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BRIDGING INDIGENOUS AND TRADITIONAL SCIENTIFIC APPROACHES: ILLUSTRATIONS FROM TWO PROJECTS

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ABSTRACT

This paper presents two projects that bridge the span between indigenous and Western approaches to waste management issues that specifically affect native peoples.

One project, the Uranium and Radiation Education Outreach (UREO) addresses the legacy of abandoned uranium mines in the Navajo Nation. This is a joint effort between the U.S. EPA, the Environmental Education Outreach Program (EEOP) at Northern Arizona University and the Uranium Education Project (UEP) at Dine College. Through teacher workshops and curriculum development the project will give teachers of K-12 Navajo students the tools to adopt a classroom program allowing students to question, explore, and research the relevance and impact of uranium mining in their communities. This project will also adopt the Native Education Philosophy that encourages the study of issues relevant to the native community that reflect the interconnectedness of all things, and incorporate native language and culture.

The second project, the Traditional Knowledge and Radionuclides Project, is designed to help Alaska Native communities identify and address their concerns about radionuclides, other types of contamination, and adverse changes in their environment. It is a joint effort among two U.S. EPA program offices, the University of Alaska's Institute of Social and Economic Research, and the Alaska Native Science Commission. A key objective of the project will be to synthesize and share information gathered from Alaska Natives and Western scientists through an Internet accessible database and a series of meetings conducted with the Native communities and scientists, with the goal to identify common and divergent understandings of environmental change as well as the role of radionuclides and other contaminants in adverse environmental impacts.

INTRODUCTION

The 1940's through the 1980's is recognized as the era of the nuclear age and national defense from World War II through the Cold War against the Soviet Union. With these efforts came the placement of military bases in strategic locations in Alaska, the hunt for uranium on the Colorado Plateau, and testing of nuclear weapons in the Aleutian Islands. Over the years, the legacy from these activities includes a number of environmental problems, among them, radioactive contaminants in the Bering Sea from sunken Soviet submarines, hazardous waste from abandoned military sites in Alaska, and abandoned uranium mines on Navajo lands.

In many cases, these military defense activities took place in remote areas populated by indigenous people, including Alaska Natives and the Navajo Indians. Due to the abundant uranium ores in certain rocks of the Colorado Plateau, many of the country's uranium mines are located in the Four Corners area of Arizona and New Mexico. More than 1,100 mine sites were prospected on Navajo lands, the ore extracted, processed and ultimately purchased by the Atomic Energy Commission. Thousands of Navajo workers were employed at the mines and mills over several decades, often with significant exposure to radionuclides. Until the 1970's workers were not warned of the radiation hazards, provided with protective gear or advised to remove work clothing at the work site. Waste from the mines and mill sites remained unmitigated for years, without access barriers to nearby residents and livestock or posted warnings. In addition, some people used readily available mine waste materials to construct walls and foundations of their homes and other structures.

Alaska Native communities express concerns about the consequences of the Cold War between the Soviet Union and the United States. A quotation from discussions in Northwest Alaska states, "There are lots of things happening. The weather has gotten warmer. The taste of the plants has changed. The fur is coming off the seals like they are molting but it is not molting time. We're wondering if Chernobyl is responsible. They were wondering about the Russian military dumping toxic wastes and it is coming over to our side..."(1) Although these areas of Alaska are remote from the general population, Alaska Natives are concerned about the effects of radioactive and chemical contaminants on their food sources, traditional lifestyles, ecosystems, and ultimately their health.

The feelings of concern about environmental contamination are fueled by lack of information or by conflicting information. An Alaska Native expresses this by stating that "Anytime someone does a study, they say they will get back to us, but they never do." (2) A similar sentiment has been expressed by Navajos. Both of the projects discussed in this paper are designed to educate and empower Native communities to understand and make decisions to address environmental concerns that emerged during the lifetime of the elders and will continue to effect future generations.

BACKGROUND

The U.S. EPA (EPA) has established grants to operate these two projects through non-governmental organizations that work with Native communities on education, training, and research initiatives. The educational partnerships are consistent with the goals established by the National Environmental Education Act of 1990. This Act establishes that the Federal government, and specifically the EPA, will work with other organizations to increase understanding of the natural and built environment to improve awareness of environmental problems and to encourage post-secondary students to pursue careers related to the environment.

The goal of the Traditional Knowledge and Radionuclides Project is to help Alaska Native communities identify and address their concerns about radionuclides, other types of

contamination, and adverse changes in their environment. The arctic and sub-arctic climate and geography of Alaska is home to 227 Aleut, Eskimo and Indian Tribes. Since the environment sustains and informs their lives, spirits, cultures and economies, environmental contamination has far reaching effects on the Alaska Native traditional way of life.

The Traditional Knowledge and Radionuclides Project is a joint effort between two EPA program offices, the University of Alaska's Institute of Social and Economic Research and the Alaska Native Science Commission. In October 1993, The Alaska Federation of Natives (AFN) Annual Convention, passed a unanimous resolution to support the creation of an Alaska Native Science Commission (ANSC). The ANSC is an independent organization designed to provide the primary link between the scientific community and the Alaska Native community. The mission of the ANSC is to endorse and support scientific research that enhances and perpetuates Alaska Native cultures, and ensures the protection of indigenous cultures and intellectual property. More information can be found on the Web at: http://www.ankn.uaf.edu.

The goal of the Uranium and Radiation Education Project is to develop curricular materials and conduct K-12 teacher workshops that will explain the principles of radiation science, risk assessment, and how to identify and mitigate health impacts of uranium mining and radiation. The Navajo Nation is heavily impacted by uranium mining. There are more than 1,100 abandoned mines on Navajo lands, and more than half of them are still unreclaimed. With this information, the communities will be equipped to guide decisions that effect their environment and health, whether it is clean-up of mine sites or decisions regarding future mining activities.

The Uranium and Radiation Education Outreach (UREO) project is a joint initiative by the Environmental Education Outreach Program (EEOP) at Northern Arizona University and the Uranium Education Project (UEP) at Dine College. The goal of the EEOP is to strengthen environmental studies in schools and communities, as well as to encourage collaboration between educators of Native American students and tribal environmental professionals. Similarly, the UEP implements programs to address radiation and health issues caused by former uranium mining and milling operations on Navajo lands. Both organizations have complementary missions and experience to effectively reach Navajo communities and educators. The UREO Web page address is: http://www.nau.edu/eeop/ureo.

This project evolved out of Navajo community concerns about contamination from the mines and a need for better information and education. As stated earlier, uranium miners, millers, truckers, their families, and residents near the sites are learning that they may have been exposed to radioactive contaminants without their knowledge and with no warning. Many attribute the cancer deaths and lung disease to these exposures. Health studies to investigate this are underway. Communities are also concerned about contamination of water sources from mining activities, as well as the use of mine waste in the construction of building structures. Community education is one tactic, in addition to site reclaimation, by which it is hoped that the mine hazards can be reduced and prevented.

Both projects are consistent with the guiding principles of inclusive science, community right-to-know, and stewardship. Following, are examples of how these principles will be applied. The inclusive science principle brings the full range of relevant disciplines and viewpoints to bear in research to important issues of public policy. This principle will be applied as Alaska Native communities share environmental observations and findings with Arctic scientists, thereby strengthening the knowledge base for all. At the same time that Native communities learn from Western scientists, the scientists will be informed by the observations and approaches offered by the communities, in return. The Right-to-Know principle will be applied in the Uranium and Radiation Education Project as students and communities receive educational information on radiation and uranium mining. People have the right-to-know about environmental concerns that affect their communities. Stewardship applies as communities are empowered with information resources to make decisions and take action that will affect the status of the environment and public health for future generations.

APPROACH

The Uranium and Radiation Education Project

The Uranium and Radiation Education Project will equip K-12 teachers in the Navajo Nation to teach their students about radiation and uranium mining in their communities. To provide guidance on learning goals, an Advisory Committee was assembled, consisting of representatives from universities, the EPA, Navajo government agencies and high schools. Project staff will collect existing curriculum and supplement it to ensure that the materials meet the national science standards for education and also incorporate Navajo culture, language, and history. The curriculum will be distributed to teachers through nine regional workshops – four for secondary educators and five for elementary (3^{rd} - 6^{th}) educators. The workshops will be held between January and May 2001. Teachers are encouraged to utilize members of the community and to conduct field trips to make the material as relevant to the students as possible. Another aim is that through the program, Native American students will consider preparing for and entering environmental careers.

Mansel A. Nelson, an educator, has often heard teachers of Native American students say things like, "They (Native American students) are not motivated. They don't participate in class discussions and they don't turn in assignments." While Mansel was teaching at a reservation school, the math educators failed over half of the first year algebra students. When discussing this high failure rate with the math teachers, Mansel was told the students were "…lazy and unmotivated." Based on Mansel's experience and research, these educators are missing two major clues about working with Native American students:

1) Cultural Behavior - Native American students are from a different culture and have different behaviors. Native American students may express their "interest" in different, culturally appropriate ways.

2) Motivated Differently - Native American students are not motivated the same way that non-native students are motivated. While non-native students may be motivated by "grades," Native American students are more motivated by learning something that will benefit their family and community.

The curriculum of most schools focuses on generic textbooks in isolated subject areas. Students are taught about the theories and models of science, mathematics, and literature. Applications of this knowledge in the real-world is considered "non-academic" and reserved for vocational programs. However, Native American students respond better to a holistic, integrated curriculum that uses the "real-world" as an extension of the classroom. The project will utilize two approaches to education -- community-based education and problem-based learning.

Community-based education allows students to make the connection between the subject of learning and relevance to real-world issues and concerns of their community. For example, students at Monument Valley High School, Monument Valley, UT, produced a video, "Hear Our Voices," in which they interviewed community elders to document their stories about the impact of uranium mining on their lives. Through this, the students were able to explore history, use the Navajo language, perform before a camera, and film and edit the video, in a way that was meaningful to their lives. Information about this video will be posted on the UREO web page.

The curriculum plan for UREO will include specific suggestions to the teacher on ways of getting students personally involved in the issues related to Uranium mining and milling on the Navajo Nation. The UREO program approach will help students discover for themselves the relevance of uranium mining and milling to his/her family, community, and Nation.

The problem-based learning approach will be used to encourage students to formulate the problem as it connects to their lives, ask questions for investigation, establish a plan for action, with their group conduct the necessary research, and then assemble a report of their findings. Rather than handing facts and procedures to the students, this approach encourages them to develop their own questions and investigate for themselves, thereby internalizing learning with greater comprehension.(3) It is hoped that students will develop a sense of empowerment to learn about and take action on environmental issues.

The UREO program will encourage teachers to utilize small group activities that allow voluntary, self-directed participation. Studies have shown that Indian children are more likely to participate in team or group activities as opposed to individual performance before an entire class. This supports findings that Indian children are less willing to perform in a competitive situation in which they may appear superior to others or cause others to feel inferior. At the same time, team-based activities allow a group to excel and all in the group to succeed.(9)

The principles discussed above form a foundation for the Uranium and Radiation Outreach program that will be implemented on the Navajo Nation over the next couple of years. The following quote will help illustrate the Native Educational Philosophy used in the UREO

program. "All learning should start with what the student and community know and are using in every day life. The Native student will become more motivated to learn when the subject matter is based on something useful and suitable to the livelihood of the community and is presented in a way that reflects the interconnectedness of all things."(4)

The UREO program will encourage educators to incorporate the cultural guidelines published by the Native Knowledge Network (http://www.ankn.uaf.edu/standards/). In addition, the program will combine Navajo and "Western" (Euro-American) educational concepts in order to maximize the potential for learning, reinforce the value of culture and language, and support the philosophy of environmental stewardship. For example, the processes of environmental change can be explained through a Dine (Navajo) paradigm. "The Dine paradigm for cyclical processes is empirical and is analogous to Le Chatlier's principle in Euro-American physical chemistry, which states that a system in equilibrium, if disturbed, responds so as to counteract the disturbance. "(5,6,7)

The parallel use of these models serves to reinforce learning and cultural identity. A diverse group of educators argue that encouraging Navajo science students to draw on both Native and mainstream worldviews improves their abilities to formulate and work with multiple hypotheses and to more clearly understand dynamic natural processes.(8)

The Traditional Knowledge and Radionuclides Project

The Traditional Knowledge Project incorporates two sets of community-based activities for gathering information and identifying concerns about radionuclides in the environment. Detailed information on the Project is available on the website: www.nativeknowledge.org. The first set uses community-based traditional practices and protocols, known as "talking circles," to gather traditional knowledge about radionuclide concerns across five regions in Alaska. The observations about changes in the environment, which are shared during the first set of regional meetings, are incorporated in an Interactive Database. During the regional meetings, sharing of such concerns is followed by discussions about the implications of these changes as well as suggestions for making improvements.

Each regional meeting took place over a three-day period. During the first day the 20-30 community residents shared their thoughts in talking circles. The traditional talking circle process was used in order to build relationships and trust among participants and to yield consensus on major issues. The second day was spent discussing these major issues, and the third day was devoted to a review of discussions and continued dialogue in talking circles. A toll-free number was also established to enable Alaska Natives to share additional information.

The second series of regional meetings is for knowledgeable community members to consider the information gathered during the first round, and to use it to examine possible plans for action. During the next two years, a community grants program will support Alaska Native efforts to

address these concerns by establishing community-based agreement on conclusions and implementation of actions.

The second set of activities under the Traditional Knowledge Project uses complementary methods to those of the first but follows the more traditional Western science process. The project provides for input into the Interactive Database existing data on contaminants in Native foods, harvest and consumption data, nutrition data on Native foods, information about harvest practices and associated cultural values, and examples of community initiatives to address concerns about environmental change, among other input values.

Thus, with all sets of information (Native knowledge and Western science data) incorporated into a single computer database, Alaska Natives are able to perform community-based impact assessments of contaminants on their environment, with the ultimate goal of initiating actions to mitigate these effects. Of course, the information is also available for governments and researchers who may use the traditional Western risk assessment approach.

A workshop was held with researchers at the start of the project to evaluate the contaminant data needs, the status of existing contaminant data, and to determine what additional information was needed. A summary of findings was prepared; this document provided a framework for scientists to use at the "synthesis" meetings described later.

The Interactive Database currently contains information gathered not only from the regional meetings and research results, but also from existing databases that have been separately organized into sub-databases to preserve the source data integrity. Among these are:

- Data on Radionuclide Sampling Results Collected in Alaska or adjacent to Alaska beginning in the 1950s (Data collected by Alaska Department of Environmental Conservation, Environmental Radiation Program)
- Contaminants in Northern Canada (CINE): Arctic Foods Contaminants Database, Western Northwest Territories and Yukon Region
- Alaska Marine Mammals Database: Chlorinated Hydrocarbons, Metals and Other Elements in Tissues banked by the Alaska Marine Mammal Tissue Archive Project (U.S. Department of Commerce, NIST)

Another key component of this project is the series of "synthesis" meetings during which Alaska Natives and Western scientists share and exchange information. The first such meeting is designed for scientists to hear a summary of Native knowledge about environmental change gathered during the first round of regional meetings, and to review a draft summary of science knowledge and priorities. Additional synthesis meetings, to be held after the second round of regional meetings is completed, are intended to share the Native perspective and its implications. The goal of these meetings are to identify points of shared knowledge and priorities between Western and Traditional knowledge and points where continuing differences in perspective are important to respect.

The use of talking circles to share and gather observations from Native Alaskan communities is an important component of the Traditional Knowledge Project that will be described at the conference. Any conference materials presented will describe the database of observations and data about environmental contaminants which has been supplied by scientists, and meetings to enable scientists and communities to identify common and divergent understandings of environmental change as well as the role of radionuclides and other contaminants in adverse environmental impacts.

FINDINGS AND NEXT STEPS

The Uranium and Radiation Education Project

The project was launched in late September 2000, with the review of existing curriculum and an Advisory Committee meeting to guide project direction. To date, the project team has collected, reviewed, and will compile relevant science and environmental curriculum and educational materials to be utilized by teachers who attend the workshops in early 2001. Advisory Committee members (that included Navajo government staff, educators, Hopi representatives, and academics) suggested a broad-based education program to cover the social, historical, environmental, economic, and cultural aspects of uranium mining in the Navajo Nation. The goal is to provide students with the tools and analytical skills to understand key aspects of the mining legacy and be able to make informed decisions about such future activities that will impact their communities.

During the next phase of the project, relevant curricula will be assembled and distributed to teachers attending workshops. Project staff will follow-up with these teachers, even visiting some of the schools, to ensure they have the tools and skills to implement the program. New materials will be developed for the program based upon the need and available resources.

The Traditional Knowledge and Radionuclides Project

The first series of regional meetings have been held, and the second series are currently underway. A description of how the participants prepared for them, as well as how the meetings were conducted will be described on the project Website.

The second synthesis meeting was held this past fall (September 2000). Scientists have found the Native knowledge to be particularly useful and insightful. The traditional knowledge and research-based perspectives of attendees were shared, with an emphasis on the implications for action. Participants have expressed great interest in having another such meeting.

Small grants will be awarded to enable Alaska Native communities to initiate actions based on priorities they identified. Before the end of the Project period, a final meeting will be held which is designed to bring together Alaska Native participants from around the state to review and evaluate the Project.

CONCLUSION

Both projects seek to enable Indigenous communities to become informed about and make decisions regarding environmental concerns in their communities. Prevailing principles guiding these projects include respect for Native language and culture, and community empowerment. The best approach to accomplish these principles is to fund non-governmental organizations with consistent missions, and access to and familiarity with the indigenous communities of concern. The ultimate desired outcome is improved public health protection and environmental quality.

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