

ACKNOWLEDGMENTS

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I. Background

The National EPA-Tribal Science Council (TSC) was formed in 2001 to provide a forum for tribes and EPA to work collaboratively to identify and address national environmental science issues of importance to both tribes and EPA. Composed of tribal representatives from each EPA Region and Alaska and EPA representatives from each EPA Program and Regional Office, the Council is organized to ensure a national, cross-program perspective and approach. The tribal TSC representatives are selected by the respective Regional Tribal Operations (ROTC) to serve as a liaison between the ROTC and TSC.

The document is organized to provide a context and description of the science priorities identified by the tribal TSC representatives. Section II describe how the tribal science priorities have evolved and changed since they were first proposed in 2002. Section III describes the relationship between tribal traditional lifeways, other processes, and the science priorities. Section IV discusses the current priorities in detail.

II. Development of the National Tribal Science Priorities

The primary purpose of the TSC has been to collaborate with the Regional Tribal Operations Committees/Regional Operations Committees on tribal science priorities. The TSC tribal representatives work with the tribes in their Region to gather their science priorities. The TSC tribal representatives work together to identify those that are national in scope and those priorities that are Regional in nature are addressed through the TSC Regional representatives. In identifying these priorities, tribes seek to: (1) understand what ongoing activities are occurring at EPA to address these issues and where this information resides within EPA, (2) assess how tribes could contribute to advancing the science surrounding these issues, and (3) identify what tribes could do to help get these issues included into the Agency's budget priorities. This process for identifying and discussing tribal science priorities helps ensure that the TSC's activities are always tribally driven, a core part of the TSC's mission. The priorities that are national in scope are discussed with the TSC Agency representatives to determine appropriate actions.

Initial Tribal Science Priorities Identified—September 2002

The first set of national tribal science priorities was identified by the TSC tribal representatives in September 2002. The priorities were compiled by the representatives from input they had received from tribes in their respective Regions. Upon examining the various lists of Regional tribal science priorities, the tribal representatives selected only priorities that were national in scope and then organized and categorized these priorities for presentation to their Agency counterparts. The initial tribal science priorities identified included:

- Tribal Traditional Lifeways (including tribally relevant risk assessment and a new concept for environmental decision making),
- Endocrine Disruptor Chemicals (EDCs),
- Dioxin Reassessment and Reference Dose,
- Cumulative Impacts,
- Toxic Mold,
- Pharmaceuticals in Wastewater, and
- Tribal Research (including global warming and climate change monitoring).

Tribal Science Priorities Reassessed—November 2004

Between 2002 and 2004, the TSC held workshops, encouraged research efforts, and developed tools to share information on these topics. As a result of these activities and input from tribal representatives about new or changing science priorities in Indian country, the Council reassessed the original priorities at their meeting in Carlton, MN, in November 2004. Most notably, the tribal representatives decided to reframe each science priority in terms of its overarching relationship to and impact on tribal traditional lifeways. Originally, tribal traditional lifeways had been a discrete priority in relation to the TSC's efforts regarding risk assessment and development of a new environmental decision-making concept based around health and well-being. However, through the TSC's discussions, it became apparent that the aspect of each science priority that made it particularly relevant to tribes was its impact on tribal traditional lifeways.

In addition, the TSC chose to revise some of its initial science priorities and add a few new priorities. The TSC identified both “Habitat Loss” and “Biological Stressors (e.g., algal blooms and cyanobacteria)” as new priorities. The Council also changed the title of the “Dioxin Reassessment and Reference Dose” issue to “Dioxin and Dioxin-like Compounds” to reflect the broader issue of concern. Additionally, the TSC changed the “Tribal Research (Including Global Warming and Climate Change Monitoring)” issue so that tribal research was included as an activity under each of the other tribal priorities. Global warming and climate change were incorporated into a new topic, “Habitat Loss.” Finally, the TSC decided to replace the “Toxic Mold” issue with the broader topic of “Environmental Triggers for Respiratory Distress.” The Council determined that toxic mold was of concern largely because of the respiratory problems it contributes to, and felt that the issue should be broadened to include other triggers as well.

In addition, the TSC decided at the Carlton, MN meeting that each tribal science priority identified should be considered in relation to a series of cross-priority activities, including risk (i.e., exposure and impact), education, research, environmental justice, and restoration.

Tribal Science Priorities Refined—May 2005

At the TSC meeting held in Denver, CO, in May 2005, the Council worked to refine and clarify the national tribal science priorities. Specifically, the tribal representatives worked to (1) fully define the science priorities as they relate to Indian country, and (2) provide specific examples of how each issue impacts Indian country. In a separate discussion, Agency representatives provided additional information on (1) the Agency’s proposed actions and products to address each science priority issue and (2) the description of the Agency’s activities to date for each issue. The refined listing of science priorities resulting from this discussion and a diagram of their relationships can be found in Section III.

III. Considerations for each National Tribal Science Priority

The TSC tribal representatives identified three sets of considerations for each of the national tribal science priorities:

- Tribal traditional lifeways
- Environmental decision-making processes
- Cross-priority activities

Tribal Traditional Lifeways—An Overarching Issue

Tribal traditional lifeways¹ encompass the unique cultural, spiritual, economic, and language practices pursued by tribal communities. While EPA’s mission is to protect human health and the environment, tribes have expressed concerns that many environmental criteria and standards are not adequately protective of tribal community health or natural resources, given the unique relationship that many tribes have with the environment and the unique role that the environment plays in the continuation of their cultural, spiritual and dietary practices.

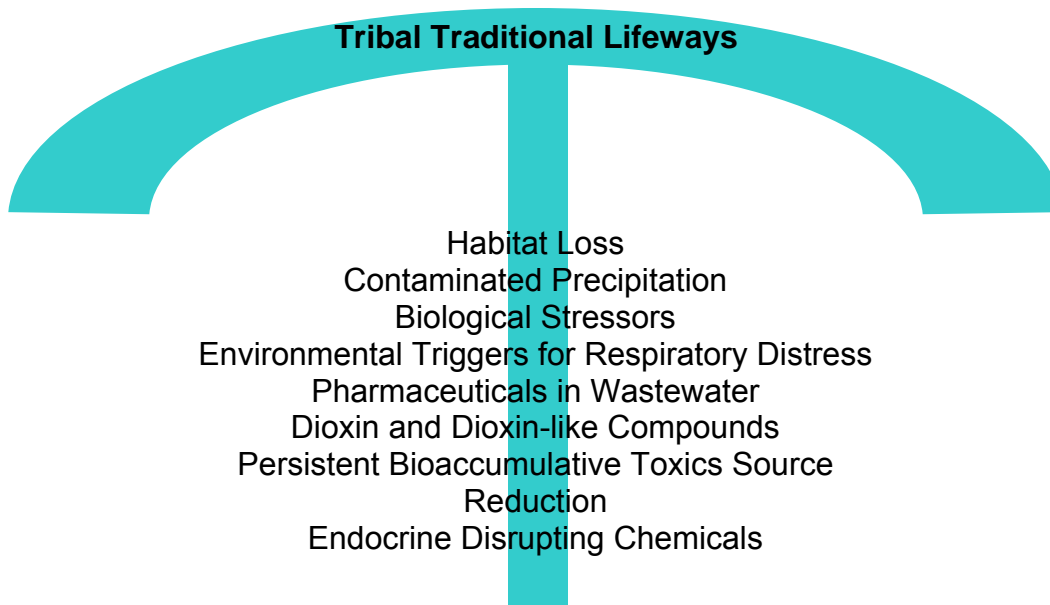
When tribal lands are degraded, the impact to tribal traditional lifeways can be considerable. Tribal resources can decline, disappear, or become contaminated, and as a result, tribes may be unable to practice their traditional ways of life as before—with detrimental impacts to the cultural, spiritual, economic, and health of tribal communities. When tribal resources become unavailable, language, income, and/or cultural (e.g., hunting, gathering, harvesting, basket making, sweat lodge, etc.) practices surrounding these resources can be lost. When resources such as traditional foods (e.g., fish, sea mammals, beavers, moose, deer, and wild rice) are lost to tribal communities, direct health impacts may result (e.g., increased rates of cardiovascular and diabetes) as alternative foods replace traditional diet. In addition, the tribe’s history and cultural practices that revolve around these aspects of the environment may come to an end.

As a result, TSC tribal representatives have identified traditional tribal lifeways as the overarching issue under which all of the tribal science priorities fall. The importance of each science priority is directly related to the way in which the issue impacts not only tribal health and the environment, but also the way in which it directly impacts the ability of tribal communities to pursue their traditional tribal ways of life—with direct implications for cultural, spiritual, economic, and language practices of tribal communities.

The diagram below shows the importance of tribal traditional lifeways and the relationship to the national tribal science priorities. Tribal traditional lifeways acts as an umbrella to the science priorities. Each science priority, for instance, habitat loss would

¹ The term “tribal traditional lifeways” was identified by TSC tribal representatives as the preferred way to describe the unique cultural, spiritual, economic and other practices that connect tribes to their environment, their past and their future. It was meant to replace the term “subsistence” that was commonly used to describe these things but was considered to have negative connotations.

come under the umbrella and be viewed from the tribes' traditional ways and relationship with the environment and others – their ability to continue life - their own and future generations. Therefore, tribal traditional lifeways would be considered in conjunction with each of the science priorities.



Improve the Agency's Environmental Decision-Making Processes

Tribes assert that EPA's current risk assessment policies and procedures for environmental decision-making are not protective of tribal resources and lifeways.

Improve Environmental Decision-making Processes:

- Current Risk Assessment paradigm
- Create a new environmental decision-making process

The processes fail to adequately account for or include a holistic approach for assessing the social, cultural, and spiritual values, beliefs, and practices that link tribal people to their environment. Since current risk scenarios and risk factors are geared toward urban settings in the United States, they may not consider subsistence lifestyles. Therefore, tribes who practice traditional lifeways outside the “mainstream” are less protected, since they are subject to exposure levels higher than those included in typical exposure factors. In addition, the risk management solutions identified from the current risk assessment methodologies often force tribal populations to alter activities that are core to their existence, such as those constraints imposed by the creation and adoption of fishing and hunting advisories.

The TSC has identified environmental decision-making processes as an area for improvement. The TSC recognizes that EPA currently utilizes the risk assessment paradigm as the basis for environmental decision-making and seeks to improve the policies and practices to incorporate tribal traditional lifeways. In addition, the TSC recognizes that the fundamental assumptions and approach of EPA's risk assessment paradigm can not fully address tribal issues and perspectives and seeks a longer-term goal

of developing a new environmental decision-making paradigm for EPA consideration – one focusing on human and ecological health well-being.

Cross-Priority Activities

As noted previously, the TSC identified a number of activities to be considered for each of the national tribal science priorities. Each activity identified is listed below along with a brief description of its relevance to the science priorities.

Cross Priority Activities:

- Exposure and Impact
- Education
- Research
- Environmental Justice
- Restoration

- ***Exposure and Impact*** – One of the primary factors that drove its listing was the concern that tribes had about exposure to environmental contaminants or changes and the impact of these exposures to tribal populations. Tribes are interested in better understanding and protecting against harmful impacts and outcomes to the health of tribal communities and the environment.
- ***Education*** – In many cases, the science priorities identified are of concern to tribes at least in part because tribes feel there is not enough information about the issue and how it specifically relates to tribes. Although EPA may have a number of resources available on these topics, more effort needs to be made to get this information out to Indian country so that tribes have a more complete picture of the issue and its potential impacts.
- ***Research*** – For a number of cutting-edge science priority issues, including “Pharmaceuticals in Wastewater” and “Endocrine Disrupting Chemicals,” tribes are especially interested in learning more about the Agency’s current research efforts and to learn of avenues to increase tribal participation in these research efforts. In many cases more research may be needed to better understand how these issues are impacting tribal populations.
- ***Environmental Justice*** – With respect to each science priority, tribes wish to recognize and to protect against disproportionate impacts to tribal communities by environmental hazards. Tribes assert that, given that tribal lifeways are uniquely tied to tribal lands, they are often disproportionately impacted by environmental hazards.
- ***Restoration*** – Once issues are fully understood, steps need to be taken to restore the environment and tribal traditional lifeways. These steps should be appropriate, taking into account tribes’ unique legal and cultural status.

IV. Current National Tribal Science Priorities

This section describes each of the current national tribal science priorities and provides examples of why these priorities are of concern in Indian country as well as information on what EPA has done or is doing in response to these priorities.

Habitat Loss

Description

Habitat loss occurs when an ecosystem experiences a change in its structural makeup (either flora and/or fauna) due to an outside influence. Habitat loss can be particularly detrimental to tribal communities pursuing traditional lifeways because many tribes depend on specific species of plants or animals or land areas to support their cultural practices. Without these specific resources, they are not able to continue these practices. Substituting other resources is often not an option or can have other detrimental environmental or health impacts.

Habitat loss can occur in a variety of ways, including reservoir and dam management and mining impacts, which are of particular concern to tribes.

Specific concerns related to reservoir and dam management include: (1) the impact to habitat by sediment loading through the controlled raising and lowering of river and reservoir levels and the impact of the potential influx of contaminants that are brought in with the sediments; (2) the impact of water fluctuation and water loss on tribal communities living along waterways [e.g., lack of drinking water, impacts to fish and waterfowl, impacts to traditional gathering practices (e.g., for medicinal plants, basket making materials, etc.), impacts to traditional activities (e.g., such as dances that are held in areas along the river)]; (3) the impact of management practices on groundwater recharge and its impact on tribal water supplies; and finally (4) the impact of the

Examples Where Tribal Impacts from Reservoir and Dam Management are Felt

- The Penobscot Nation Reservation waters currently support extremely diminished runs of salmon ($\approx 2\%$ of historical runs) and eels, and populations of alewives, shad, and sturgeon are nearly absent. The low population levels are due to cumulative fish passage and habitat impacts of multiple dams and other historical upstream production that has impacted habitat for these species.
- Water diversion in the Klamath River is affecting the local salmon population on which the Klamath Tribe depends.
- Water transfer on the San Francisco Bay Delta is impacting a number of tribes in the area.
- Water diversion on the Salton Sea is impacting a number of tribes bordering the sea and impacting a major Pacific flyway for migratory birds.
- Water diversion on the Colorado Delta, which borders Mexico, is impacting various tribes.
- Channelization of the Missouri River is impacting neighboring tribes. Denise West looked into – TSC needs to decide whether to include. If it is included, additional detail is needed.
- Water quality data collected since 1999 indicates that Deadfish Lake on the Fond du Lac Reservation, a premier producer of wild rice, is seeing higher nutrients and sediment mercury concentrations than other lakes on the reservation. The data suggests that the filling and releasing of water from an impoundment built to control water levels and protect the wild rice from water level fluctuations that negative affect the rice crop are responsible. However, more research is required to confirm these findings.

lack of any formal or prescribed fish passage facilities at some dams, cumulative upstream and downstream fish passage inefficiencies and losses at dams with formal fish passage facilities, and lost or degraded production habitat and enhanced predatory environments due to associated impoundments.

Examples Where Tribal Impacts from Mining Issues are Felt

Interest by a mining company to develop mine lands associated with an Alaska Native Community, where there is concern that mining impacts will harm lake seals---This is one of two areas in the world where lake seals are found.

Specific concerns related to mining impacts include: (1) the impact of radium from mining activities on tribal drinking water sources, and (2) the impact of mining activities on tribal lands and resources.

Although the group recognized that this is a significant and broad issue, the tribal representatives suggested that the TSC conduct educational and outreach efforts on this topic to enhance the scientific capacity of tribes in the areas of sampling, monitoring, and data assessment and the development of environmental standards to protect species or specific habitats (e.g., water quality standards).

Efforts to Address This Issue:

When the TSC tribal representatives identified this issue in 2004, they worked with their EPA counterparts to assess what activities were being done to address the issue and identify any additional activities that would be helpful.

Efforts already underway on this issue include:

- EPA is developing habitat criteria; there is a framework for guiding and prioritizing habitat research under discussion between Office of Water and Office of Research and Development.
- EPA's Science Advisory Board has begun investigating the potential for EPA to develop methods or processes for Valuing the Protection of Ecological Systems and Services.
- EPA Ecological Benefits Assessment Strategic Plan (EBASP). The plan is being prepared by a multidisciplinary workgroup of EPA ecologists and economists as part of the Agency's ongoing efforts to improve our ability to value the ecological benefits of EPA policies and actions.
- NatureServe is developing criteria for healthy habitats. This group collects and checks many sorts of environment data.
- The Las Vegas lab for terrestrial habitat does GIS-based spatial analysis, also referred to as landscape ecology. This group could serve as a resource to tribes.

Based on these current activities, the tribal representatives identified additional requests that, if met, could assist tribes in understanding and addressing this issue. In 2005, the TSC met to discuss these requests and respond to them. The requests identified and EPA's actions in response to these requests are included below.

- Conduct research on the extent of habitat loss in Indian country, the causes of habitat loss and methods to regain/restore the habitat. (For example, the TSC could pilot an Environmental Monitoring and Assessment Program/Regional

- Environmental Monitoring and Assessment Program (EMAP/REMAP) project in Indian country, and biasing the sampling scheme to focus specifically on Tribal lands. Through this process, tribes can take advantage of funds EPA has allocated to train tribal members to do such work, and can collect desired data as they go through their training. Tribes can also work on developing culturally-relevant indicators and can compare the data from Indian country to the national database. Region 10 has done some of this work with the Nez Perce tribe.)
- EPA OW and ORD are discussing a framework for guiding and prioritizing habitat research. Tom Barnwell and Rita Schoeny will invite a representative from EPA OW and ORD to present the TSC tribal representatives with an overview of what the Agency is doing with respect habitat loss to; this could result in a pilot on tribal lands.
 - TSC Member Tom Barnwell (EPA ORD) will contact Bruce Jones to advocate and educate about tribal interest in this topic and will assess EPA ORD's activities in this area.
 - TSC Member Rita Schoeny (EPA OW) will provide a discussion document that addresses habitat loss research plans for distribution to the TSC.
- Contact SAB regarding the activities of the subcommittee working on Valuing the Protection of Ecological Systems and Services and contact EPA's workgroup regarding tribal involvement in EPA's Ecological Benefits Assessment Strategic Plan.
 - TSC member Charlotte Bertrand (EPA OEI) will contact EPA's Scientific Advisory Board (SAB) regarding (1) the activities being conducted by the SAB subcommittee working on Valuing the Protection of Ecological Systems and Services, and (2) tribal involvement in EPA's Ecological Benefits Assessment Strategic Plan. The plan is being prepared by a multi-disciplinary workgroup of EPA ecologists and economists as part of EPA's ongoing efforts to improve its ability to value the ecological benefits of EPA policies and procedures.
 - Develop a TSC subcommittee for this topic.
 - The TSC will consider creating a TSC subcommittee for this topic pending the results of the above efforts.
 - Hold a Tribal science workshop – similar to the national one done for Environmental Justice (EJ) community. This could possibly be combined with another tribal environmental conference.
 - The TSC will consider holding an EPA-sponsored tribal science workshop on habitat loss similar to the national conference for the Environmental Justice community. The TSC will assess interest from the tribal community on this action and consider conducting a workshop as part of a larger workshop on tribal science issues.
 - Begin a regional or national speaker series and use video teleconferencing to link tribes, universities or other interested parties.
 - Once information is collected, the TSC will determine the most appropriate avenue for sharing this information with tribes.

Additional ideas that the TSC will consider at future meetings include:

- Coordinating funding sources for this kind of broad work. Possible mechanisms/resources include: Regional Applied Research Effort (RARE), Strategic Environmental Research and Development Plan (SERDP) from Department of Defense; Science to Achieve Results (STAR); National Institute for Environmental Health Services (NIEHS); NatureServe and Water Environment Research Foundation (WERF).

Contaminated Precipitation

Description:

Power plants, mining operations, and incinerators release heavy metals (e.g., arsenic, lead, copper, mercury, and zinc) and other contaminants (e.g., NO_x and SO_x), into the atmosphere. These pollutants combine with water to form contaminated precipitation, which can enter terrestrial systems and impact human health and the environment. Of particular concern is the impact of airborne mercury deposition. In the United States, coal-fired power plants and incinerators are the largest sources of mercury emissions to the air, and mineral mining releases the largest amount of mercury to land. When mercury enters water, biological processes transform it to a highly toxic form that builds up in fish and animals that eat fish. People are exposed to mercury primarily by eating fish, and exposure to excessive levels can permanently or fatally injure the brain and kidneys. Women of child bearing age and young children are at particular risk from mercury health effects.

Tribal communities are particularly concerned with the impacts of airborne mercury deposition, as tribes that practice subsistence fishing and consume larger amounts of fish are at greater risk of direct health effects from consuming mercury-contaminated fish. In addition, for tribes that have traditionally depended on subsistence fishing and hunting practices, fish and game advisories encouraging tribes to reduce or discontinue consumption rates due to elevated mercury levels can result in severe impacts to tribal income and/or cultural practices.

Generally, tribes are interested in identifying and obtaining additional education and outreach opportunities to train tribes and develop tribal capacity for air monitoring and testing of airborne mercury deposition. Tribes are also interested in developing Regional and national air monitoring programs on tribal lands and would need both training and hardware for developing tracking and monitoring programs within Indian country.

Examples Where Tribal Impacts from Contaminated Precipitation are Felt

- The impact of mercury deposition resonates on a nationally geographic level throughout tribal waters, lands, and resources. Several tribes have reported fish advisories such as: Penobscot (Maine); Cheyenne River Sioux (South Dakota); and Fond du Lac and Grand Portage Bands of Lake Superior Chippewa (Minnesota). Fish advisories prevent tribes' ability to maintain traditional tribal lifeways.
- Acid deposition is a major contributor to tribal water quality degradation. The pH levels are consistently driven below a value of six standard units—which is the tribal water quality standard of the Eastern Band of Cherokee Indians (North Carolina).

Efforts to Address This Issue:

Although tribes recognize that this is a pervasive issue and can likely only be solved by significant regulatory action to prevent the release of these pollutants, they identified a number of other requests that may help educate and inform tribal communities about the problems associated with mercury deposition in particular and contaminated precipitation more generally. A summary of these requests and efforts that are being initiated in response to the requests are provided below:

- Encourage alternative energy systems (e.g., wind and solar) and coordinate with pollution prevention staff in EPA Regions to explore other ways to prevent pollutants from entering the atmosphere.
 - TSC Members David LaRoche (EPA OAR) and Robert Hillger (EPA Region 1) will develop a list identifying EPA pollution prevention personnel from each EPA Region as a resource for encouraging alternative energy system implementation (e.g., wind and solar) by tribes.
- The TSC should obtain a copy of the Agency's Mercury research plan.
 - TSC Member Rita Schoeny (EPA OW) will provide a copy of the Mercury Action Plan, the multi-year plan, and the mercury portal link for distribution to the TSC.
- Hold a Tribal science workshop – similar to the national one done for Environmental Justice (EJ) community. This could possibly be combined with another tribal environmental conference.
 - The TSC will consider hosting an EPA-sponsored tribal science workshop on contaminated precipitation issues similar to the national conference for the Environmental Justice community.
- Begin a regional or national speaker series – use video teleconferencing like Region 1 does and potentially link up with Universities to involve Tribes.
 - Once information is collected, the TSC will determine the most appropriate avenue for sharing this information with tribes.

Other requests or recommendations that will be considered by the TSC at future meetings include:

- Encourage tribes to access money for risk assessment similar to what states are doing with respect to community level assessment guidance update (i.e. ATRA library Vol. 3) and community-based air toxics projects.
- Take advantage of money for community-based (not volunteer) programs.
- Get more tribal expertise and reps on the TSC from this and other science areas less focused on water.
- Consider holding a product expo (e.g., green building materials and alternative energy systems).
- Review EPA OAR's strategic plan, goals, and programs to identify potential opportunities for collaboration.
- Consider ways to encourage tribes to use funds available under Section 305(b) of the Clean Water Act to set up air monitors for mercury in air.

Biological Stressors (e.g., algal blooms, cyanobacteria)

Description:

Biological stressors on water bodies can have a variety of impacts. Nutrient inputs generate bloom conditions of marine and freshwater phytoplankton and periphyton and can cause shifts in community composition to potentially toxic species. Algal blooms can result in fish kills, impact wading birds, and cause beach closures. For tribes who depend on impacted water bodies for fishing, bathing, drinking water and other uses, these stressors can have a significant impact on their lifeways.

Efforts to Address This Issue:

Although EPA is developing nutrient criteria, and the Office of Water (OW) provides grants to help develop them, nothing is being done specifically regarding the impact of biological stressors on tribes. As a result, the TSC identified a number of potential efforts that may be able to help address the issue and its impact to tribal traditional lifeways. A summary of these requests is provided below. Unfortunately, the TSC has not yet explored these requests fully, so no specific responses have been developed to date.

Examples Where Tribal Impacts are Felt from Algal Blooms

- Algal blooms caused by polluted lake waters impact the Miccosukee and Seminole Tribes in Florida. The Seminole Tribe has a reservation on the northern boundary of Lake Okeechobee. They draw water from the lake for irrigation purposes, and pollution from Lake Okeechobee can violate the tribe's water quality standards. The algal blooms also can impact the tribes through fish kills and impacts to wading birds.
- Algal blooms along the Salton Sea and in the Great Lakes cause fish die offs and beach closings that can impact neighboring tribes.
- The Penobscot Nation has been experiencing planktonic algal blooms since the mid-1990s. The worst bloom was experienced in 2004, with the bloom extending 100 miles from its origin. While the bloom was dominated by a species that did not produce toxins, species in the sample found in smaller quantities did produce toxins, similar to those found in ride-tide conditions. The bloom caused the Nation to suggest that community members not swim in the river or ingest river water.
- For decades, large mats of periphytic algae have occurred during low flow summer months along the Meduxnekeag River, home to the Houlton Band of Maliseet Indians. These algal blooms cause large diurnal shifts in dissolved oxygen content in the river waters and dramatically alter the physical and biological character of the river system.

- Contact the University of Washington's Pacific Northwest Center for Human Health and Ocean Sciences, which investigates how environmental conditions trigger blooms of harmful algae in marine waters and ultimately how these blooms impact human health. This is seen as an indicator that this problem is more national than initially thought.
- Implement and enforce nutrient criteria in National Pollutant Discharge Elimination System (NPDES) permits and water quality standards.
- Contact Office of Water and Regions about grants to develop nutrient criteria.
- Contact Regions and states about proposed Total Maximum Daily Loads (TMDLs) for nutrients. Encourage EPA to hold a tribal forum on TMDL studies to address non-point source pollution (NPS) contributions to nutrient loads.
 - Where possible, the actions and products should include a focus on risk (measurement and exposure), education, environmental justice issues, and/or restoration.

- Groups should consider whether or not this is a topic that someone from outside the TSC should be invited to speak on.
- The TSC should consider holding a conference call to discuss this priority in the spring/early summer so that tribes are more informed before summer – the times of worst blooms.

Environmental Triggers for Respiratory Distress

Description:

Estimates from the National Health Interview Survey (1986-1990) indicate that age-adjusted prevalence for asthma was 4.45 percent in Native American men and 6.02 percent in Native American women, while prevalence in white men was 4.26 percent and in white women, 4.30 percent. Respiratory illnesses are on the rise everywhere, and Reservation tribal members seem to be higher than the non-Indian population. While indoor triggers are addressed by tribal health departments, outdoor triggers, seem less defined. Some of the key environmental triggers of respiratory distress that the TSC will focus on include: mold (indoor emissions) and PM_{2.5} and PM₁₀ (outdoor emissions). Given the elevated risk of respiratory illness found in Native American communities, tribes wish to have EPA better define these environmental triggers and work with other agencies in explaining the current tribally relevant research.

Examples Where Tribal Impacts are felt from Environmental Triggers for Respiratory Distress

Since 1993, California's Coachella Valley has been classified by EPA as a non-attainment area for PM₁₀ air emissions contributing to the incidence respiratory distress in these communities that impact a number of tribes living in the Valley including: Agua Caliente, Augustine, Cabazon, Torres-Martinez, and Twenty-Nine Palms. Fugitive dust sources are responsible for 97% of the PM₁₀ emissions, with construction activities, re-entrained dust from paved roads, and windblown dust from agricultural and disturbed lands representing the major sources.

Reports of are coming forth of skin infections and other serious health problems in Pine Ridge Tribal housing units that may be due to mold. Asthma and other respiratory ailments, to elevated glucose levels in other Indian communities due to mold/fungi infested housing are constantly surfacing and is an ever growing problem in Indian Country.

Efforts to Address This Issue:

The requests made by tribes on this issue focus on gathering existing data and research activities in this area. The TSC discussed this request and agreed to provide the tribal representatives with any information that was available as described below.

- Provide the tribal members with the current asthma statistics related to American Indians, including children, adults, men and women and provide information on current inter-agency research being done on environmental triggers for respiratory distress that looks at American Indians as a group apart from the general population.
 - TSC Members David LaRoche (EPA OAR) and Ella Mulford (EPA AIEO) will develop a status update on the work done to date on this topic, including gathering information on environmental triggers and

work being done by the Indian Health Service on household inspections.

Environmental Triggers for Respiratory Distress Special Section on Mold

Description:

Fungi, mold in this specific case, are in a completely different kingdom of organisms called Eumycota. They are eukaryotic having a well defined nucleus enclosed by a nuclear membrane, and the cells contain a cell membrane and the various cellular organelles making it similar to animal cells.

Molds are found virtually everywhere in the environment (over 200,000 species of fungi have been catalogued by scientists, at least 200 of these have been identified as familiar pathogens^A). Mold in nature break down organic waste, and because of this they are readily found in building materials ranging from wood, drywall, stucco, sheetrock, wall paper, ceiling tiles, showers, and the lists goes on.

Whereas, much is known of viruses and bacteria, little is known of mold/fungi concerning indoor air quality. New research is coming forth showing a distinct link between mold and human health and disease. Mayo clinic discovered that fungi, and not bacteria, are the culprit behind chronic sinusitis.¹

Why the interests in mold? Mold/fungi release secondary metabolites called mycotoxins. These are toxins produced by molds to defend against enemies in nature which are bacteria, viruses, and other organisms such as dust mites. The well known mold *Aspergillus* produces the powerful carcinogens aflatoxin, it is the only mycotoxin regulated in America, and “is the most carcinogenic chemical known to science”², and ochratoxin. “Although aflatoxin is the most carcinogenic substance on the planet, ochratoxin beats it ten times over in terms of toxicity and damage inflicted on the human body”³.

Mycotoxins are relatively large and non-volatile molecules (do not readily release into the air themselves), so direct contact is mostly required. The mold overcome this due to the spores they produce and release into the air.

Exposure to molds and the secondary metabolites they produce are an area of growing concern in Indian Country. The routes of entry to the human body are mainly skin contact, and inhalation into the respiratory system.

On the Pine Ridge Indian Reservation, mold has been found in 75% of the 1,700 tribal housing units. Health effects range from chronic sinusitis, severe headaches, fungal skin infections in children and elderly, upper and lower respiratory illness, and on the fringe: reports of elevated cancer cases, and diabetes worsening. This black mold is causing many tribal members to become sick. The diabetes epidemic on the Pine Ridge Reservation alone is 800% higher than the U.S. national

Black Mold

- Found in 75% of the 1,700 tribal housing on the Pine Ridge Indian Reservation
- Causes sickness and poor health among tribal members
- Health effects include chronic sinusitis, severe headaches, fungal skin infections, upper and lower respiratory illness; cancer cases rising and diabetes worsening
- Diabetes found to be 800% higher on this reservation than U.S. national average

average of diabetes in a population.

Reports of asthma and other respiratory ailments, related to elevated glucose levels in other Indian communities due to mold/fungi infested housing are constantly surfacing and are an ever growing problem in Indian Country. The environmental impact of these organisms and their metabolites, how they affect indoor air quality, and human health is the primary concern of the EPA National Tribal Science Council. An organized effort needs to be launched in Indian Country to look into this issue which affects tribes across the United States.

References

A. Sugar, A. A Practical Guide to Medically Important Fungi and the Diseases They Cause. Lippincott-Raven. Philadelphia, PA. 1997.

1. Salvatore, S. Fungus causes most chronic sinusitis, researchers say. CNN report Sept. 9, 1999.
2. Etzel, R. Mycotoxins. Journal of the American Medical Association. 287(4). Jan23/30, 2002.
3. Kemin.com. Kemin Americas, Inc.: The Control of Mold and Mycotoxins in Ruminant Foods. Dec. 2002.

Efforts to Address this Issue:

The EPA's Office of Indoor Air and Radiation has developed a web site dedicated to the mold issue and has also produced two documents dealing with mold. The web site is located at <http://www.epa.gov/mold/moldresources.html>. The two documents are also located there and are (1) "A Brief Guide to Mold, Moisture, and Your Home" and (2) "Mold Remediation in Schools and Commercial Buildings". Both documents can be down loaded using the PDF format. The web site also lists other resources.

Pharmaceuticals in Waste Water (including personal care products and antibiotics in livestock products)

Description:

Pharmaceuticals and personal care products (PPCPs), (i.e., products consumed by individuals for personal health or cosmetic reasons), comprise a very broad, diverse collection of chemical substances. PPCPs can enter the environment when PPCP residues in treated sewage effluent are released from sewage treatment systems or when raw sewage is discharged directly to surface water. In addition, antibiotic can be released directly into surface waters from fisheries management activities and from livestock rearing activities (e.g., from direct waste run-off, use of manure as fertilizer for crops, etc.). While the risks posed to aquatic organisms and humans by PPCP and low-level antibiotics are essentially unknown, the issue is receiving increasing attention within Indian Country.

Many tribes are located in rural areas with septic systems that are located above groundwater sources. As insufficient information currently exists to adequately identify the impacts of PPCPs in wastewater on tribal communities, tribes feel that additional research is needed to assess the risks of residual PPCPs and low-level antibiotics from livestock operations and their impact on human health and the environment.

The TSC tribal representatives are interested in obtaining EPA's current status on the science, research, and policy development surrounding PPCPs and low-level antibiotics in wastewater. Tribes would like to be aware of the latest scientific developments with respect to this topic in order to respond more appropriately and effectively to this issue.

Efforts to Address This Issue:

EPA has already developed a comprehensive website on this topic. Although the site was not specifically developed for tribes, it contains a great deal of useful information on the issue. It can be found at <http://epa.gov/nerlesd1/chemistry/pharma/about.htm>. Tribal representatives indicated that more education was needed on this topic and recommended that the TSC focus their efforts on research and outreach on the following key questions:

- Are there alternatives to those pharmaceuticals and personal care products that are being detected in surface and wastewaters?
- Can wastewater be applied on land without adversely affecting the environment and human health?
- What are wastewater treatment options for eliminating pharmaceuticals and personal care products?
- What are the potential human health and environmental risks associated with exposure to these chemical substances?
- What are proposed uses of wastewater containing these compounds that could be responsible for adverse impacts to humans or ecological receptors?
- What is EPA's current research plan for PPCPs?
- What is EPA's current policy on PPCPs?
- What should we know about the potential adverse impacts to groundwater from aboveground septic systems?

In response to this overall request, the TSC is undertaking the following actions:

- TSC Members Ella Mulford (EPA AIEO) and Patti Tyler (EPA Region 8) will contact Christian Daughton and Rita Schoeny (EPA OW) will contact Octavia Connerly to find out more about what Agency information is available on this topic. The TSC plans to work with these individuals to develop some educational and training materials.
- TSC members will attend RTOCs/ROCs meetings and work with the RTOCs/ROCs to identify more examples of how this issue is impacting tribes.
- EPA will post relevant information collected on this issue on EPA's Science and American Indians website or the tribal portal, as appropriate.

Dioxin and Dioxin-like Compounds

Description:

“Dioxins” refer to a group of chemical compounds that share certain chemical structures and biological characteristics and are formed as a result of combustion processes such as commercial or municipal waste incineration and from burning fuels (like wood, coal or oil). At high enough doses, dioxins may cause a number of adverse health effects, including skin disease, cancer, and reproductive or developmental impacts.

In general, tribes are disproportionately impacted by chemical contaminants in the environment through their resource use practices relating to traditional lifeways. The impact to tribes when tribal resources are contaminated extends beyond impacts to human health and the overall ecosystem to larger issues of tribal culture, spirituality, and lifestyle.

Examples Where Tribal Impacts are Felt by Dioxin and Dioxin-like Compounds

- A recent study has shown significantly elevated levels of PCBs in breast milk of women from Akwesasne Mohawk Nation (New York), directly related to the consumption of contaminated fish, resulting in an advisory against breast feeding.
- Numerous tribes across the country have issued consumption advisories for dioxin and dioxin-like compounds, including Leech Lake Band of Ojibwe (Minnesota), Penobscot Nation (Maine), and Great Lakes Tribes.

Tribes are particularly interested in understanding the current state-of-the science at EPA relating to dioxins and dioxin-like chemicals that might impact tribal health and well-being, particularly in respect to tribal diet and cultural practices that may leave them at risk to environmental exposures.

Efforts to Address This Issue:

Currently, EPA is working to develop a comprehensive reassessment of dioxin exposure and human health effects. EPA submitted a draft dioxin reassessment that updates a 1995 EPA inventory of dioxin sources and analysis of the source contributions to dioxin environmental levels to the National Academy of Science (NAS) for review. The NAS is working to provide an additional review to help ensure that the risk estimates contained in the draft are scientifically robust and that there is a clear delineation of associated uncertainties. Because the dioxin reassessment is now under review by the National Research Council (and publicly available), EPA will not likely be doing anything with the reassessment for the next year or two.

The TSC first identified dioxin as a tribal science priority in September 2002 when TSC tribal representatives were interested in learning the status of the Agency’s dioxin reassessment and in lending support to the effort to make the assessment more accurate for tribal populations. Given the current status of the issue, in November 2004, the TSC agreed that the dioxin science priority should be expanded to encompass issues associated with dioxin and dioxin-like compounds, and should include:

- Dioxin Reassessment and Reference Dose;
- PCBs (co-planars);
- Burn Barrels (air emissions);
- Pulp and Paper Mills (air emissions and water discharges);

- World Health Organization’s Toxic Equivalents (TEQ) (for use in human health & ecological evaluations); and
- Furans.

Based on this expanded scope, the TSC tribal representatives developed a list of requests related to research and education on these topics. Specifically, the representatives requested more information on the following issues:

- What Toxic Equivalents are and how are they derived (general description). A fact sheet would help with a more in depth discussion to follow if needed.
- Sources of dioxins and dioxin-like compounds and how these compounds are regulated.
- Major exposure pathways that would impact tribes.

Based on this request for additional information, TSC member Mike Callahan (EPA Region 6) will coordinate with EPA’s National Center for Environmental Assessment (NCEA) and collect relevant information and work on this issue. Mr. Callahan will create a fact sheet that references these activities. TSC member Dana Davoli (EPA Region 10) will provide assistance with the development of the fact sheet.

Another recommendation that will be considered by the TSC at future meetings is reviewing the Office of Prevention, Pesticides, and Toxic Substances (OPPTS) Tribal Strategic Plan to see if there are any synergies (e.g., objective 4.3.2 refers to dioxin in Alaska, but this could be generalized to encompass all tribes).

Persistent Bioaccumulative Toxics Source Reduction

Description:

Persistent Bioaccumulative Toxic (PBT) pollutants are chemicals that are toxic, persist in the environment, bioaccumulate in food chains and, thus, pose significant risk to human health and ecosystems. Examples of PBTs include: aldrin/dieldrin, mercury and its compounds, chlordane, DDT, DDP, DDE, hexachlorobenzene, dioxins, furans, and PCBs. The biggest concerns about PBTs are due to the fact that they transfer rather easily among air, water, and land, and span boundaries of programs, geography, and generations.

In general, tribes are disproportionately impacted by persistent chemical contaminants in the environment because of their unique resource use that often occurs as a result of their traditional lifeways. The impact to tribes when tribal resources are contaminated extends beyond impacts to human health and the overall ecosystem to larger issues of tribal culture, spirituality, and lifestyle, particularly in relation to traditional dietary practices of

<p>Specific Examples Where Tribal Impacts are Felt from PBTs</p> <ul style="list-style-type: none"> • Impacts to Aleutian food chain consisting of fish and marine mammals that are being impacted by persistent bioaccumulative toxic substances. • Potential impacts of pesticide residues on crops in tribal communities. • Repatriation of tribal artifacts that were contaminated during the preservation process.

tribal communities.

Tribes are interested in learning what EPA is doing concerning PBTs, both from a research and a regulatory perspective. In addition, tribes would like to see additional testing, outreach, and education for tribes on this issues and the development of a national strategy for testing subsistence foods.

Efforts to Address This Issue:

The TSC is working to identify efforts by which both (1) TSC efforts and (2) existing EPA initiatives and programs may be able to help address the issue of PBTs and its impact to tribal health and traditional lifeways. To help identify appropriate efforts and appropriate entities with whom the TSC can collaborate on this issue, the Council developed a list of questions to be addressed:

- What is the current list of PBTs?
- What research is being done on PBTs? (ORD, OPPTS, and OW)
- What regulator controls are in place to eliminate PBTs? (OPPTS and OECA)
- What is the process for getting new chemicals on the PBT list? Can Tribes propose chemicals to be added? (OPPTS)
- What are the impacts of PBTs on human health, particularly tribal, and the ecosystem? (ORD, OPPTS, and OW)
- How does the Agency assess emerging chemicals? Can the tribes propose emerging chemicals to the Agency for action? (OPPTS)
- What actions and/or products would the TSC like to pursue to help address this issue?
 - Need to develop general presentation on PBTs (What they are, how they operate, and why they are important to tribes) and current status on controlling PBTs, for a TSC conference call. (OPPTS)
 - More specific discussion could be warranted based on the presentations above. TSC to determine specific need.
 - An April to June timeframe for the first presentation was suggested.
 - Need to address the questions listed above.

Endocrine Disruptor Chemicals

Description:

In recent years, there has been increasing concern that chemicals (pesticides, commercial chemicals and environmental contaminants) might be disrupting the endocrine system of humans and wildlife. Chemicals with the potential to interfere with the function of the endocrine system are called endocrine disrupting chemicals (EDCs).

In general, tribes are disproportionately impacted by chemical contaminants in the environment through their resource use practices relating to traditional lifeways. The impact to tribes when tribal resources are contaminated extends beyond impacts to human health and the overall ecosystem to larger issues of tribal culture, spirituality, and lifestyle.

Tribes are particularly interested in (1) understanding the current state-of-the science at EPA relating to chemicals that might be disrupting the endocrine system of humans and wildlife, (2) education, training, and outreach opportunities to provide tribes with an opportunity to develop tribal capacity and participate in EDC research, and (3) tribally specific EDC research.

Efforts to Address This Issue:

The tribal representatives on the TSC developed some specific requests related to their overall interest in finding more out about this topic. These requests and the TSC's planned activities related to these requests appear below.

Building Tribal Capacity for EDC Research

In 2003, upon hearing from the Region 9 RTOC that EDCs were an important, emerging concern for EPA and that the Agency was actively developing analytical methods for EDCs and was planning to recruit outside laboratories to verify these EDC analytical methods, 29 Palms Laboratory proceeded to set up a molecular biology laboratory to perform EDC analysis and microbial source tracking. 29 Palms, an EPA- and state-sponsored tribal environmental laboratory, intends to build sufficient capacity to participate with EPA in developing expertise for EDC monitoring and microbial source tracking. To increase tribal participation, the laboratory is working with the Pyramid Lake Paiute Tribe's fisheries program to breed fathead minnows for developing and implementing the vitellogenin gene expression assay for estrogenic EDCs. The laboratory is also collaborating with EPA's Office of Research and Development to develop SOPs and QA plans for these technologies.

- Need to obtain an update of the work that the Agency is doing in the area of EDCs. Suggest that the update be general in nature and done on a TSC conference call.
 - TSC member Liz Resek (EPA OPPTS) will develop a written update on what EPA is doing in the area of EDC research and training.
- The TSC should develop more specific topic areas for in-depth presentations dealing with the impacts/effects on tribes and the science behind what we are doing based on the information presented on the call. This information could be conveyed to tribes through a workshop/breakout session that has three components: basic EDC 101 – What are EDCs, how do they operate and why are they important; what is the science behind the work that we (EPA) are doing; and what are the known impacts of EDCs on human health, particularly tribal, and on environmental well-being.
 - The TSC will form a subcommittee to determine what a Basic EDCs 101 course should address. The committee may include a representative from EPA AIEO, the Institute for Tribal Environmental Professionals, and the Tribal Air Monitoring Support Center and Dan Murray from EPA ORD. Following the training, there may be an opportunity for tribes to provide input into the list of chemicals to be tested to determine whether or not they should be listed as an EDC.
- Need to get to a wider tribal audience. This workshop/breakout should be presented at a tribal national environmental meeting such as the National Tribal Conference on Environmental Management.
 - The TSC will consider conducting a pilot via conference call to a certain number of Regions to communicate EDC information to tribes via phone.

The TSC will consider sponsoring a workshop/breakout session with three components on EDCs (i.e., Basic EDCs 101, the science behind what EPA is doing on EDCs, and known impacts of EDCs).