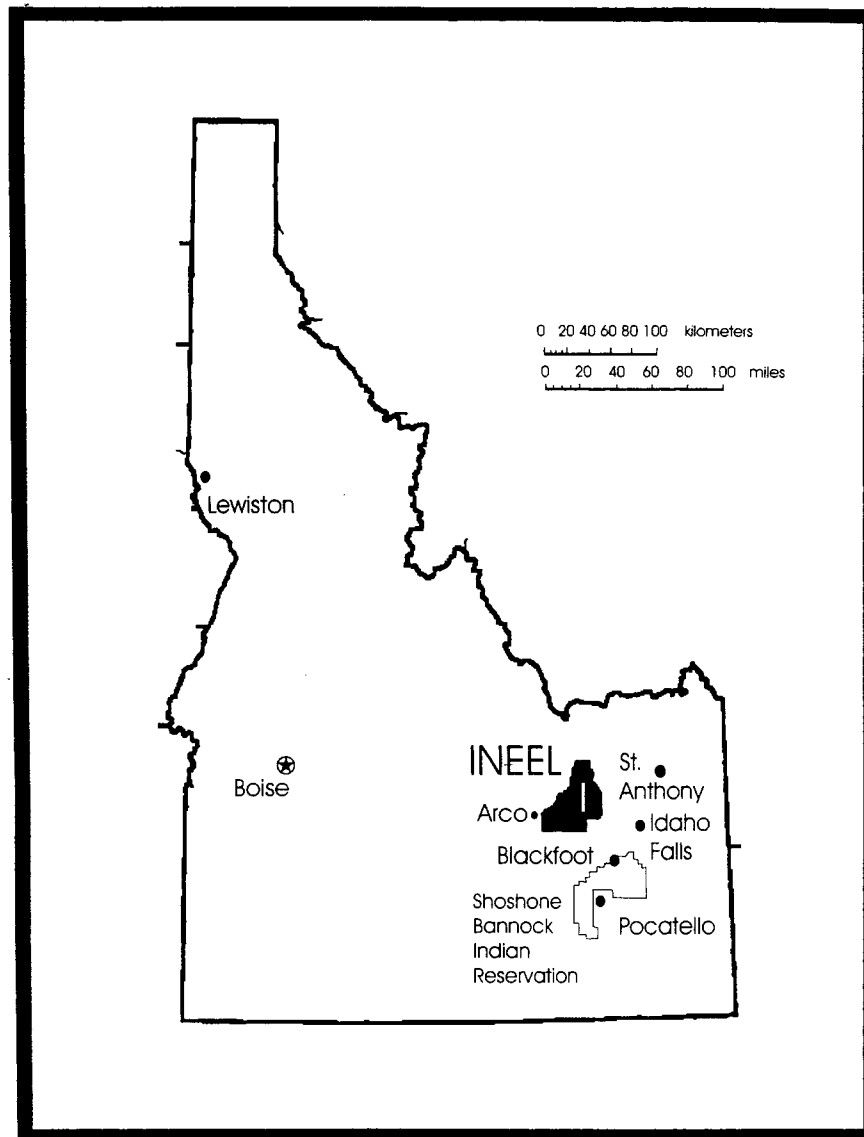


FIG. 1. Map of Idaho showing the location of INEEL and the Shoshone-Bannock Reservation at Fort Hall.

elsewhere throughout the western United States and featured events such as dancing, drumming, rodeo, and pony races.

Our survey design was modeled after the Total Design Method (Dillman, 1978) and followed Frey and Oishi (1995). Interviews were structured using an instrument of 85 questions which was administered by trained interviewers, who had participated in six previous events using the same instrument. Phrases used to introduce the survey and answer questions about the survey were the same for all interviewers. Following Frey and Oishi's (1995) suggestions for lessening the fatigue effect, a flash card was used for the 47 Likert scale items, for which there were five possible responses. For key response variables there were no significant differences as a function of interviewer (ANOVA, $P > 0.10$).

At this event, adults were approached while they waited and watched events, ate meals, and visited in small groups. After interviewing the first person, we walked for 1 min before approaching the next person within 1 m of our transect. We made transects back and forth over the entire pow-wow area to ensure that people in all areas had an equal chance of being interviewed. As many festival-goers were camping at the festival site, interviews took place throughout the day and evening. Following an introductory explanation that we were from Rutgers University and interested in recreational rates and land use preferences, only eight people refused to be interviewed. Four of these said that no one would listen to their views anyway.

Though this study is based on a convenience sample, we have no reason to believe that it was not representative of those attending the festival because we selected subjects randomly, using a transect approach that included the whole pow-wow area, and we sampled at all times of the day. However, caution should be used in generalizing our findings to larger populations of American Indians or Idaho residents because people who attend such a festival might not be representative of the entire population. However, the population of Ft. Hall is 2932, and we were told by the tribal police that nearly the entire population attends this pow-wow, making our sample of Ft. Hall residents likely to be representative (Shoshone-Bannock Tribal Enrollment Office, pers. commun., Dec. 4, 1997). Further, 50% of the people living at Ft. Hall are men, compared to 51% for our sample.

Our questionnaire consisted of five sections dealing with recreational activities, views of how INEEL land should be used in the future, future use of

federal funds on selected environmental problems, concerns specific to the INEEL, and demography. Recreational and demographic data were recorded using whole numbers and place names, whereas land use preferences, environmental problems, use of federal funds, and concerns about the INEEL were collected on Likert scales (1 = never, strongly disagree, or no concern; 5 = definitely, strongly agree, or most concern). Two open-ended questions were used as transitions between more structured sections. The first asked how INEEL land should be used if returned to tribal ownership; the second asked what the most important impact of the INEEL was to the respondent. We did not ask subjects about income because on previous surveys people were reluctant to answer this question; we use education and present employment as a partial surrogate, recognizing that income information would perhaps have been more valuable.

The questionnaire, except for exchange of locational information, was the same as that used at four events in South Carolina near the Savannah River Site (SRS; Burger *et al.*, 1997) and at four other events in Idaho. In other places where we used this survey instrument, an interview usually required about 15 min to complete; at the Shoshone-Bannock Festival an interview often required 30 min because of their apparent interest and deliberation in answering our questions and their willingness to volunteer information. The interviewers, however, did not provide any information about the objectives of the survey until after all questions had been answered.

We analyzed the data by blocking our sample into three groups: American Indians living at the Ft. Hall Reservation, all other American Indians, and Whites. We were particularly interested in the views of the Shoshone-Bannock living at Ft. Hall because the lands of the INEEL are still considered as part of the tribes' homeland, and thus they have a clear stake in both the ecological resources of the INEEL and future land use decisions concerning this DOE site.

The resultant three groups were compared using Wilcoxon χ^2 tests to determine whether there were differences among variables as a function of these ethnicity/location of residence classifications. Further, ANOVA tests and a Duncan multiple range test determined differences between them (SAS, 1988). We used these same procedures to examine whether there were gender and age differences within the American Indians (both Ft. Hall and others). We use $P < 0.05$ as the acceptable level of significance.

RESULTS

Although 40% of the people interviewed were American Indians living on the Ft. Hall Reservation (who identified themselves mostly as Shoshone, Bannock, or Shoshone-Bannock, often verbally abbreviated as Sho-Ban), our sample also included 46% American Indians from other areas (hereafter referred to as Other American Indians) and 14% White Americans. We blocked the data by Ft. Hall Indians, Other American Indians, and White Americans. Other American Indians came primarily from the neighboring states of Utah, Nevada, Montana, and Washington, as well as from Arizona, New Mexico, and other western states. Only 6% had ever worked at INEEL.

There were significant ethnic differences in the mean age of those interviewed (Ft. Hall Indians, 39.7 ± 1.5 years; Other Indians, 36.6 ± 1.2 years; Whites, 45.4 ± 2.3 years; $\chi^2 = 10.7$, $P < 0.005$). For Bingham County as a whole (where Ft. Hall is located), 10% are over 65 years of age (U.S. Census data for 1990), compared to 8% of the Ft. Hall Indians interviewed in this study.

Advancement in school also varied significantly among the study populations (Ft. Hall Indians, 11.4 ± 0.3 years; Other Indians, 12.6 ± 0.2 years; Whites, 14.7 ± 0.5 years; $\chi^2 = 35.6$, $P < 0.0001$). While only 60% of Ft. Hall Indians graduated from high school, 81% of Other American Indians and 93% of Whites did; the percentage for Bingham county was 77% (U.S. Census data for 1990). The percentage of college graduates for Bingham County was 13.1% (U.S. Census data for 1990), compared to 13.5% for our sample from Ft. Hall. There were no gender differences in age or advancement in school among the three groups.

Attitudes toward Land Use at the Idaho National Engineering and Environmental Laboratory

Before asking people to rank future land uses, we asked them how they thought the INEEL land should be used, if it were given back to the Shoshone-Bannock Tribe. Of those Ft. Hall Indians that responded, 22% thought the land should be used for tribal activities (farming, grazing, burial grounds, let the Council decide), 52% thought it should be used for fish and wildlife, 11% thought INEEL should be cleaned up first, and the rest thought it should be used for recreation, camping, resorts, or even residential use, after cleanup (Table 1). The Council is the Tribes elected, governing body.

TABLE 1

Responses of Fort Hall Indians to the Open-Ended Question, "How Would Your Tribe Use INEEL Lands If They Were Returned?"

	Number giving this answer	Percentage of replies
Tribal affairs (22%)		
Farming or grazing	11	8
Let tribal council decide	10	7
Bingo/casino	4	3
Recreational/cultural center	4	3
Burial grounds	1	1
Game and wildlife issues (52%)		
Animal reserve	35	26
Leave as is for a preserve	8	6
Open for elk, deer, and buffalo migrations	7	5
For hunting	20	15
Clean up first (11%)	15	11
Other (16%)		
Recreation	7	5
Camping	3	2
Resort	3	2
Residential	8	6
	Total 136	Total 100

We then asked people to rank specific future land uses. Overall, American Indians who attended the Shoshone-Bannock Festival ranked returning the land to the tribe as the preferred land use, followed closely by hunting and maintenance of the site as a National Environmental Research Park. Lowest preferred land uses were continuing nuclear materials reprocessing and increasing storage of nuclear waste (Fig. 2).

There were significant differences in attitudes toward land use of INEEL (Table 2). For many recreational activities (fishing, camping, and hiking) and for growing crops, the Ft. Hall Indians ranked them similarly to the Whites (who all lived in the area of INEEL). For others, such as returning the land to be tribes, and continuing nuclear reprocessing, the Ft. Hall Indians and Other Indians held similar views (Table 2). The relatively low ranking of building factories and increasing nuclear storage was shared by all groups.

For American Indians, there were few gender differences in rankings of future land use, although some approached significance. Women ranked building houses higher ($\bar{X} = 2.3 \pm 0.1$) than did men ($\bar{X} = 1.9 \pm 0.1$) ($\chi^2 = 3.6$, $P < 0.06$), and women ranked increasing storage of nuclear waste lower ($\bar{X} = 1.1 \pm 0.0$) than did men ($\bar{X} = 1.3 \pm 0.1$) ($\chi^2 = 3.4$, $P < 0.06$; both Ft. Hall and Others combined).

*Attitudes and Perceptions of Problems and Risks
at the Idaho National Engineering and
Environmental Laboratory*

We asked people whether they had any concerns about INEEL, and if so, what they were (Table 3). This was an open-ended question, and all concerns elicited were recorded; any given person might give more than one concern. The greatest number of concerns voiced by the Ft. Hall Indians related to contamination of land, water, and air, with concerns for the well-being of game and other wildlife ranking second. Concerns for human health were the third most common. Fourteen percent of the Ft. Hall Indians mentioned concerns for disrupted migration routes; these concerns were voiced by older members of the tribe (mean age of 53 years compared to a mean age of 39 years for all those interviewed). Other American Indians were most concerned about contamination of land, water, and air, followed by "no concerns regarding INEEL" (Table 3). For both groups of Indians, concerns about jobs or other direct economic considerations ranked very low.

When then asked to rank specific concerns, respondents said storage of current nuclear material, storage of additional material, and accidents or spills on site were most on their minds. They were least concerned about changes in property values (Fig. 3). There were significant ethnic differences in the ranking of loss of jobs, loss of hunting and recreational opportunities, and eating the game from INEEL (Table 4). Whites and Other American Indians were significantly more concerned about jobs than were Ft. Hall Indians, whereas all Indians were more concerned about loss of hunting and recreational opportunities and about eating the game from INEEL than were Whites.

There were no significant gender differences in the ranking of concerns about INEEL by American Indians (Ft. Hall Indians, Other American Indians, all Indians combined).

DISCUSSION

Methodological Considerations

One qualitative aspect of our interviewing was particularly noticeable: the American Indians interviewed in this survey were more deliberate in their replies, volunteered more information, and took longer to answer the questions than others that we have interviewed using the same survey instrument (Burger *et al.*, 1997; Burger 1997, 1998), even though the questions were framed in the same way. Further, they asked more questions about why we wanted to

know and how the information would be used, although the answers to these questions were deferred until the end of the interview. Individual interviews took longer than with other groups.

Another difference between this particular event and others where we have conducted these interviews was in the distance that some people had traveled to attend. Although 40% lived on the Ft. Hall reservation, and the Whites all lived in the general vicinity, the Other American Indians had driven from as far away as Arizona and New Mexico, although most were from adjoining states. Thus, whereas the Ft. Hall Indian population shared a common homeland (and presumably a common set of problems), the rest of our sample of American Indians did not. Finally, it was difficult to divide the sample cleanly by either geography or ethnicity because not all Ft. Hall Indians were Shoshone-Bannock, and not all Shoshone-Bannock lived on Ft. Hall Reservation. We divided our sample by Ft. Hall Indians and Other American Indians because those Indians living in Ft. Hall shared a common homeland and were equally close to INEEL. Further,

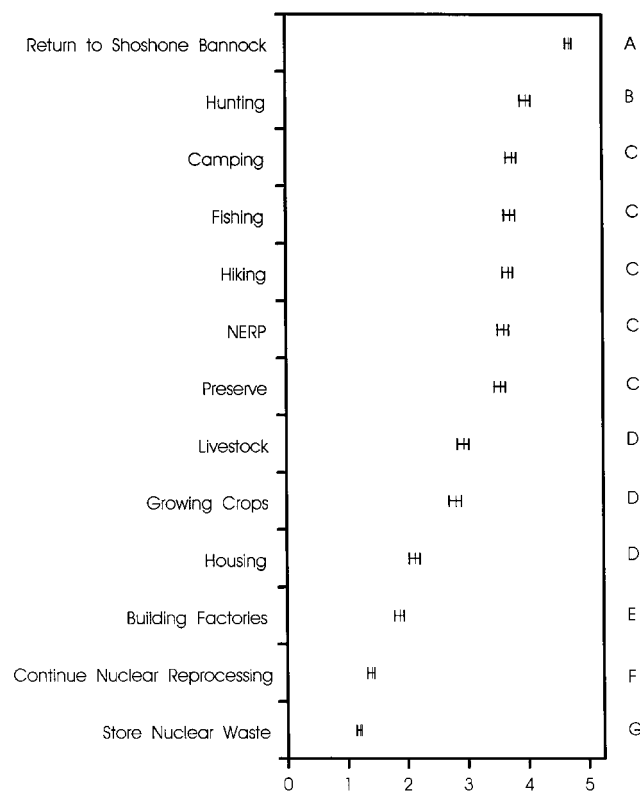


FIG. 2. Relative ranking of all people interviewed at the Shoshone-Bannock Festival with respect to future land use. Given are means \pm standard errors (letters at right indicate significant differences).

TABLE 2
Attitudes toward Future Land Use of INEEL

	Ft. Hall American Indians	Other American Indians	White ^a	Wilcoxon χ^2 (P)
Number of respondents	130	147	44	
Hunting	3.7 ± 0.1 (B)	4.2 ± 0.1 (A)	2.7 ± 0.2 (C)	32.6 (0.0001)
Fishing	3.3 ± 0.1 (B)	4.1 ± 0.1 (A)	2.8 ± 0.3 (B)	34.3 (0.0001)
Camping	3.4 ± 0.1 (B)	4.1 ± 0.1 (A)	3.1 ± 0.2 (B)	22.3 (0.0001)
Hiking	3.4 ± 0.1 (B)	3.9 ± 0.1 (A)	3.2 ± 0.2 (B)	14.0 (0.0009)
Building homes	1.7 ± 0.1 (B)	2.6 ± 0.1 (A)	2.1 ± 0.2 (B)	24.8 (0.0001)
Building factories	1.7 ± 0.1 (A)	2.0 ± 0.1 (A)	1.8 ± 0.2 (A)	NS
Grazing livestock	2.7 ± 0.1 (AB)	3.1 ± 0.1 (A)	2.3 ± 0.2 (B)	11.2 (0.004)
Growing crops	2.4 ± 0.1 (B)	3.2 ± 0.1 (A)	2.3 ± 0.2 (B)	24.0 (0.0001)
Returning to Shoshone-Bannock tribes	4.6 ± 0.1 (A)	4.8 ± 0.1 (A)	3.5 ± 0.3 (B)	41.5 (0.0001)
Continuing nuclear materials reprocessing National Environmental Research Park (NERP)	1.4 ± 0.1 (B)	1.3 ± 0.1 (B)	2.1 ± 0.2 (A)	18.6 (0.0001)
Perserve only	3.4 ± 0.1 (B)	3.8 ± 0.1 (AB)	4.2 ± 0.2 (A)	9.9 (0.007)
Increasing storage of nuclear waste	3.5 ± 0.1 (A)	3.5 ± 0.1 (A)	3.4 ± 0.2 (A)	NS
	1.1 ± 0.0 (A)	1.2 ± 0.1 (A)	1.2 ± 0.1 (A)	NS

Note. Given are means ± standard error. NS = not significant. Like letters are not significantly different when all three groups are considered (Duncan Multiple Range Test).

^aIncludes White and 5 Hispanics.

our sample of Whites was relatively small, but we felt that it was worth including since presumably it is a population that is likely to be interested in, and perhaps sympathetic to, the cultural needs of American Indians, as evidenced by their attendance. Moreover, many of the differences were highly significant, even with the small sample size of Whites.

Differences in Attitudes between Shoshone-Bannock at Ft. Hall and Other American Indians

Attitudes about future land use on INEEL were more similar between the Ft. Hall Indians and the Whites than between the Ft. Hall Indians and the Other American Indians. We attribute this similarity to Ft. Hall Indians and Whites being local residents familiar with the site. However, these two groups differed with respect to preferences placed on hunting, returning the land to the Shoshone-Bannock tribe, and a National Environmental Research Park. The differences in the ranking for hunting may relate to the relatively lower hunting rates of the Whites (U.S. Fish & Wildlife Service, 1996) compared to those of the Ft. Hall Indians (Burger, 1999). The reason for the lower ranking of Whites for returning the land to the Shoshone-Bannock is obvious: the Ft. Hall Indians (largely Shoshone-

Bannock) stand to gain considerably if it is given back to them, since they can use it. The reason for the difference in ranking for the National Environmental Research Park, however, is unclear. The Ft. Hall Indians often commented that the land should either be a preserve for wildlife (with no human use) or that only Indians should be allowed to go there.

These data clearly indicate that there is not unanimity in views of future land uses for INEEL among American Indians. Those that resided closer to a site (Ft. Hall residents) ranked most recreational land uses lower than did Other American Indians. Again, this partly relates to their expressed desire that INEEL be used for game, without even hunting, camping, or hiking on the site. The Ft. Hall Indians were interested in the long-term stewardship of the land and wildlife.

Future Stewardship: An Emphasis on Animals and the Ecosystem Compared to Human Health

Historical records indicate that there were abundant subsistence resources in the eastern Snake River plains in pre-Euro-settlement days (Reed *et al.*, 1987). These resources historically included bison, antelope, deer, moose, elk, and bighorn sheep, and many of these migrated through the plains. Early Shoshone-Bannock culture was nomadic as well (Steward, 1938). Apparently the American

TABLE 3

Responses of Fort Hall Indians and Other American Indians to an Open-Ended Questions Regarding Their Greatest Concerns about INEEL

	Fort Hall Indians	Other American Indians	Fisherman's Breakfast
Number of respondents	130	147	283
Don't have any		45 (32)	26 (9)
Game and wildlife	(33)		(<2)
Healthy populations of game	17 (13)		4 (1)
Loss of game	4 (3)		1 (<1)
Disruption of migration routes	19 (14)		
Contamination of game	4 (3)		
Contamination of land/water/air	(51)	(45)	(<23)
Air quality		3 (2)	1 (<1)
Groundwater contamination/leaching	16 (12)	11 (8)	10 (4)
Containment of chemicals/contamination	19 (14)	37 (27)	14 (5)
Nuclear waste buildup/storage	12 (9)	4 (3)	22 (8)
Cleaning up the site	12 (9)	5 (4)	10 (4)
Transport of chemicals through reservation	9 (7)	2 (1)	2* (<1)
Health and safety	(13)	(14)	(15)
Human health problems	9 (7)	6 (4)	8 (3)
Explosions/spills/accidents	8 (6)	12 (9)	28 (10)
Cancel/radiation		2 (1)	6 (2)
Economic	(2)	(3)	(32)
Economy			12 (4)
Jobs (few Indians work there)	3 (2)	4 (3)	78** (28)
Other	(<2)	(<6)	(<21)
Took our land	2 (1)	5 (4)	
Inept governor	1 (<1)		
Not enough research funds		1 (<1)	21 (7)
Too much money spent/inefficiency		2 (1)	23 (8)
Knowledge/education/public relations			11 (4)
Mission			4 (1)
Increased population in region			2 (<1)

Note. Given are number of replies (percentage of total). For comparison we present data on attendees at a Fisherman's Breakfast (whites). (Burger *et al.*, 2000).

*Or transportation generally.

^bLoss of jobs for this group.

Indians from the Ft. Hall region traveled north and east for bison (Steward, 1938), in the region of INEEL, and the acquisition of horses increased the distances that they traveled for game. There were bison near Ft. Hall until the mid-1800s (Schoolcraft, 1851), and Ft. Hall served as the traditional winter location for bison (Anderson *et al.*, 1996). Today, there is a bison herd of 200 on the Ft. Hall reservation.

Many of the American Indians interviewed at the Shoshone-Bannock Festival expressed concerns about the welfare of game, including contamination and disruption of migration routes. This concern came out most strongly on the open-ended questions (Tables 2 and 3). This type of concern was not expressed by a group of hunters surveyed around the

Savannah River Site, another DOE facility (Burger *et al.*, 1997; Sanchez and Burger, 1998), nor by other people in Idaho that were surveyed near INEEL, at St. Anthony, Boise, Idaho Falls, and Lewiston. For example, 30% of the people surveyed at a Fishermen's Breakfast at St. Anthony, Idaho listed jobs and economics as their greatest concerns, followed by human health concerns (11%; accidents, spills, health and cancer), and "we don't have any concerns" (10%; Burger *et al.*, 2000). People surveyed at the Fishermen's Breakfast (primarily White) lived distances from INEEL similar to those of the Ft. Hall Indians. People who attended the Fishermen's Breakfast entered the event by waiting in line to obtain breakfast; we interviewed every 8th-10th person in line during the entire event, thus assuring

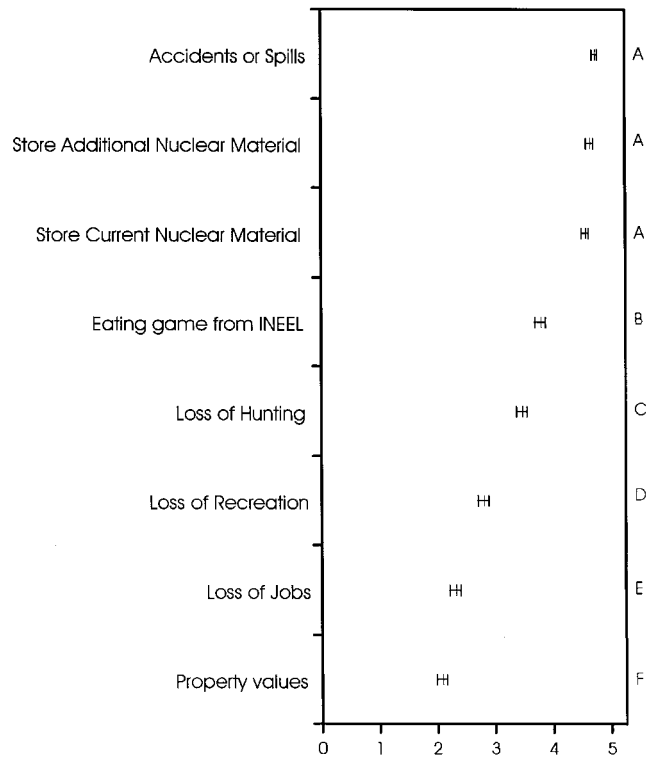


FIG. 3. Relative ranking of all people interviewed at the Shoshone-Bannock Festival with respect to their greatest concerns. Given are means \pm standard errors (letters at right indicate significant differences).

a representative sample of those attending. The Ft. Hall Indians expressed concern first for wildlife and game, whereas the people surveyed at the Fishermen's Breakfast were most concerned about jobs and human health. Thus, the Ft. Hall Indians showed a remarkably sophisticated environmental sensitivity for the well-being of the wildlife and the overall health of the ecosystem and for stewardship of the land, although they also expressed concern for human health.

The Ft. Hall Indian's expressions of concerns for wildlife and other components of the environment indicate a considerable degree of environmental sensitivity within the group. Many were concerned for the contamination of air, earth, and water, as well as for their own health. Environmental sensitivity, defined as empathy toward the entire environment (Hungerford and Volk, 1990), has been demonstrated to be the best indicator of environmentally responsible behavior (Sia *et al.*, 1985/1986) and is a necessary ingredient for successful stewardship. That this environmental sensitivity stands in contrast with the expressed concerns of non-Indians

highlights its potential as a source of friction in future land use discussions. A concern for the welfare of animals and for game populations has often been attributed to Native Americans (Huffman, 1992), but this concern is often for wildlife in general and not with respect to specific land use options.

Traditionally, American Indians viewed humans as caretakers of the environment that should coexist with animals, air, water, and plants (Cornell, 1994). This relationship dictates individual respect for the natural world. The Ft. Hall Indians worried about the health of the game on the site, as well as whether their migration routes were interrupted. In the former case, some people expressed the thought that the animals should be allowed to live there for many years, uninterrupted, until "their populations had recovered and they were free of contaminants." Whether the animals on INEEL are actually "contaminated" or not is a separate issue from the view expressed that they were contaminated. In our list of concerns, we had included eating game from INEEL, which addresses the problem of contamination from the perspective of human consumers, but we did not address contamination from the perspective of the animals themselves.

One of the interesting dichotomies of the research was the relatively high value that the Ft. Hall Indians placed on wildlife and migration routes and their worries about contamination, whereas only 11% felt that INEEL should be cleaned up completely. While these two concepts seem contradictory, within the context of ideas expressed, they are not. Many Ft. Hall Indians said that DOE should leave the land unoccupied for many years, and allow it to recover on its own. Some said that cleanup would disrupt the plants and animals living there and that if left alone, the animal populations would come back. Further, some Ft. Hall Indians said that highly contaminated areas on INEEL should be cleaned up, but that the whole site should not be cleaned up because it would destroy the land, and much of it would recover better on its own.

None of the concerns on our list embodied concern for population levels or migration routes of the game animals. Unprompted, many of the Ft. Hall Indians expressed the desire to allow populations to grow to their presettlement numbers without any hunting pressure. They were concerned not only for population levels of game but also about disruption of game migration routes. These are knowledge-based concerns which were not expressed with respect to INEEL either by the Other American Indians or by the White Americans attending the nearby Fishermen's Breakfast (Burger *et al.*, 2000). Since INEEL has

TABLE 4
Ranking Concerns about INEEL Where We Asked the Respondents about Specific Topics

	Ft. Hall American Indians	Other American Indians	White ^a	Wilcoxon χ^2 (P)
Number of respondents	130	147	44	
Loss of jobs	2.1 ± 0.1 (B)	2.5 ± 0.1 (A)	2.6 ± 0.2 (A)	7.3 (0.03)
Loss of hunting opportunities	3.4 ± 0.1 (A)	3.5 ± 0.1 (A)	1.6 ± 0.2 (B)	52.5 (0.0001)
Loss of recreation opportunities	2.5 ± 0.1 (B)	3.1 ± 0.1 (A)	1.6 ± 0.2 (C)	32.8 (0.0001)
Eating game from INEEL	3.8 ± 0.1 (A)	3.8 ± 0.1 (A)	2.1 ± 0.2 (B)	38.7 (0.0001)
Changes in property values around site	2.0 ± 0.1 (A)	2.2 ± 0.1 (A)	2.0 ± 0.2 (A)	NS
Storage of current nuclear material	4.6 ± 0.1 (A)	4.5 ± 0.1 (A)	4.4 ± 0.1 (A)	NS
Storage of additional nuclear material	4.7 ± 0.1 (A)	4.6 ± 0.1 (A)	4.7 ± 0.1 (A)	NS
Accidents or spills at site	4.7 ± 0.1 (A)	4.7 ± 0.1 (A)	4.8 ± 0.1 (A)	NS

Note. Given are means ± standard error. Like letters are not significant when all three groups are considered (Duncan multiple range test). NS = not significant.

^aIncludes White and 5 Hispanics.

been owned by the government for about 50 years, the knowledge about disruption of migration routes of elk and bison must have been passed down from older Indians to the younger generations. In reality, however, the massive herds of bison disappeared in the west during the 1870s and 1880s (Cornell, 1994), largely due to Euro-American settlers (Zinn *et al.*, 1995). Moreover, INEEL causes less disruption of migration routes than the surrounding agricultural lands, and there are abundant herds on site.

Identification of Scale in Risk Concerns

Our list of potential concerns about INEEL included contamination, accidents and other health concerns, loss of jobs, and decreased property values. These effects are likely to be strongest adjacent to the site and to decrease with distance from the site. In other words, there is a dilution effect as one moves away from the site. Indeed, in a previous interview study with the same survey instrument, we showed that distance of residence from the Savannah River Site influenced concerns and environmental attitudes (Burger *et al.*, 1997).

This present study, however, identified an additional concern that is not influenced by distance from the site. The Ft. Hall Indians were concerned about disruption of the migration routes and health of the game herds (deer, antelope, bison). The ancestral migration routes of these game animals are large-scale spatial phenomena and are not as restricted in space as potential contamination and human health effects might be. This is an issue of scale

(Jasanoff, 1993). The disruption of game migrations as the concern of Ft. Hall Indians is also of interest because many different factors influence such disruptions in addition, to the presence of INEEL, including roads, urban and suburban development, and farming practices. Yet, INEEL is viewed as a vast expanse of land that “could” be deemed a preserve for the animals (“without government activities”). Surprisingly, even when people mentioned contamination, they often followed by saying they were concerned about contamination to game animals living there. The open-ended nature of the question that elicited this response proved to be important, because had we only asked about contamination, the interviewers would have related this to either groundwater or human concerns, whereas the Ft. Hall Indians were more often talking about contamination as it affected animal populations, supporting Jasanoff’s (1993) contention that context deeply influences interpretation.

The emphasis on game also indicates that, for the Ft. Hall Indians, concerns about INEEL involve long time scales, since they are harkening back to the 1700s and early 1800s when game, such as bison, still migrated across the Snake River Plain. Thus, this is an intergenerational issue, which leads to a greater perception of risk and harm (Gregory and Mendelsohn, 1993).

The concern for the health of game populations may be influenced in part because of Ft. Hall community views INEEL as having low benefit for them. Many people noted in passing that they ranked concerns for jobs low because “almost no Indians work there.” Concern for the animals living there,

however, translates into land use options that involve keeping the land wild (and many even thought there should not even be hunting by Indians for many years until the populations recovered). This view is in direct conflict with other land uses that would develop the land and reduce wildlife. Like most difficult ecological policy issues, land use decisions for public resources such as INEEL involve complexity, polarization, and winners and losers (Lackey, 1996). The Ft. Hall Indians are concerned that the game, and the sacred nature of the land itself, not be the losers.

Comparisons with Hunters

Similar interviews have been conducted with hunters and fishermen residing near another DOE Site in South Carolina (Burger *et al.*, 1997; Burger, 1997), and in many ways the recreational rates and future land use preferences of the Indians interviewed in Idaho are similar. Hunters and fishermen in South Carolina ranked a National Environmental Research Park and hunting the highest, and building houses and storage of nuclear material the lowest, as future land uses for SRS. The Ft. Hall Indians also ranked hunting and NERP as some of the highest future land uses (after returning the land to them) and ranked increased nuclear storage the lowest. NERPs were created on several of the larger DOE sites in the early 1970s to provide a means of examining the effects of radionuclides on ecosystem structure and function (DOE, 1994). The relative rankings of the Ft. Hall Indians were similar to those of the Other American Indians that lived considerable distances from INEEL. That there are similar views in sportsmen in South Carolina and the Ft. Hall Indians reflects their common interest in wildlife and hunting. For groups at both locations, the welfare of the wildlife was of interest in its own right, not just as the object of the hunt. This was particularly true for Ft. Hall Indians; many believed that the land should be a preserve where only the wildlife could live.

CONCLUSIONS

Over the long term, this study will assist land use planners and others in meeting the overall goals for Department of Energy lands through enhanced communication and information with different stakeholder groups. The land use question for governmental lands is of general interest because of the large number of government facilities where future land uses are now being debated. By under-

standing how different communities view both ecological services and future land use options, it is possible to begin conflict resolution that involves groups not otherwise included in the decision-making process through the usual institutional mechanisms.

The information from the other American Indians interviewed is the first information from the large sample of individual Indians, from a wide range of geographical areas, that demonstrates their preferences for future land use. It clearly indicates that they prefer that these lands be used for hunting, fishing, camping, hiking, and environmental research, rather than for industrial or residential purposes. Since DOE is considering future land uses for many of their sites (DOE, 1996), the data can be used to justify and help design refuges or management areas where there can be public recreation and consumptive activities. The data also suggest that stewardship on DOE lands should include a preservation and conservation of wildlife component.

The perceptions of the Ft. Hall Indians can be used to justify and establish wildlife management and recreational areas on INEEL, as well as preserves where the wildlife are undisturbed. Their interest in wildlife and migration routes indicates support for the maintenance of wildlife refuges on INEEL lands. The emphasis of the Ft. Hall Indians on disruption of migration routes and game habitat is an issue that has not been mentioned previously in interviews with other, primarily White, stakeholders.

The concerns of American Indians are especially important given the existence of DOE agreements with the Ft. Hall Indians with regard to land use and land stewardship, which make incorporation and deliberate consideration of perceptions of Ft. Hall Indians necessary for more satisfactory and equitable outcomes to land use questions on and around the INEEL. Finally, conflict resolution concerning future land use preferences can occur only if all the stakeholders' views have been clearly enunciated and documented. This research clearly documents differences in future land use preferences which must be accounted for in future DOE decisions.

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