

EPA STAR GRANTS PROGRAM & TRIBAL SCIENCE COUNCIL
June 30 Webinar Summary

**Eco-social Cultural Mapping: Tribal Lifestyles and Environmental Risks ---
Regional Tribal Exposure Scenarios Based on Ecological Zones and Traditional Lifeways**
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Overview

Dr. Barbara Harper led the presentation on “Eco-social Cultural Mapping: Tribal Lifestyles and Environmental Risks—Regional Tribal Exposure Scenarios Based on Ecological Zones and Traditional Lifeways,” the first webinar to be conducted under EPA’s STAR Research Program/Tribal Science Council webinar series this year.

Dr. Harper presented an overview of her research team’s project. The purpose of the project was to devise a method for systematically describing how tribal people interact with the environment and how they might be differentially exposed to environmental contaminants. Specific goals include quantifying methods for subsistence-based exposures and risks among the Umatilla Tribe, measuring exposure effects, and developing models for integrating the data collected on subsistence activities and determining cumulative exposure profiles.

These scenarios do not measure risk; they describe how people interact with the environment so that risks may be more accurately estimated if one or more of the resources is contaminated. These baseline subsistence scenarios describe how the resources are used if they are available and are not contaminated. The scenarios would be combined with local contamination data to estimate exposures, doses, and risks.

Tribal communities engage in active, outdoor lifestyles in all climates, with greater environmental contact rates in comparison to members of the suburban community. Diets of each Tribe are based on the natural resources present and the unique cultural uses. Consequently, most tribal exposure factors are higher than EPA default rates.

The initial driver behind the project was the lack of exposure scenarios and exposure factors for use in Superfund risk assessments where Tribes and tribal resources are affected. Because traditional tribal lifestyles are inseparable from the ecology in which they live, contaminant exposures from subsistence-based activities can only be measured after a numerical representation of those environmental contact rates is developed.

The rationale for a natural resource assessment is to make the tribal site clean enough to use in a traditional manner as described by the developed scenarios; to restore it enough so that the resources are sufficient to make that possible; and to protect it administratively from pollution and commercial development.

The research was conducted with the informed consent of tribal members, who had an active role in the planning, conduct, analysis, translation, and dissemination of the study.

Exposure Scenarios

Exposures occur through food and medicine intake as well as through cultural, ceremonial, and occupational practices of tribal members. Data were taken in consideration of the whole-life scenario—that is, data from full-time residents, not those with recreational status—and analyses were conducted assuming nutritionally complete diets for accurate statistical plotting.

Basic Concepts

The study approach considered the cultural, whole-life patterns of tribal residents and their ecological and resource challenges to determine ways for traditional lifeways to be restored safely in the future.

Researchers operated under these basic premises:

- Ecological systems form the basis of the locally embedded lifestyles.
- Recognizing the interconnectedness of people and their environment is important.
- Indigenous worldviews often have a broader definition of health and well-being.
- Cultural quality of life depends on the quality of many eco-cultural attributes.
- Contemporary suppression of resource use must be recognized; reconstruction of traditional lifeways through a multidisciplinary approach provides greater accuracy in exposure assessments and eco-cultural health impacts.

The *ecological basis* for tribal scenarios recognizes that tribal peoples live in close contact with their ecosystems and use local natural resources. They may leave their local environment to visit suburbia, but do so only briefly. In contrast, suburban dwellers may leave suburbia briefly to visit “nature.”

Cultural quality of life for indigenous people revolves around their ethno-habitat; the land supports their basic needs for grocery store, school, church, clinic, living room, and serves as their “eco-cultural system.” The researchers considered a range of eco-cultural attributes, such as biodiversity, landscapes, critical habitat, and human use of the local environment to describe a way to estimate potential food chain exposures.

Many Native American communities embrace a *broad definition of health* that includes a state of complete physical, mental, and socio-cultural well being, rather than simply the absence of disease or infirmity. They regard health as multi-dimensional and reflective of their values, beliefs, and practices, which intertwine physical, cultural, social, mental, and spiritual indicators that are assessed on a community level.

The researchers recognized that *contemporary suppression of resource use* would need to be considered when collecting data. Local fish advisories, contaminated sites, and rights of access issues could restrict use and consumption, so a fish consumption survey would reflect

contemporary conditions, not the subsistence lifestyles and diets that are needed for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) risk assessment of reasonably foreseeable resource uses and to support restoration efforts of the natural resources.

To *reconstruct traditional lifeways* and natural resources, the researchers conducted culturally competent interviews and reviewed anthropological literature that included traditional ecological knowledge, physiology, culture, ecology, ethno-botany, language and oral tradition, and exposure science. Major food groups were used to categorize caloric intake, and consumption and exposure rates were estimated based on cultural activities. This holistic overview approach to data collection was used, versus simple food consumption surveys, in order to attain more accurate study results. These multiple lines of evidence were peer-reviewed for a more robust and confident conclusion.

Ethics and Informed Consent

This research was conducted solely for the benefit of each individual Tribe, so it was critical to ensure their willing participation. An advisory board consisting of tribal and technical members for the grant ensured that the communities were involved, informed (informed consent) and in control of the data (intellectual property). True informed consent was obtained after members were apprised of how the data would be used and potential misuse of the data was explained fully.

Methods

Ecologically-based exposure scenarios that reflect traditional subsistence tribal lifestyles are needed in a format suitable for CERCLA risk assessments. Exposure scenarios were established based on a set of activities and diets that described the lifestyle and its degree of environmental contact. Exposure rates factored in the frequency, duration, and intensity of exposure for each pathway (diet, soil ingestion, water intake, inhalation).

Scenario Reports

In order to ensure that lands and resources are clean and whole enough to support tribal uses, research needs to understand the state of ecology prior to the degradation. Of the scenarios developed to date, most are being used at Superfund sites in baseline risk assessments. Another is being used to support the development of water quality standards. The following text describes the generic chapters of scenario reports.

Scenario Section A – Tribal History

The section on tribal history typically describes factors such as whether Tribes have moved or have been consolidated onto reservations; historical reports such as trading records; and linguistic and oral histories that describe how Tribes identify with and use natural resources. This information is essential for understanding lifeways as they existed prior to significant resource degradation, the abundance and cultural importance of specific resources, and cultural affiliation.

Scenario Section B – Environmental Setting

The ecological description provides information about plants, animals, biodiversity, relative proportions of different habitat types, seasonality, and physiographic features of the environment. This description is important because it supports estimates of the dietary staples, which are the resources that are most abundant and reliable. It also gives information about factors that affect contact rates with soil, sediment, and water and their associated ingestion and/or inhalation rates.

Scenario Section C – Natural Resource Use

Ethno-botanical and ethno-historical literature describes the general diversity of plants used for food, medicine, or materials in various regional ecotypes and helps derive dietary intake values. This literature is generally not accessed by risk assessors.

Scenario Section D – Diet

Information about natural resources and their abundance and uses is used to estimate relative importance of the major food categories. This is combined with nutritional information to estimate a nutritionally complete subsistence diet. Staples are identified with rough apportions among food groups that include protein and vegetable sources, and caloric intake is estimated based on the same or similar foods taken from the USDA nutritional database.

Scenario Section E –Direct Exposure Factors

Direct exposure factors include soil, sediment, and water ingestion, dermal absorption, and inhalation. The crosswalk between major activities (hunting, fishing, gathering) and the abiotic exposure pathways (soil ingestion, sediment ingestion, water intake, and inhalation) is based on estimated activity levels. Physiological information is obtained to determine the relation between inhalation rates and calorie needs to ensure a reasonable and physiologically coherent set of exposure parameters.

Ongoing Research

Ongoing research activities include the study of:

- Activity levels (with oxygen intake and heart rate data during specific traditional activities) to complement CHAD and check caloric intake and inhalation rates;
- Contaminant uptake into native food plants such as cattails;
- Macro and micronutrient values of native food plants;
- Native diets and seasonal patterns of nutrient intakes; and
- Diabetes control and broader definitions of health for health promotion goals.

Future Research Applications

- Climate change (resiliency of natural systems and wisdom from traditional environmental knowledge);
- Environmental justice (disproportionate exposures and risks and improved evaluation methods);
- Integrated (cumulative) aspects of assessment, planning, and management;

- Natural resource damage assessment (eco-cultural and traditional service flows and injury definitions based on subsistence exposures/risks and eco-cultural impacts);
- Regulations such as pesticide registration, Clean Water Act, CERCLA;
- Homeland security, quality of life;
- Tribal measures for EPA's Strategic Plan (and others).

Cumulative Risk Assessment

The eco-cultural system is one of the researchers' core concepts. It leads to a new first step in CERCLA assessments that is a standard part of National Environmental Policy Act (NEPA) analysis: describing affected resources and affected eco-cultural systems before moving to hazard identification. This applies to pesticide management plans and pesticide registration as well as to cleanups and Federal actions under NEPA. Conventional risk assessment can be enhanced by incorporating cumulative and complex factors that impact many tribal communities. Contaminated salmon, for instance, affects the entire ecosystem. Not only is the human food pathway affected, but the social and cultural practices of harvesting, drying, and preparing fish will be impacted as well. Further, these consequences can have ripple effects that impact instructional stories in which salmon play a key role and cause psychological harm to the tribal community. Successful cumulative risk assessments will factor these eco-cultural components as well as the cumulative effects of all chemicals under regulation and other exposures into data analyses.

Our research team recommends merging human and ecological assessments and focusing on:

- Risk characterization (resources at risk, human systems and uses at risk; and existing stressors);
- Hazard identification (probability and severity); and
- Fate and transport (contamination of media and resources).

Confederated Tribes of the Umatilla Indian Reservation (CTUIR) Tamánwit Well-Being, Subsistence Economy

Tamánwit, or the "Natural Law," states that everything is interconnected locally, over space and over time. Their philosophy is to live lightly on the land, waste nothing, and share. They feel that tribal peoples are not only inseparable from the environment, they are emergent from it. The Tamánwit subsistence economy revolves around fishing, hunting, and gathering, which also includes a wide range of associated activities such as preparation, processing, using or consuming, and various traditional and cultural activities. Therefore, the exposure scenario includes a full cross-section of these activities.

Quality of Life System

The tribal quality of life system similarly involves a complex inter-relationship between overall health, environmental conditions, social/cultural factors, and economic components, but measurement of these factors are not well quantified in the research. Metrics for each of the following categories can be developed, and our research team will be working on them over the next few years.

- Health (culturally relevant exposure scenario, health effects selected by the Tribe, multi-generation and population effects).
 - Clean fresh air, clean cold water, clean soils, and sediment
- Environment (treaty-based resources, media, biota relevant species, ecosystems and cycles, habitats, watersheds, landscapes, functions, and services).
 - Intact functioning habitats, undisturbed landscapes, no light or noise pollution
- Social/cultural (quality of consultation, cultural resources, ceremonial activities, social indicators, language, rights and access, values).
- Economic (food, shelter, jobs, education, valuation of natural resources, costs to avoid, mitigate or repair, recognized roles within a subsistence economy).

These four life factors are tied to and are derived from ethno-habitats and eco-cultural systems, physical and emotional health and well-being, and quality of life. Compromise of any of these life factors can make a tribal population vulnerable on a community level and pose risks to its traditional way of life.

By using measured or predicted impacts of these risks and co-risk factors, such as social and physical elements (poverty, mental health issues, job hazards, communicable disease, housing conditions, prenatal care, legal challenges), we hope to minimize future impacts to tribal communities' quality of life.

Securing the Homeland and Future

Dr. Harper spoke about the need for true tribal Governance, which should include an infrastructure for commerce; community services; and the right to well-being and tribal resources that are adequate to define and meet threats to stability, self-determination, culture, mental and physical health, religion, economy, and security.

Each Tribe has a right to a secure land base with jurisdiction and ownership and freedom from legal attacks. The land must be clean enough to safely use in a traditional manner; restored and administered so that the resources are sufficient to support those uses through ecological functions, human services, and landscape-level metrics; and protected from pollution and development.

Question & Answer Session

Q: Does Federal law apply directly to Tribes or are treaties the only means of enforcing CERCLA statutes in Tribal areas?

A: A treaty is the supreme law of the land from a constitutional standpoint; it is not just specific to CERCLA. However, many laws were written before people started thinking about Tribes, so there is an ongoing effort to go back into the regulations and insert the word "Tribes" alongside "state and local governments."

Q: Are the results of assessment studies available?

A: Several risk assessment reports are published on the Oregon State Web site www.hhs.oregonstate.edu/ph/tribal-grant-main-page, but some are still unpublished or in litigation.

Q: How have standards been enforced for Superfund sites that are upriver of a reservation?

A: Water that flows onto a reservation has to meet certain clean water standards, so it helps to have legal and technical teams working together to deal with sediment issues. If Tribes have a standing as a Natural Resource Trustee, they have a better chance of participating in a technical discussion as an equal. Tribes located on Superfund sites have clearer legal standing.

Q: Eco-cultural maps and attributes may change over time due to the impacts of climate change. We are planning on tracking these changes, but how might we also think about understanding the potential shifting of the dietary pyramid within that context? And how do we rapidly get the right kinds of data and make sure we are speaking to the issue accurately without disturbing proprietary issues within the Tribe?

A: One thing that would help with tracking climate change would be to have real-time ecological data. The USDA considers this type of data classified for trade reasons, but if EPA is tracking it, that would be very helpful. As far as dealing with that information quickly, we already know what to track for some eco-regions because we already have data on their model diets. Others will require a little bit of background work because we don't have that baseline data. We will also have to look southward two or three eco-zones and do enough research to learn what micro-habitat we might have prepared to receive those species as they move north and receive cultural information along with them.

Q: Have cultural sweats been included in the assessment study?

A: The research team developed a specific sweat lodge module for their study that looked at steam equations for inhalations associated with instant evaporation chemicals in the groundwater that was used in the lodge. Condensation was also included as a steam function. The equation factored in one hour of exposure per day and drinking water for rehydration after each use.

Q: Are there any assessments planned for Region 5?

A: No funding was received for risk assessments for tribal areas in Region 5. Grant money or a Superfund client with available funds would be needed to conduct such studies.

Q: Can you clarify the study's approach on sharing of regional and cultural information so that it is not misused?

A: Dr. Harper explained that most risk assessment studies do not require the kind of detailed information that has the potential to be misused because it is done at a summary level. There is always a potential to misuse information (e.g., used by competing factions to restrict hunting or fishing rights), but a lot of emphasis was placed on ethics and informed consent during the study as an additional safeguard. Risk assessors no longer require raw data or interview transcripts, so summary data are adequate for these kinds of studies. The researchers took steps to avoid collecting data that was not already in the public domain, and interviews were not recorded. On the other hand, some national risk assessments are data-intensive, with a great emphasis on statistics and raw data, so this issue can arise in any setting.

Q: Do you think Governmental action in respect to environmental responsibility has earned the trust of Tribes since the Symposium on Health Research and Need for Environmental Justice Interagency Conference in 1994?

A: The Federal Government is working to live up to its legal and financial responsibilities to Tribes, and there is more recognition and awareness of the issues because we have more proponents in higher levels of government now. There is still a lot of push-back however regarding the methods used to achieve environmental justice. I believe EPA is now reinvigorating an Environmental Justice focus with its new leadership.

Q: Do you have any ideas on how we can encourage researchers who are conducting epidemiological studies with Tribal partners to be as transparent as possible when collecting environmental and biological data? EPA abides by its certificate of confidentiality when dealing with tribal information, but is there something we can perhaps add to the consent forms to help protect the ecological data?

A: It is incumbent on us to inform universities of the need to go through the Indian Health Service IRB process and regional Indian health boards. The Tribes have the legal power to exert control over their health information but they may not have their own formal IRB process to ensure it. They also may not realize how epidemiologic data might be used for other purposes, so it is incumbent on researchers to make an extra effort in the informed consent process.

Q: You mentioned that there was a lack of access to NHANES (National Health and Nutrition Examination Survey) data. Are there other data sources?

A: There is NHANES data on the Navajo Nation, but much of that data is restricted. There is also the issue of data accuracy. Some of the tribal data collected by NHANES may be happenstance; that is, not necessarily gathered from traditional tribal members, which are those that we want to target for information. The contemporary data included in the NHANES database would not work well with our statistical approach because it does not include data from traditional sources. It should be recognized that scenarios only describe how environmental contact occurs; an additional step is required to obtain contaminant data and perform a risk assessment. However, the relation between contemporary lifestyles as evaluated in NHANES and a subsistence lifestyle and diet relative to health outcomes is an item of interest.

Q: Had you thought about wanting to verify some of the exposure models using some of the NHANES data?

A: Our focus is on the traditional lifeways and the proportion of people who are fully traditional within a contemporary setting, which is going to differ between Tribes and Tribal circumstances, so contemporary data may not lead to an accurate verification. This model does not fit our statistical approach. A fish consumption study, for instance, among certain Tribes would not include data from traditional members who are mistrustful of government surveys and who would not submit to an interview request. So you have to be mindful of matching your data to how it is collected. Also, NHANES may not be an appropriate source for the type of question you want to answer.

Q: What about biomarkers?

A: People may not want to give biological samples. And again, that type of information is the kind that can be misused. Another issue with the NHANES data is that exposure data on Native Americans are combined with Asian American data and other ethnicities so it is difficult to get an accurate assessment of Native American exposure rates.

Q: Do you think the scientific community is more respectful of traditional knowledge as scientific at this point?

A: In general, acceptance of Native American knowledge has increased, but it is still not as recognized as it should be. Canada has done a lot of work with tapping environmental knowledge from traditional sources.

Q: Many Tribes do not want their eco-cultural activities mapped, so would this data remain private if the Tribes requested it?

A: Yes. The Tribes have intellectual property rights over their eco-cultural activity. However, it would be a struggle to keep some of this information private if dealing with Tribes on a Superfund site. Once the information is given to EPA, it may be accessed through a Freedom of Information Act request, so a confidentiality agreement would help.

Q: What about areas where alteration of habitat has permanently changed the resource base available to Tribes—would the data then be considered private?

A: If the environmental degradation is not irreversible and the Tribe has goals for natural resource restoration, we need to know how it needs to be restored because of the particular uses that people want to make of it after restoration. If there is no hope of restoration, then the Tribe is faced with the challenge of preserving culture with missing resources.