

The Changing Role of Native Americans and Stakeholders in Decisions Concerning Nuclear Facilities - 9412

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ABSTRACT

For 15 years the Consortium for Risk Evaluation with Stakeholder Participation (CRESP) has been involved in providing technical and policy assistance to several Department of Energy Sites in the area of Environmental Management. CRESP is an independent consortium of Universities that includes the author's affiliations, as well as Oregon State University, Howard University, University of Pittsburgh, and New York University. Over this period of time, the role of a Native Americans and a range of stakeholders (including government, private and commercial interests) has changed from the provision of information to inclusion of different entities in both the development and the execution of the research that has led to closure of sites (Amchitka Island) or to facilitate the necessary steps to reach Records of Decision (RODs). Several models developed by CRESP have shown success, including 1) combining the assessment of perceptions and consumption patterns of fisherfolk with examination of mercury loads in fish to provide site-specific information that could lead to risk reduction and the creation of a fish fact sheet that informed those most at risk (Savannah River Site, Oak Ridge), 2) assessing perceptions of appropriate land use and recreational rates to address future land use (Savannah River Site, Idaho National Laboratory, Los Alamos National Laboratory, Brookhaven National Laboratory), 3) examining and evaluating perceptions of the communication process involved in remedial investigations, feasibility studies, and contaminant analysis during the process leading to development of RODs (Hanford), and 4) the development and execution of a science plan and a biomonitoring plan that led to closure of an underground nuclear testing site (Amchitka). In the latter case a wide range of stakeholders were actively involved in the development of ideas at each stage, including Aleut Native Americans who participated in the scientific expedition to collect specimens for radionuclide analysis. These examples are used to build a conceptual model for Native American and stakeholder inclusion beyond only communication to the process of obtaining the science necessary to answer risk-based questions relating to human health and the environment. This research was supported by the Department of Energy (DE-FC01-06EW07053).

INTRODUCTION

The public wants to be aware of both information and decisions regarding environmental protection, and more recently, the public and agencies have sought active participation in environmental concerns, issues, and decisions. While the public was recognizing its need for participating in decisions, governmental agencies were recognizing the need for a standardized and formal process for assessing environmental hazards and risks from chemicals. The National Research Council (NRC 1983) published a framework

for risk assessment, which was entirely science-based, was modified by different agencies, and was applied to ecosystems (NRC 1986, 1991, 1993). However, beyond development of the NRC reports, stakeholders were left out of the process.

The President's Commission (PCCRAM 1997) developed a paradigm that placed stakeholders in the center of a process that included risk assessment (science-based), and risk management. This led to an emphasis on stakeholder involvement in many agencies, although some agencies viewed stakeholder involvement as equaling communication to inform the public about the hazards and risks of environmental contamination, cleanup options, and management decisions. With time, many agencies have tried to involve stakeholders in the statement of problems, and in the decision-making process itself (Goldstein et al. 2000). There are many levels of stakeholder involvement.

Stakeholder involvement can be as limited as assessing public perceptions and attitudes about an environmental problem, such as the siting and storage of chemical plants, nuclear facilities, and waste disposal sites (Slovic 1987, 1993, Kunreuther et al. 1990, Slovic et al. 1991, Mitchell 1992, Flynn et al. 1994), or it can occur at nearly all stages of the assessment and decision-making process. While there are a number of theoretical approaches to identifying levels of community involvement (Arnstein 1969), there are few examples of how a range of stakeholders actually participates in a particular technical activity.

Several of the large DOE sites were built on lands that were traditional Native American hunting and fishing grounds, including the Yakama Indian nation, the Umatilla Tribe, the Wanapum, and the Nez Perce Tribe at the Hanford site in Washington, the Shoshone-Bannock at the Idaho National Laboratory, and the San Ildefonso, Jemez, Santa Clara, and Cochiti Pueblos on the Los Alamos National Laboratory (Arnon and Hill, 1979; Edelman, 1979; Lange, 1979; Burger et al., 2004), and their role in decisions about hazardous waste management at DOE sites is critical. In this paper we review some of the ways in which stakeholders can be involved in various aspects of the science and management of hazardous wastes, using Department of Energy (DOE) sites as case studies.

BACKGROUND ON CRESP'S INVOLVEMENT WITH DOE

The Consortium for Risk Evaluation with Stakeholder Participation (CRESP) is an independent consortium of Universities that includes the author's affiliations, as well as Oregon State University, Howard University, University of Pittsburgh, and New York University. CRESP consists of environmental, biological and social scientists, risk assessors, and public policy analysts that have been working together to address environmental and risk problems faced by the DOE. For 15 years CRESP has been involved in providing technical and policy assistance to several Department of Energy Sites in the area of Environmental Management and stakeholder involvement. CRESP was initially formed in response to a study by the National Academy of Sciences that indicated that DOE needed to engage an outside consortium of universities to help the agency deal with issues of cleanup, public perceptions, public trust, and decision making (Goldstein et al. 2000). It has evolved over the years to work with both DOE headquarters and the individual sites to address specific remediation technologies and issues, public perceptions and opinions, and risk assessments and evaluations, to evaluate particular programs or approaches, to provide advice when requested, and to conduct research relevant to the issues of hazardous waste management and the protection of human health and the environment (see www.CRESP.org).

CASE STUDIES

The case studies described below indicate the various ways that stakeholder involvement has evolved over the past two decades from a top-down DOE approach to one in which Native Americans and stakeholders are included in as many phases of the decision-making and execution of science (often characterization or assessment) or cleanup required for legacy wastes. They are arranged from less complex issues and problems to more complex and intertwined problems of human and environmental protection at DOE waste sites.

Science and Stakeholders Combine to Evaluate Risk to Fish Consumers

One of the main issues for many hazardous waste sites is the exposure of humans and eco-receptors to contaminants in fish. Mercury exposure through fish consumption has been an issue at Oak Ridge Reservation (Burger and Campbell 2004), Brookhaven National Laboratory (Burger and Gochfeld 2005), and at the Savannah River Site (Burger et al. 1999, 2001a, 2001b). At all three sites, the issues was not whether there was a hazard from mercury released as a function of site activities, but rather whether mercury was in the fish, whether people were exposed to mercury through fish consumption, and what action to take if there was a risk. Without involving stakeholders, including the general public, in some aspects of the process of assessment and decision-making led to confusion, and an inability to move forward with cleanup or resolution. The issue at each site differed, and therefore required different levels of involvement and collaboration.

At Oak Ridge Reservation (Tennessee) the issue was whether there were anglers at risk from mercury levels in fish, who was at risk, and whether the anglers were aware of the risk (Campbell et al. 2002, Burger and Campbell 2004). It was important to involve the public in assessing who was fishing, how much fish they ate, and whether this amount posed a risk to the anglers or their families. This is the least complex level of stakeholder involvement, since the problem was one of assessing fish consumption as a function of demographics.

At Brookhaven National Laboratory (on Long Island, New York), risk assessments conducted by state and federal agencies differed in their apparent conclusions regarding the risk of mercury exposure from fish consumption (Burger and Gochfeld 2005). The Peconic River flows through the laboratory, and people fish along its banks. DOE conducted its risk assessments based on composite risk of mercury from all exposures (not just fish consumption), and the State of New York conducted risk assessments of mercury exposure from fish consumption only, using criteria for levels of mercury currently in fish. In this case, while the public was naturally concerned about the discrepancies, and whether it was safe to eat the fish, the confusion resulted from different methods and objectives for risk assessment. DOE was interested in determining the need for remediation; the county was interested in having DOE accomplish the highest level of cleanup; and the State of New York focused on whether it needed to issue additional fish consumption advisories for the Peconic River. Thus, the solution was to clearly define the conditions, questions, and assumptions of each risk assessment, thus explaining the discrepancies in the conclusions. This example illustrates that the stakeholders for an issue include not only the agency (DOE in this case), but state and county agencies, as well as the general public.

At the Savannah River Site (in South Carolina), the issue was whether there was any risk from mercury to anglers who fished along or on the Savannah River, who was at risk, and what could be done about it (Burger et al. 1999, 2001a, 2001b, Burger and Waishwell 2001). The Savannah River flows between Georgia and South Carolina, and passes along the DOE's Savannah River Site (SRS). Indeed, SRS location was selected partly because of the availability of water for cooling the reactors. As a result of plant operations, mercury flowed into the Savannah River, and both states as well as the federal Environmental Protection Agency (EPA) were interested in the possible exposure of anglers to high levels of mercury in fish.

Of the three examples, the SRS was the most complex because the interested and affected stakeholders included DOE, the states of Georgia and South Carolina, the federal EPA, the Center for Disease Control in Atlanta, and anglers and their families. Thus the full range of possible stakeholders had to be included in the assessment and management process. The information required by all parties included: who was fishing, what were the consumption rates, did consumption rates vary by demographics, what were the mercury levels in fish, and was there any risk. If there was risk to anglers or their families, then a risk management strategy or appropriate cleanup was required.

CRESP's role was to conduct the necessary assessments of consumption patterns and contaminants in fish, and to examine the potential risk with full stakeholder involvement and collaboration at each stage. Stakeholders were involved in every phase from design and execution of the fish consumption

questionnaire, to collection of fish for analysis (Burger et al. 1999, 2001a, 2001b). An interview study showed that: 1) there were anglers fishing along the Savannah River, 2) fish consumption levels were relatively high and varied by ethnicity, 3) on average, blacks consumed more fish than previously assumed and were at greater risk than white anglers, 4) some fish consumers were eating sufficient quantities of fish to put them at risk, and 5) risk management was required. The EPA, DOE and states felt that the appropriate response was to manage fish consumption (rather than remediate Steel Creek), which led to the development of a Fish Fact Sheet (Burger et al. 2001a) to be distributed to anglers along the river, as well as at other locations. The development of the Fish Fact Sheet again involved the full range of stakeholders, and its usefulness and efficacy was examined for the people fishing along the river (Burger and Waishwell 2001). The involvement of the full range of stakeholders (state and federal agencies as well as DOE and anglers) led to a satisfactory solution that was more cost effective than large-scale remediation that might not have solved the problem.

Future Land Use, Public Perceptions and Exposure Rates

For DOE to move from clean-up to long-term stewardship, there must be a congruence between cleanup levels and future land use. While it is DOE's responsibility to develop a future land use plan for each site, and initial plans were published in a future land use document for many DOE sites (DOE 1994, 1996a), the process of relating cleanup levels to future land use should be an iterative process, whereby there are interactions between DOE, the tri-parties, and the public about suitable land use. That is, cleanup level should relate directly to how the land will be used in the future, which in turn should be related to how the states and other stakeholders wish to use the land. Thus, it is critical to understand the public's perceptions of how DOE land should be used generally, and for specific sites. For example, if the land is going to be used for industrial purposes, then cleanup levels do not need to meet residential standards. Thus, the stakeholder involvement in this case is in assessing public perceptions of suitable land use, which in turn can be used by DOE and other tri-parties to set cleanup levels.

Remarkably, there is general agreement among people living around four sites (Savannah River Site, Idaho National Laboratory, Los Alamos National Laboratory, and Brookhaven National Laboratory) that the preferred land use for DOE lands is to preserve the land, to use it for National Environmental Research Parks (DOE 1994), or to use it for recreation (Fig. 1, after Burger 2004). Although these data are from only four sites, they represent urban and rural sites (Brookhaven versus Los Alamos), large and small sites (Idaho National Laboratory versus Brookhaven), and different geographical regions. Given that there is a general preference for no public access or use (preservation) or low level use (recreational use), it suggests that DOE should consider these future land uses as priorities for some of their sites, which in turn requires less cleanup than to residential standards. The critical issue is, however, that local and regional stakeholders should be involved in examination of future use preferences for each site, and for specific regions of large sites (such as Idaho National Laboratory, Hanford, Savannah River, Oak Ridge, Los Alamos). While these sites have developed land use plans (e.g. DOE 1996a-c), these need to be updated periodically and should reflect a range of stakeholder values (especially Native Americans, state and federal agencies, and the public).

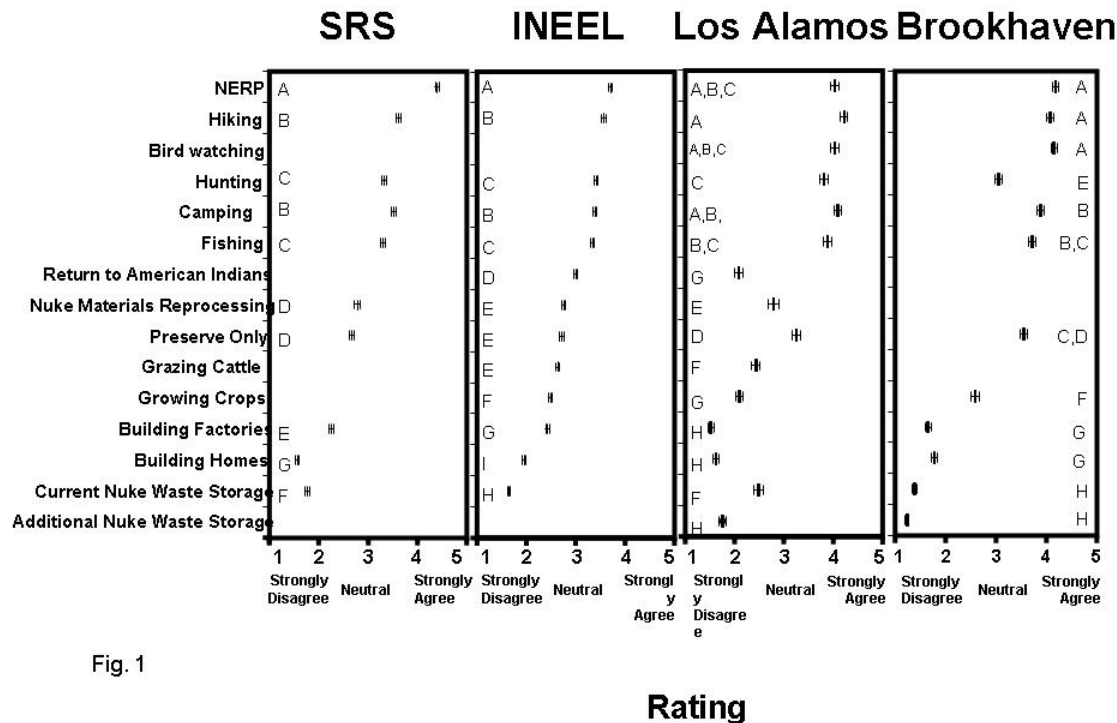


Fig. 1

Fig. 1. Relative ratings (1 = no preference; 5 = maximum preference) for future land use at four DOE sites (after Burger 2004).

Science Necessary for Cleanup

Cleanup decisions (codified in Records of Decision [ROD]) are between DOE and other Tri-Party signatories, but most state and federal agencies will not sign off on RODs if Native Americans and stakeholders (other non-TriParty entities and people) are in strong disagreement. Disagreement or discontent can derive from a lack of input during the cleanup decision process, which includes characterization and human/ecological risk assessment. The issue stakeholders are often most concerned about (in addition to future land use) is whether there is sufficient site characterization to perform essential human and ecological risk assessments, and therefore to make sound cleanup decisions. Whether sufficient science exists for complete site characterization and for performing risk assessments (both human and ecological) is often more contentious for large sites where both characterization and risk assessments are normally performed for operable units (or subsections of the site). Perhaps the most complex DOE site is the Hanford Site because it is large, adjacent to the Columbia River, and has a range of Native American Tribes (Warm Springs Tribe, Yakama Nation, Umatilla Confederated Tribes, Nez Perce Tribe), states (Washington, Oregon), organized advisory groups (such as the Hanford Advisory Board) and other stakeholders. More than 1.7 trillion gallons of liquid waste, radionuclides and hazardous chemicals were released to the ground at Hanford; some remain in the soil or groundwater, and others have reached the Columbia River (Department of Ecology 2008). About 60 % of the Nation's defense nuclear wastes is located at Hanford, mostly in underground tanks that have leaked or could leak (French 1999). Nine nuclear reactors and four reprocessing plants at Hanford produced about two-thirds of the plutonium used in the United States for defense purposes. The last reactor shut down in 1987, and the processing plant closed in 1990 (Zorpette 1996, Gephart 2002). This has produced

the greatest radioactive cleanup problem in the United States, creating the potential for contamination to “threaten the Columbia River” (GAO 2005). The geography of the contamination is complex; there is no complete characterization of the site; and risk assessments can therefore not be either complete or comprehensive.

Unlike the above examples, the Hanford Site poses many different and difficult integrative issues that include questions of adequate characterization, sufficient and comprehensive risk assessments, acceptance of future land use designations, and whether cleanup will be sufficient for tribal uses sanctioned by US Treaties (Nez Perce 2003). Hanford, and other DOE sites in the west such as Idaho National Laboratory and Los Alamos National Laboratory, have several neighboring tribes that hold a legitimate and Treaty-sanctioned rights to usual and accustomed hunting, fishing and other activities on these DOE lands. This requires that DOE involve and collaborate with the tribes, as well as with stakeholders, on developing sufficient science to address the basic issues of characterization, assessment and establishment of cleanup goals and future land uses. We suggest that DOE has an imperative to include Native Americans, EPA, Washington and Oregon, and other stakeholders in issues surrounding cleanup and long-term stewardship at Hanford. A first step in this process is identifying the major issues facing such a large and complex site (see Table 1). Each of these issues requires integration and iteration among DOE, the Tribes, regulators (EPA, Washington, Oregon), and other stakeholders.

Table I. Major Issues Facing Cleanup and Long-term Stewardship at the Hanford Site.

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1. Performing adequate characterization of the site (including site-wide analysis and present “inventory” of hazardous wastes)
 2. Relating the cleanup to adequate characterization
 3. Solving technical issues involved in cleanup and long-term storage of legacy wastes
 4. Integrating Tribal and regulatory/stakeholder mandates with cleanup and future land use
 5. Working within the Tri-Party framework to include appropriate Tribal and stakeholder input and collaboration
 6. Integrating the chronology of characterization and cleanup appropriately
 7. Developing a site-wide strategy for characterization, risk assessment and cleanup
 8. Integrating cleanup strategies with future land uses for specific units and for whole site.
 9. Establishing a framework for sustainable protectiveness through engineering, institutional controls, and long-term monitoring.
 10. Establishing sufficient monitoring, maintenance and response actions if there are failures
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Science Necessary for Closure

For some DOE sites surface cleanup is possible, but underground contamination either from groundwater or vadose plumes, or from underground detonations is not possible. In those cases DOE retains a long-term responsibility for the radionuclides and other contaminants that remain, which normally requires long-term institutional controls, and in some cases, monitoring. Amchitka Island provides an example where Native Americans and stakeholders played a key role in reaching closure.

Amchitka Island (in the Aleutian Chain of Alaska) was one of the islands traditionally inhabited by Aleuts, although they had abandoned the island before the decision to test nuclear weapons. In Alaska, Native rights come from several different authorizing acts and legislation, including the Alaska Native Claims Settlement Act (ANCSA), the Alaska National Interest Lands Conservation Act (ANILCA), the Venetie Decision, and the Constitution of the State of Alaska, among others. Although Amchitka is 280 km from the nearest Aleut community on Adak Island, the Aleuts consider the whole Aleutian Chain their home, partly because they travel freely among islands for employment, and to visit family and friends (Burger et al., 2007a-c).

The controversy that surrounded Amchitka increased when DOE's Environmental Management Office declared that the Amchitka remediation was complete, and announced its plans to "close" Amchitka (Greenpeace, 1996; Kohlhoff, 2002). DOE cleaned up the surface of Amchitka by traditional remediation methods, but the Aleuts, the State of Alaska, and the public were concerned about the possibility of subsurface transport of radionuclides from the three test cavities to the marine environment. The immediate concern was whether the subsistence foods of the Aleuts, as well as the commercial fish and shellfish from the island vicinity, were safe to eat (Burger et al. 2007a-c). The Aleuts who live in small villages on remote islands are largely dependent upon locally-derived plants and animals, and sometimes fish near Amchitka Island for halibut and other resources.

DOE asserted that there was no risk to people or the environment from the underground nuclear tests, based on a groundwater model which did predict future leakage at some uncertain time and a much-criticized draft human health risk assessment (DOE, 2002a, b). The Aleuts, the State of Alaska, and many stakeholders had little faith in the groundwater models, and less faith in the human health risk assessments because there were no site-specific data on either consumption patterns or radionuclide levels in subsistence foods, and ecological characterization of the marine environment was ignored or misrepresented. In short, DOE, the State of Alaska, the U. S. Fish & Wildlife Service (USFWS), the Aleutian Pribilof Island Association, Inc. (APIA), and other stakeholders disagreed with DOE about the path forward to closure (= no further action) of Amchitka Island. The parties disagreed contentiously, and were at an impasse.

DOE headquarters asked CRESP to develop a comprehensive Science Plan, in conjunction with ADEC, USFWS, APIA and DOE, that would provide the science basis for closure (Burger et al., 2005, 2006, 2007a-c; Powers et al. 2005). The mechanism was a letter of intent signed by DOE (as the responsible party), the State of Alaska, and the U.S Fish and Wildlife Service (as the landowner).

CRESP worked on a model of Aleut and stakeholder (regulators, natural resource trustees, the public) participation and collaboration at every stage in the process, from development of the Science Plan, to its execution and data analysis (Table 2, Burger 2007, Burger et al. 2005, 2007a,b, 2008, 2009). The process, which took from 2000 until 2005, resulted in consensus among previously contentions entities, and resulted in the transfer of Amchitka Island to the Office of Legacy Management, and the creation of a long-term biomonitoring plan (DOE 2008)

Table 2. Involvement and collaboration of Aleuts and stakeholders in developing the science necessary to reach closure of Amchitka Island in Alaska.(after Burger 2007, Burger et al. 2005, 2007a-c, 2008, 2009). The two expeditions were on two separate boats (2004) to collect subsistence and biological samples (expedition 1) and to collect commercial fish (expedition 2).

ACTIVITY	ALEUT or STAKEHOLDER	CONTRIBUTION
Develop a Path Forward (a public workshop)	Aleut/Pribilof Island Association (APIA) State of Alaska US Fish & Wildlife Service DOE The Public	At a public workshop, Aleuts and stakeholders presented their views in a public forum, allowing all parties to recognize differences and agree on a path forward (that additional characterization was necessary).
Development of Science Plan	APIA State of Alaska US Fish & Wildlife Service DOE	While CRESP wrote the basic Science Plan, directions and modifications came from all stakeholders in the form of written communications and a series of workshops
Refinement of the Science Plan	Aleut/Pribilof Island Association State of Alaska	After the Science Plan was approved by the signatories,

	US Fish & Wildlife Service	CRESP researchers visited several Aleut villages and the stakeholders to refine the protocol. This involved adding new Aleut subsistence species, selecting a reference site, and adding Aleut hunters and fishermen to the expedition
Biological Expedition 1	Aleut hunters/fishermen U.S. Fish & Wildlife Service	While on the expedition, changes were made to the collection protocol to add species (and eggs of species) that the Aleuts used for subsistence foods.
Biological Expedition 2	National Oceanographic and Atmospheric Administration (NOAA)	While on the expedition, changes were made to collect fish of interest to commercial fishermen, and to collect the size fish currently being caught by fishermen.
Biological preparation and radiological analysis	Aleut/Pribilof Island Association U.S. Fish & Wildlife Service State of Alaska DOE	All groups were involved in the initial and refined selection of biota to be analyzed, and in the radionuclides to be analyzed. Representatives from both APIA and the State of Alaska with high security clearance reviewed our choice of radionuclides for analysis
Data analysis and presentation	APIA, Aleuts and stakeholders	Once CRESP prepared a draft report, all results were presented in writing, on the web, and in public workshops to solicit additional ideas for analysis. CRESP scientists revisited the Aleut villages in the Aleutian Chain, and with each stakeholder group to solicit additional suggestions for analysis or interpretation. These meetings led to the suggestion that CRESP write a biomonitoring report, using the data generated.
Developing a biomonitoring plan	APIA, Aleuts and stakeholders	At the suggestion of APIA, Aleuts, and several of the stakeholders, CRESP developed a biomonitoring plan using criteria suggested by the Aleuts and stakeholders (such as

		importance as a subsistence or commercial food [Aleuts, commercial fishermen], important node on the food chain [state of Alaska, U.S. Fish & Wildlife Service], and concentrated key radionuclides [Aleuts and all stakeholders]
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CONCLUSIONS

We use these examples to illustrate the ways in which Native Americans and stakeholders can participate in, and fully collaborate with, DOE in arriving at decisions about cleanup and long-term stewardship that are cost-effective and that are acceptable to Native Americans and stakeholders in providing for long-term protection of humans and the environment. The level of Native American and stakeholder involvement, participation and collaboration varies with the specific problem, but in all cases, Native Americans and stakeholders should be involved early and often to arrive at effective long-term solutions to legacy waste management.

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REFERENCES

- ARNON N.S. and W.W. HILL, "Santa Clara Pueblo". In: Ortiz, A. (Ed.). Handbook of North American Indians: vol. 9. Southwest. Washington, DC: Smithsonian Institution Press, USA. pp 296-307 (1979).
- ARNSTEIN, S, "Eight rungs on the ladder of citizen participation." Am. Inst. Plann. J. 35:216-224 (1969).
- BURGER, J. "Recreational rates and future land use preferences for four Department of Energy Sites: Consistency despite demographic and geographic differences". Environ. Res. 95:215-223 (2004).
- BURGER, J. 2007, "A model for selecting bioindicators to monitor radionuclide concentrations using Amchitka Island in the Aleutians as a case study". Environ. Res. 105:316-323 (2007).
- BURGER, J., and K. R. CAMPBELL, "Species differences in contaminants in fish on and adjacent to the oak Ridge Reservation, Tennessee". Environ. Res. 96:145-155 (2004).

WM2009 Conference, March 1-5, 2009, Phoenix AZ

BURGER, J., and M. GOCHFELD, "The Peconic River: concerns associated with different risk evaluations for fish consumption. *J. Environ. Plan. Manage.* 48:789-808 (2005).

BURGER, J. and L. WAISHWELL, "Are we reaching the target audience? Evaluation of a fish fact sheet", *Sci. Total Environ.* 277:77-86 (2001).

BURGER, J., J. SANCHEZ, J. W. GIBBONS, T. BENSON, J. ONDROF, R. RAMOS, M. McMAHON, K. GAINES, C. LORD, M. FULMER and M. GOCHFELD, "Attitudes and perceptions about ecological resources and hazards of people living around the Savannah River Site. *Environ, Monit. Assess.* 195-211 (1999).

BURGER, J., M. GOCHFELD, C.W. POWERS, L. WAISHWELL, C. WARREN, and B.D. GOLDSTEIN, "Science, policy, stakeholders, and fish consumption advisories: developing a fish fact sheet for the Savannah River," *Environ. Manage.* 27:501-514 (2001a).

BURGER, J, GAINES, K.F. and M. GOCHFELD, "Ethnic differences in risk from mercury among Savannah River fishermen," *Risk Anal.*21:533-544 (2001b).

BURGER, J., M.A. CARLETTA, K. LOWRIE, K.T. MILLER and M. GREENBERG, "Assessing ecological resources for remediation and future land uses on contaminated lands," *Environ. Manage.*34:1-10 (2004).

BURGER, J., M. GOCHFELD, D. KOSSON, C. W. POWERS, B. FRIEDLANDER, D. EICHELBERGER, D. BARNES, L. K. DUFFY, S. JEWETT, and C.D. VOLZ. "Science, policy, and stakeholders: developing a consensus science plan for Amchitka Island, Aleutians, Alaska," *Environ. Manage.* 35:557-568 (2005).

BURGER J, H. MAYER, M. GREENBERG, C.W. POWERS, C.D. VOLZ, and M. GOCHFELD, "Conceptual site models as a tool in evaluating ecological health: the case of the Department of Energy's Amchitka Island nuclear test site," *J. Toxicol. Environ. Health* 69:1217-1238 (2006).

BURGER, J., M. GOCHFELD, D.S. KOSSON, and C. W. POWERS. 2007a. A biomonitoring plan for assessing potential radionuclide exposure using Amchitka Island in the Aleutian Chain of Alaska as a case study. *J. Environ. Radioact.* 98:315-328.

BURGER, J., M. GOCHFELD, C. W. POWERS, D. S. KOSSON, J. HALVERSON, G. SIEKANIEC, A. MORKILL, R. PATRICK and L. K. DUFFY, "Scientific research, stakeholders, and policy: continuing dialogue during research on radionuclides on Amchitka Island, Alaska. *Environ. Manage.* 85:232-244 (2007b).

BURGER, J., M. GOCHFELD, D. KOSSON, C.W. POWERS, B. FRIEDLANDER, M. STABIN, M. FAVRET, S. JEWETT, D. SNIGAROFF, R. SNIGAROFF, R. STAMM, T. WESTON, C. JEITNER,, And C. VOLZ, "Radionuclides in marine fishes and birds from Amchitka and Kiska Islands in the Aleutians: establishing a baseline," *Health Physics* 92:265-279 (2007c).

BURGER, J., M. GOCHFELD, K. PLETNIKOFF, ??? *Risk Anal.* (2008)

BURGER, J, M. GOCHFELD and K. PLETNIKOFF, "Collaboration versus communication: the Department of Energy's Amchitka Island and the Aleut community. *Sci. Total Environ.* in press (2009)

WM2009 Conference, March 1-5, 2009, Phoenix AZ

CAMPBELL, K.R., R.J. DICKEY, R. SEXTON, and J. BURGER, "Fishing along the Clinch River arm of Watt Bar Reservoir adjacent to the Oak Ridge Reservation, Tennessee: behavior, knowledge and risk perception," *Sci. Total. Environ.* 299:145-161 (2002).

Department of Ecology, Washington State."Cleaning Hanford's groundwater", Department of Ecology. Olympia WA (2008).

Department of Energy (DOE), "Stewards of national resources. Department of Energy (DOE/FM-0002), Washington D.C (1994).

Department of Energy (DOE),"Charting the course: the future use report," Washington, DC, Department of Energy, DOE/EM-0283)(1994).

Department of Energy (DOE). "Idaho national engineering laboratory: comprehensive facility and land use plan," Washington DC;Department of Energy (DOE/EM-0283)(1996a).

Department of Energy (DOE). "Idaho National Engineering Laboratory: comprehensive facility and land use plan," Washington DC, USDOE, DOE/EM-0283)(1996b).

Department of Energy (DOE), "Hanford Site: comprehensive facility and land use plan," Washington DC; USDOE,DOE/EM-0283)(1996c).

Department of Energy (DOE), "Modeling groundwater flow and transport of radionuclides at Amchitka Island's underground nuclear tests: Milrow, Long Shot, and Cannikin," DOE/NV-11508-51, Las Vegas, Nevada: Nevada Operations Office (2002a).

Department of Energy (DOE), "Draft Screening risk assessment for possible radionuclides in the Amchitka marine environment," DOE/NV-857, Las Vegas, Nevada(2002b)

Department of Energy (DOE),"Draft Long-term Surveillance and Maintenance Plan for the U.S. DOE Amchitka, AK, Site, February 2008, DOE-LM/1131-(2008).

EDELMAN, S.A.. "San Ildefonso Pueblo". In: Ortiz A (Ed.). *Handbook of North American Indians: vol. 9. Southwest.* Washington, DC: Smithsonian Institution Press, 308-316 (1979).

FLYNN, J., P. SLOVIC, and C. MERTZ, "Decidedly Different: Expert and Public Views of Risks from a Radioactive Waste Repository. *Risk Anal.* 6:643-648 (1994).

FRENCH, R.T., "Comments" at Proceedings: an informal collection of papers from the conference." *Health of the Hanford Site*, U. Wash. Seattle, WA. (1999)

GAO, "Department of Energy: preliminary information on the potential for Columbia River Contamination from the Hanford Site," GAO, Washington, DC (2005).

GEPHART, R.E., "A short history of Hanford waste generation, storage, and release. PNNL-13605. Pacific Northwest National Laboratory. Richland, WA.(2002).

GOLDSTEIN, B.D., S. ERDA, J. BURGER, E.M. FAUSTMAN, B. R. FRIEDLANDER, M. GREENBERG, T. M. LESCHINE, C. W. POWERS. L. WAISHWELL, and B. WILLIAMS,

WM2009 Conference, March 1-5, 2009, Phoenix AZ

“Stakeholder participation: experience from the CRESP program,” *Environ. Epidemiol. Toxicol.* 2:103-111 (2000).

Greenpeace. “Nuclear flashback: the return to Amchitka”. Greenpeace, USA, (1996).

KOHLHOFF, D.W., “Amchitka and the bomb: nuclear testing in Alaska,”. Seattle, WA: University of Washington Press (2002).

KUNREUTHER, H., D. EASTERLING, W. DESVOUSGES and P. SLOVIC, “Public attitudes toward siting a high-level nuclear waste repository in Nevada,”. *Risk Anal.* 10:469-484 (1990).

LANGE, C.H., “Cochiti Pueblo”. In: Ortiz A (Ed.) *Handbook of North American Indians: vol. 9. Southwest.* Washington, DC: Smithsonian Institution Press, 366-372 (1979).

MITCHELL, J., “Perception of risk and credibility at toxic sites,” *Risk Anal.* 1:19-26 (1992).

National Research Council (NRC), “Risk Assessment in the Federal Government,” National Academy Press, Washington, D.C (1983).

National Research Council, ” National Academy Press, Washington, D.C.(1986).

National Research Council, “Animals as sentinels of environmental health hazards,” National Academy Press, Washington, D.C. (1991).

National Research Council, “Issues in Risk Assessment,” National Academy Press, Washington, D.C.(1993).

Nez Perce, “Treaties: Nez Perce perspectives,” Nez Perce Tribe, Lapwai, Idaho (2003).

POWERS, C.W., J. BURGER, D. S. KOSSON, M. GOCHFELD, and D. BARNES, (Eds), “Biological and geophysical aspects of potential radionuclide exposure in the Amchitka marine environment,” Piscataway, NJ: CRESP (2005).

President's Commission (PCCRAM), “Presidential/Congressional Commission on risk assessment and management. U.S. Government Printing Office, Washington, D.C. (1997).

SLOVIC, P., “Perception of risk,” *Sci.* 236:280-285 (1987).

SLOVIC, P., “Perceived risk, trust, and democracy,” *Risk Anal.* 13:675-682 (1993).

SLOVIC, P., M. LAYMAN, and J. FLYNN, “Lessons from Yucca Mountain,” *Environ.* 3:7-11, 28-30 (1991).

ZORPETTE, G., “Hanford’s nuclear wasteland,” *Scientific Am.*, May: 88-97 (1996).