

Assessing Overall Concerns from Hazardous Waste Sites on Tribal Lands

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What I am Going to Talk About

- ◆ National Survey Results for Tribal hazardous waste site concerns.
- ◆ Conclusion from above: Intangible risks are imperative for a full "Tribal risk assessment model". Quantitative contaminant exposure *does not* accurately describe "Tribal risk".
- ◆ Basic Tool for Tribes to assess contaminant exposure risks incorporating traditional Tribal lifeways.

Thank You

- ◆ My mother and father, grandmothers and grandfathers.
- ◆ The people I work with that inspire me to be a better person. Quyana cakneq. I am honored.
- ◆ Simone, Susan, Whitney, Anna who got us through this project when it looked impossible.
- ◆ Quinault Nation - Thank you for inviting me.

Background

- ◆ One-year Project in 2004 to assess the overall national situation of hazardous wastes sites on, or next to, Tribal Lands, and to describe the risks to Tribes that the sites pose.
- ◆ Sites were identified through federal databases, agency websites, and by 115 responding Tribes nationwide. We compiled this information into a database for Tribes.
- ◆ The responding Tribes answered a survey that included questions about risks to Tribal lifestyles. We performed a separate empirical study too that provides more context.
- ◆ We also carried out a relative health symptom risk study.
- ◆ Finally, we developed a model to determine physical risks from contaminant exposure. I will run the model towards the end.

Why am I here?

This:



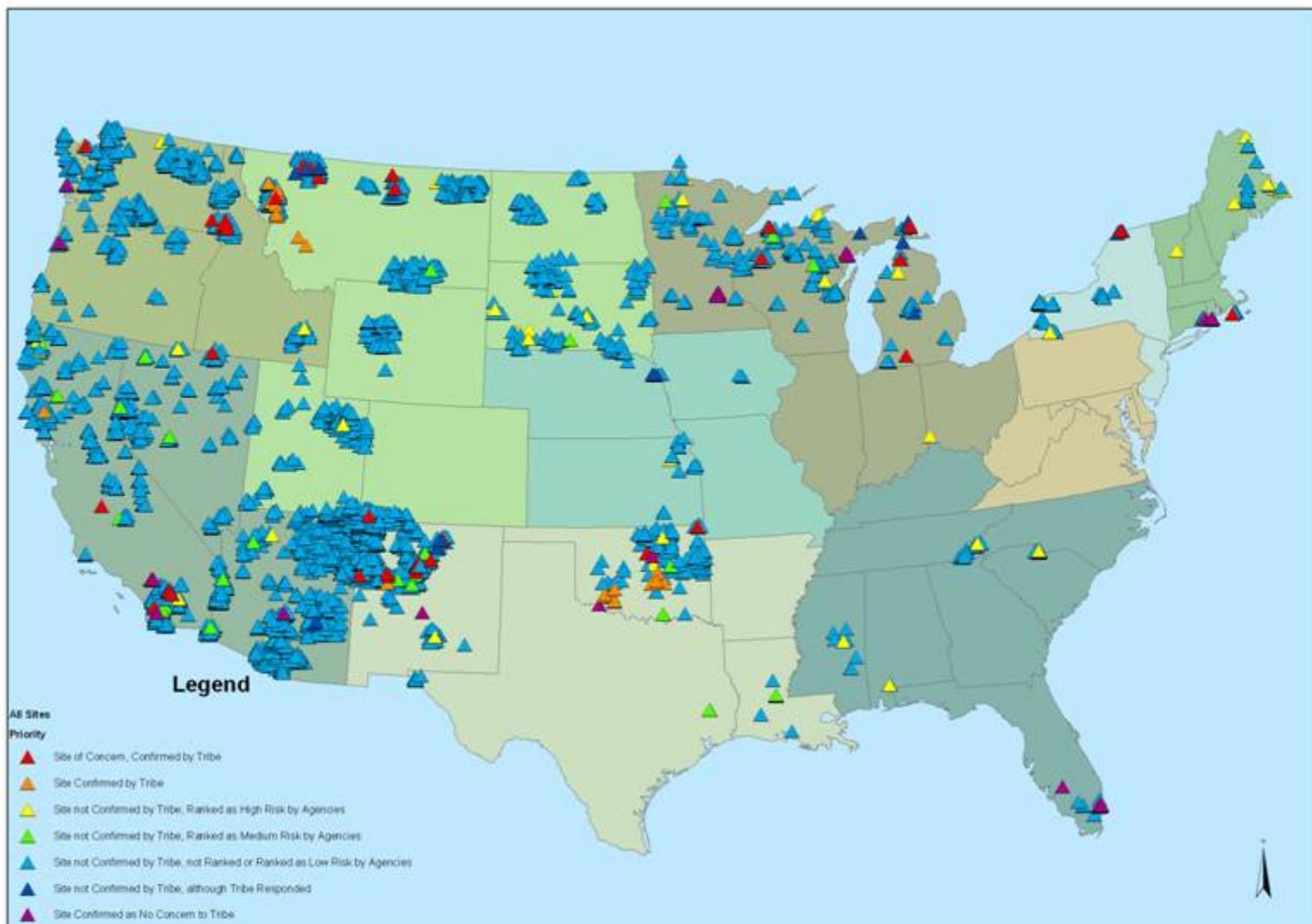
Shouldn't ever have to impact this:



Results from searching National databases and surveying Tribes.

- ◆ How many sites did we find?
- ◆ Over 15,000 hazardous sites and facilities that present potential risks to Tribal lifestyles were identified.
- ◆ About 979 of these sites were **Superfund** sites
- ◆ About 582 were classified as **hazardous waste facilities**
- ◆ About 1,104 were **open dumps**
- ◆ About 7,884 were **mines**
- ◆ About 4,075 were **Leaky Underground Storage Tanks**
- ◆ About 320 were **Formerly Used Defense sites**
- ◆ At least 33 were **Brownfields**
- ◆ About 88 were newly identified sites or site groups from this project

Tribal Hazardous Site Registry Map-Conterminous United States



Survey on Tribal Concerns – Response, solicitation

Parameter	All	1	2	4	5	6	7	8	9	10	AK	Explanation
Number of Tribes	559	8	7	6	29	66	9	27	141	42	224	Federally recognized
Total number of Tribes contacted via phone	243	5	5	6	21	23	6	16	63	38	60	Any contact as long as a Tribe was reached, and a message left on the voice mail, or with a person.
Total number of Tribes contacted via email, fax	361	8	3	6	13	56	7	18	79	23	148	Including all emails that did not get bounced back. 125 Tribes were emailed and phoned.
Total number of Tribes where contact was attempted.	526	8	6	11	32	63	9	26	129	41	201	Including email, fax, phone, and including failed contact attempts.
Average number of contact attempts per Tribe contacted	1.4	2.6	2.2	2.7	1.3	1.5	1.3	1.4	1.3	2.0	1.2	“Total number of tribes contacted” divided by “total number of contact attempts”
Number of Tribes with 2-way contact established.	194	6	3	4	16	27	4	13	30	31	60	How many Tribes did we converse with via phone or email (including those who did not submit a survey).
Total number of Tribes turning in a survey or “zero site confirmation” by fax, online, email, or phone.	115	3	1	2	9	16	2	5	20	6	51	Excludes Tribes that responded with general feedback, but no specific sites provided. For example, concerns about aboriginal lands, insufficient staff time, etc.
Overall survey return rate	21%	37%	14%	33%	31%	24%	22%	18%	14%	14%	23%	Mean and median average =23.2%, 22.8%
Adjusted Return rate	59%	50%	33%	50%	56%	59%	50%	38%	67%	19%	85%	Mean and median average =51.6%

Meaningfulness of results from a statistical point of view



Standard confidence interval calculations with corrections for finite populations reveal an error rate of plus or minus 8% at the 95% level of confidence, which can be considered adequate to identify *general* trends and issues. Note, if we could assume responses were distributed evenly among all Tribes, our 20.6% response would be adequate to infer *conclusions* about the situations for the full population of Tribes. A random sample of 20.6% from any population is considered adequate to make inferences about that population, provided a very high response rate is confirmed for that 20.6%. In our case, we essentially sampled the full population of Tribes, and received a 20.6% return rate.



Statistical information continued.

Due to the limited scope of the Project, we were unable to confirm *why* Tribes responded - i.e. whether the 20% was random in regards to the issues of interest, or whether there was something different about the site situations for Tribes that responded. We suspect that responding Tribes had something to say about the site list we provided. In this context, because we are interested mostly in sites and their impacts anyway, our 20% response rate would be adequate to infer general characteristics of these Tribes. But there are likely additional reasons as to why some Tribes did not respond. Thus we cannot strictly infer the characteristics of the site impact situations for these Tribes. A follow-up verification and statistical analysis would be required.

Summary: We received a reasonable response for the purposes of finding out general impacts to Tribes from Hazardous Waste Sites.

Do sites affect Tribal lifeways?

Yes. 57% of responding Tribes have changed their **subsistence activities** due to concerns about a hazardous site



Concerns about the site *have changed* subsistence activities:

<i>Tribes chose:</i>	“Not at all” for 20.5% of sites: :	“Somewhat” for 27.4% of sites	“A lot” for 31.5 % of sites:	
How have site concerns been changed due to the concerns?	For the above sites, subsistence was <i>still changed</i> in these ways:	For the above sites, subsistence was changed in these ways:	For the above sites, Subsistence was changed in these ways:	Total %of sites that have impacted subsistence by each way listed:
<u>Where</u> activities are performed:	For {3.3%} of these sites.	For {50.0% of these sites	For {93.5%} of these sites	78%
<u>How often</u> they are performed:	0.0%	12.5%	73.9%	33.6%
<u>How they</u> are performed:	0.0%	12.5%	69.6%	31.9%
<u>Type of food</u> obtained:	0.0%	47.5%	87.0%	50.9%
<u>Amount</u> of food consumed:	0.0%	27.5%	82.6%	42.2%
An activity can no longer be performed:	3.3%	17.5%	78.3%	37.9%
Another way:	0.0%	10.0%	21.7%	12.1%
Decline to specify:	10.0%	5.0%	67.4%	31.0%

Total portion of all sites that have affected subsistence practices in some way: **78%**

Do sites affect Tribal lifeways?

Yes. Also 52% of responding Tribes have changed other cultural/traditional activities, such as performing ceremonies, making baskets, art, tools, and making traditional medicine, because of their concerns about a site.



Concerns about the site *have changed* other traditional activities:

<i>Tribes chose:</i>	“Not at all” for 21.9% of sites:	“Somewhat” for 23.3%	“A lot” for 30.8 % of sites:	
<i>How have site concerns been changed due to the concerns?</i>	For the above sites, subsistence was <i>still changed</i> in these ways:	For the above sites, subsistence was changed in these ways:	For the above sites, Subsistence was changed in these ways:	<i>Total %of sites that have impacted subsistence in by each way listed:</i>
<u>Where</u> activities are performed:	For {6.3%} of these sites.	For {52.9%} of these sites	For {88.9%} of these sites	78%
<u>How often</u> they are performed:	0.0%	17.6%	73.3%	33.6%
<u>How they</u> are performed:	3.1%	14.6%	75.6%	31.9%
<u>Amount</u> of food consumed:	0.0%	14.7%	68.9%	42.2%
<i>An activity can no longer be performed:</i>	0.0%	8.8%	77.8%	37.9%
Another way:	6.3%	5.9%	8.9%	12.1%
Decline to specify:	6.3%	20.6%	68.9%	31.0%

Total portion of all sites that have affected other traditional practices in some way: 74%



We developed a questionnaire to find out more about the relative importance of tradition.

Note this study was not done with EPA funds.

Tribes: If people change the way they do traditional practices to avoid pollution, but they still do the same amount of traditional practices (e.g. eat as much subsistence foods) - is that bad or not? Check one.

Non-Tribal: Each region of the Country has a "unique flavor", partly due to its unique traditions and customs- - i.e. activities, behaviors, or events that have been historically practiced and have been passed down several generations. Examples could be quilt making, square dancing, Southern hospitality, 4th of July parades, Times Square New Year's celebration. If people change the way these traditions are done, but they still do them, is that bad or not? For example, changing the route of a parade to accommodate traffic. Please check one.

___ doesn't really matter ___ matters some ___ yes, it matters a lot ___ it is extremely important



Does Changing A Tradition Matter As Long As It Is Still Performed?

For Tribes, Yes:

<i>Answer selected:</i>	Tribal Group	Non-Tribal Group	
Doesn't really matter	12%	33%	Fishers exact test P value = 0.026% (= chance that the difference could be coincidence)
Matters some	0%	48%	
Yes matters a lot	41%	19%	
Extremely important	35%	0%	



	Tribal	Non-Tribal	Was there a significant difference in what groups valued?	P value:
Approximate description of tradeoff, with key terms, values bolded	Which is your highest concern?		<u>Compared to non-Tribal group</u> , Tribal group valued :	
<p>A few elders' berry-picking tradition w/ <i>possible physical exposure</i>.</p> <p><u>Versus</u></p> <p>Many non-elders with definite significant physical exposure.</p>	35%	14%	Elders/traditions	5.81%
	47%	86%	<u>Over</u> Non-elders, having low exposure risks	
<p>Losing elders /traditional knowledge/traditions.</p> <p><u>Versus</u></p> <p>Several non-elders having short-term health effects.</p>	59%	10%	Elders/traditions	0.02%
	24%	90%	<u>Over</u> Having good short-term health	



	Tribal	Non-Tribal	Was there a significant difference in what groups valued?	P value:
Approximate description of tradeoff, with key terms, values bolded	Which is your highest concern?		<u>Compared to non-Tribal group</u> , Tribal group valued :	
Losing elders /traditional knowledge/traditions	53%	14%	<i>Tradition/knowledge</i>	0.11%
<u>Versus</u>			<u>Over</u>	
Pollution of a sacred site , with intangible impact only	24%	86%	<i>Intangible risk -free sacred site</i>	
Non-members polluting/ jurisdiction issue/intangible impact.	35%	29%	<i>Sovereignty/community</i>	21.8%
<u>Versus</u>			<u>Over</u>	
Tribal members , regular physical exposure , nearby open dump.	35%	71%	<i>No physical exposure risks for community members</i>	

	Tribal	Non-Tribal	Was there a significant difference in what groups valued?	P value:
Approximate description of tradeoff, with key terms, values bolded	Which is your highest concern?		<u>Compared to non-Tribal group</u> , Tribal group valued :	
<p>Small dump with low risks near where elders gather</p> <p><i>Versus</i></p> <p>Kids playing at abandoned building with high risks</p>	18%	33%	<i>No significant difference</i>	61.6%
	53%	67%		
<p><i>Intangible pollution, but loss of tradition.</i></p> <p><i>Versus</i></p> <p><i>Physical pollution and cancer risk, but tradition continues.</i></p>	47%	14%	<i>Tradition</i> <u><i>Over</i></u> <i>Physical pollution, cancer risks</i>	0.21%
	24%	86%		

This project documented that intangible risks and concerns **MUST** be incorporated into an accurate assessment of Tribal risks, and by inference into any prioritization Scheme that looks at allocating funds for site cleanup/site addressal/education, etc.

But we also found that with about 20% of sites that Tribes wrote to us about, concerns about Tribal lifeways were not expressed in any form. But concern was expressed for these sites about house/school/activity proximity to the site, drinking water, etc. This consideration we believe had to do with concern on the quantitative amount of site contaminants and their physical impact to Tribal members through physical exposure.

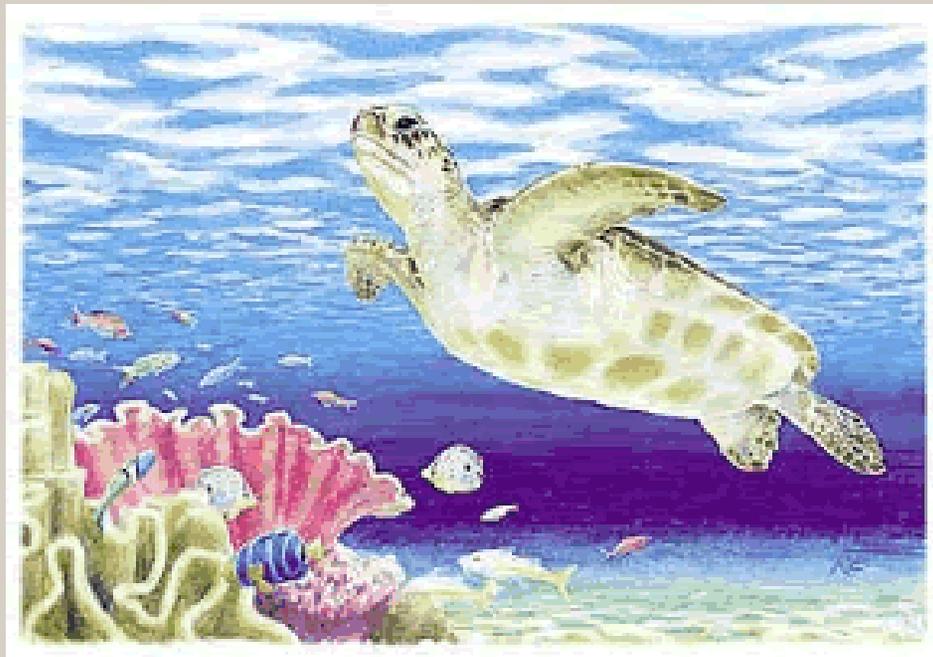


Contaminant Physical Exposure Risk Assessment Model

- ◆ All tribal lifeway activities reported by Tribes in the survey, plus those identified through research, are included in the model.
- ◆ They are grouped into 8 activity categories, based on exposure type(s). Each category has many separate sub-categories.
- ◆ The model is individual, not population based. This makes it simple to use, and good for educational and internal Tribal purposes, as well as for potentially obtaining funding for site cleanup or other means of addressal, assuming reliable data is used.
- ◆ Tribes must provide their own data. It can work for historical, current, or desired activity levels and patterns.
- ◆ The architecture is based on a series of cascading questionnaire sheets, which the user is prompted to fill out according to the exposure type(s) engendered by the activity of interest.
- ◆ This model works on a Windows operating system. It has not been programmed or tested yet for public use.
- ◆ This model is not intended to serve as a "Tribal Risk Assessment" Model. A full Tribal Risk model must incorporate intangible impacts.



A model to estimate exposure and risk to Native Americans from chemicals at hazardous waste sites



View License

Accept License and
Start Model

Exit

Personal and Chemical Data Entry Form



User Information

Name

Height (m):

Weight (kg)

Age (yr)

Sex
 Female
 Male

Pregnant

Chemical Information

Name:

Chemical is Carcinogenic

Cancer slope factor

Reference dose

Continue

Cancel

Native American Exposure and Risk Assessment Model



File Help

User Information

Name: Katherine Marsh
Height (m): 1.75
Weight (kg): 50
Age (yr): 35
Gender: Female

Chemical Information

Name: methylmercury
Carcinogenicity Status: Non-Carinogenic
Reference Dose: 0.0001

Update User/Chemical Information

Risk Summary

ID	Description	Category	Activity	Daily Dose

Activity Entry Controls

New

Edit

Delete

Total Daily Dose (mg/kg-day) 0

Hazard Index (HI) 0

Activity Selection Tool



Available Activity Categories

Ceremonial and non-ceremonial activities (at a HWS)
Incidental transport of hazardous material (away from a HWS)
Plant use and consumption (impacted by a HWS)
Animal use and consumption, including fish (impacted by a HWS)
Mineral use (impacted by a HWS)
Water use and consumption (impacted by a HWS)
Sweatlodge, bathing, showering (impacted by a HWS)
Breast feeding (impacted by a HWS)

Activities Available for the Activity Category

Select category above first

Instructions: Select Activity, Fill then Save Questionnaires

Description

Fill Questionnaires

Save Questionnaires

Cancel

Activity Selection Tool



Available Activity Categories

Ceremonial and non-ceremonial activities (at a HWS)
Incidental transport of hazardous material (away from a HWS)
Plant use and consumption (impacted by a HWS)
Animal use and consumption, including fish (impacted by a HWS)
Mineral use (impacted by a HWS)
Water use and consumption (impacted by a HWS)
Sweatlodge, bathing, showering (impacted by a HWS)
Breast feeding (impacted by a HWS)

Activities Available for the Activity Category

Making regalia or other clothing (using shells, feathers, skins, bones, tusks, antlers) from gathered animal products
Making baskets (using shells, feathers, skins, bones, tusks, antlers) from gathered animal products
Making of drums or game pieces (using shells, feathers, skins, bones, tusks, antlers) using gathered animal products
Carving of bones, tusks, antlers for figurines, pipes, etc., using gathered animal products
Other ceremonial and non-ceremonial preparation and use of gathered animal products impacted by site for crafts/artwork/tools
Preparing and consuming raw, dried, smoked, cured, or cooked animal tissues
Other ceremonial and non-ceremonial hunting/trapping/cleaning/preparing animals that have been impacted by the site for food and
Use of hides, oils, bones, tusks, antlers for regalia, carvings, tanning
Other ceremonial and non-ceremonial hunting/trapping/cleaning/preparing animals that have been impacted by the site for crafts/art

Instructions: Select Activity, Fill then Save Questionnaires

Description

Fill Questionnaires

Save Questionnaires

Cancel



Hazardous Waste Site (HWS) Exposure Questionnaire



Activity Category: Animal use and consumption, including fish (impacted by a HWS)

Activity: Preparing and consuming raw, dried, smoked, cured, or cooked animal tissues

- Are your hands in contact with animal tissues that have been hunted or fished at or near the HWS?

- Do you eat animal/fish tissues (raw or cooked) that have been hunted or fished at or near the HWS?

Required Questionnaires (Click to Activate)

Inhalation (Dust)

Inhalation (Smoke)

Inhalation (Water)

Ingestion (Diet)

Ingestion (Soil)

Hand to Mouth

Dermal (Non-Water)

Dermal (Water Swim)

Dermal (Water Non-Swim)

Continue

Cancel



Dietary Ingestion Exposure Calculator



Ingestion exposure is calculated based on the following variables

<u>Value</u>	<u>Variable Description</u>
<input type="text" value="1e-3"/>	Contaminant concentration in food, water, or breastmilk (mg/g)
<input type="text" value="200"/>	Contact rate (g/day)
<input type="text" value="7300"/>	Exposure duration (days)
<input type="text" value=".95"/>	Fraction absorbed

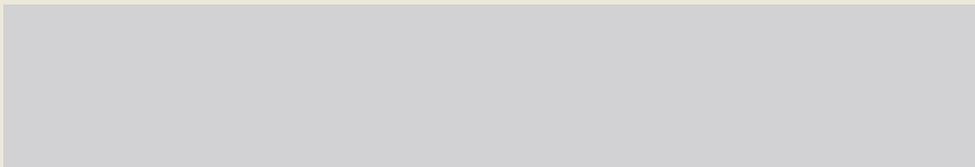
Reason for questionnaire: Animal consumption.

Continue

Cancel



Hazardous Waste Site (HWS) Exposure Questionnaire



Activity Category: Animal use and consumption, including fish (impacted by a HWS)

Activity: Preparing and consuming raw, dried, smoked, cured, or cooked animal tissues

- Are your hands in contact with animal tissues that have been hunted or fished at or near the HWS?

- Do you eat animal/fish tissues (raw or cooked) that have been hunted or fished at or near the HWS?

Required Questionnaires (Click to Activate)

Inhalation (Dust)

Inhalation (Smoke)

Inhalation (Water)

Ingestion (Diet)

Ingestion (Soil)

Hand to Mouth

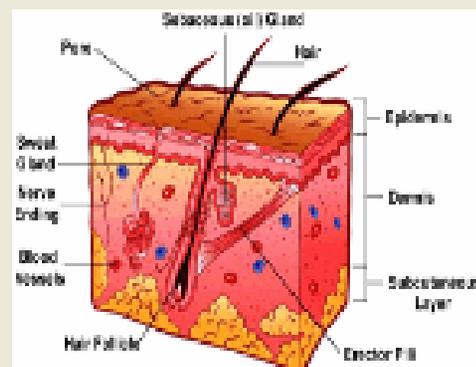
Dermal (Non-Water)

Dermal (Water Swim)

Dermal (Water Non-Swim)

Continue

Cancel



Dermal exposure is calculated based on the following variables

Value

Variable Description

1e-6

Absorbed dose per event (mg/cm²-event)

1

Event frequency (events/day)

20

Exposure duration (years)

365

Exposure frequency (days/year)

378

Skin surface area available for contact (cm²)

Reason for questionnaire: Skin is in contact with animal tissue.

Continue

Cancel



Hazardous Waste Site (HWS) Exposure Questionnaire



Activity Category: Animal use and consumption, including fish (impacted by a HWS)

Activity: Preparing and consuming raw, dried, smoked, cured, or cooked animal tissues

- Are your hands in contact with animal tissues that have been hunted or fished at or near the HWS?

- Do you eat animal/fish tissues (raw or cooked) that have been hunted or fished at or near the HWS?

Required Questionnaires (Click to Activate)

Inhalation (Dust)

Inhalation (Smoke)

Inhalation (Water)

Ingestion (Diet)

Ingestion (Soil)

Hand to Mouth

Dermal (Non-Water)

Dermal (Water Swim)

Dermal (Water Non-Swim)

Continue

Cancel



Hand to Mouth Exposure Calculator



Hand-to-mouth exposure is calculated based on the following variables

Value

Variable Description

1e-20

Dislodgeable contaminant concentration (mg/cm²)

1

Contact rate (cm²/day)

1

Exposure duration (days)

1

Fraction absorbed

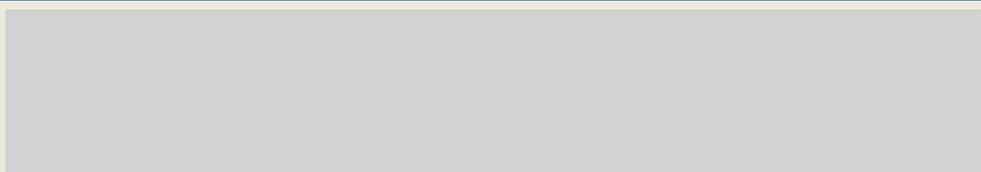
Reason for questionnaire: Hands part of the dermal exposure.

Continue

Cancel



Hazardous Waste Site (HWS) Exposure Questionnaire



Activity Category: Animal use and consumption, including fish (impacted by a HWS)

Activity: Preparing and consuming raw, dried, smoked, cured, or cooked animal tissues

Are your hands in contact with animal tissues that have been hunted or fished at or near the HWS?

Do you eat animal/fish tissues (raw or cooked) that have been hunted or fished at or near the HWS?

Required Questionnaires (Click to Activate)

Inhalation (Dust)

Inhalation (Smoke)

Inhalation (Water)

Ingestion (Diet)

Ingestion (Soil)

Hand to Mouth

Dermal (Non-Water)

Dermal (Water Swim)

Dermal (Water Non-Swim)

Continue

Cancel



Activity Selection Tool



Available Activity Categories

Ceremonial and non-ceremonial activities (at a HWS)
Incidental transport of hazardous material (away from a HWS)
Plant use and consumption (impacted by a HWS)
Animal use and consumption, including fish (impacted by a HWS)
Mineral use (impacted by a HWS)
Water use and consumption (impacted by a HWS)
Sweatlodge, bathing, showering (impacted by a HWS)
Breast feeding (impacted by a HWS)

Activities Available for the Activity Category

Making regalia or other clothing (using shells, feathers, skins, bones, tusks, antlers) from gathered animal products
Making baskets (using shells, feathers, skins, bones, tusks, antlers) from gathered animal products
Making of drums or game pieces (using shells, feathers, skins, bones, tusks, antlers) using gathered animal products
Carving of bones, tusks, antlers for figurines, pipes, etc., using gathered animal products
Other ceremonial and non-ceremonial preparation and use of gathered animal products impacted by site for crafts/artwork/tools
Preparing and consuming raw, dried, smoked, cured, or cooked animal tissues
Other ceremonial and non-ceremonial hunting/trapping/cleaning/preparing animals that have been impacted by the site for food and
Use of hides, oils, bones, tusks, antlers for regalia, carvings, tanning
Other ceremonial and non-ceremonial hunting/trapping/cleaning/preparing animals that have been impacted by the site for crafts/art

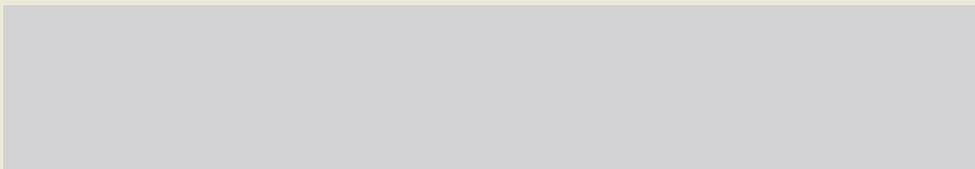
Instructions: Select Activity, Fill then Save Questionnaires

Description

Fill Questionnaires

Save Questionnaires

Cancel



User Information

Name: Katherine Marsh
 Height (m): 1.75
 Weight (kg): 50
 Age (yr): 35
 Gender: Female

Chemical Information

Name: methylmercury
 Carcenogenicity Status: Non-Carinogenic
 Reference Dose: 0.0001

Update User/Chemical Information

Risk Summary

ID	Description	Catagory	Activity
1	bass consumption	Animal use and consumption, including fish (impacted by a HWS)	Preparing and cons

Activity Entry Controls

New Edit Delete

Total Daily Dose (mg/kg-day) 0.0065594
 Hazard Index (HI) 65.594



User Information

Name: Katherine Marsh
 Height (m): 1.75
 Weight (kg): 50
 Age (yr): 35
 Gender: Female

Chemical Information

Name: methylmercury
 Carcinogenicity Status: Non-Carinogenic
 Reference Dose: 0.0001

Update User/Chemical Information

Risk Summary

	Activity	Daily Dose
▶	a HWS) Preparing and consuming raw, dried, smoked, cured, or cooked animal tissues	0.0065594

Activity Entry Controls

New

Edit

Delete

Total Daily Dose (mg/kg-day) 0.0065594

Hazard Index (HI) 65.594

User Information

Name: Katherine Marsh
 Height (m): 1.75
 Weight (kg): 50
 Age (yr): 35
 Gender: Female

Chemical Information

Name: methylmercury
 Carcenogenicity Status: Non-Carinogenic
 Reference Dose: 0.0001

Update User/Chemical Information

Risk Summary

ID	Description	Category	Activity
1	bass consumption	Animal use and consumption, including fish (impacted by a HWS)	Preparing and consumption

Activity Entry Controls

New

Edit

Delete

Total Daily Dose (mg/kg-day) 0.0065594

Hazard Index (HI) 65.594

Activity Selection Tool



Available Activity Categories

Ceremonial and non-ceremonial activities (at a HWS)
Incidental transport of hazardous material (away from a HWS)
Plant use and consumption (impacted by a HWS)
Animal use and consumption, including fish (impacted by a HWS)
Mineral use (impacted by a HWS)
Water use and consumption (impacted by a HWS)
Sweatlodge, bathing, showering (impacted by a HWS)
Breast feeding (impacted by a HWS)

Activities Available for the Activity Category

Making regalia or other clothing (using shells, feathers, skins, bones, tusks, antlers) from gathered animal products
Making baskets (using shells, feathers, skins, bones, tusks, antlers) from gathered animal products
Making of drums or game pieces (using shells, feathers, skins, bones, tusks, antlers) using gathered animal products
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Preparing and consuming raw, dried, smoked, cured, or cooked animal tissues
Other ceremonial and non-ceremonial hunting/trapping/cleaning/preparing animals that have been impacted by the site for food and
Use of hides, oils, bones, tusks, antlers for regalia, carvings, tanning
Other ceremonial and non-ceremonial hunting/trapping/cleaning/preparing animals that have been impacted by the site for crafts/art

Instructions: Select Activity, Fill then Save Questionnaires

Description

Fill Questionnaires

Save Questionnaires

Cancel

Hazardous Waste Site (HWS) Exposure Questionnaire



Activity Category: Animal use and consumption, including fish (impacted by a HWS)

Activity: Preparing and consuming raw, dried, smoked, cured, or cooked animal tissues

- Are your hands in contact with animal tissues that have been hunted or fished at or near the HWS?
- Do you eat animal/fish tissues (raw or cooked) that have been hunted or fished at or near the HWS?

Required Questionnaires (Click to Activate)

Inhalation (Dust)

Inhalation (Smoke)

Inhalation (Water)

Ingestion (Diet)

Ingestion (Soil)

Hand to Mouth

Dermal (Non-Water)

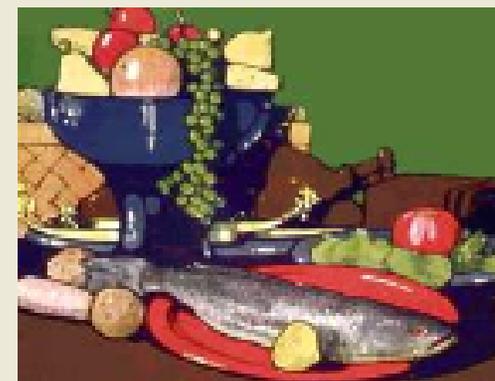
Dermal (Water Swim)

Dermal (Water Non-Swim)

Continue

Cancel

Dietary Ingestion Exposure Calculator



Ingestion exposure is calculated based on the following variables

<u>Value</u>	<u>Variable Description</u>
<input type="text" value=".05e-3"/>	Contaminant concentration in food, water, or breastmilk (mg/g)
<input type="text" value="200"/>	Contact rate (g/day)
<input type="text" value="1040"/>	Exposure duration (days)
<input type="text" value=".95"/>	Fraction absorbed

Reason for questionnaire: *Animal consumption.*

Continue

Cancel



Hazardous Waste Site (HWS) Exposure Questionnaire



Activity Category: Animal use and consumption, including fish (impacted by a HWS)

Activity: Preparing and consuming raw, dried, smoked, cured, or cooked animal tissues

- Are your hands in contact with animal tissues that have been hunted or fished at or near the HWS?

- Do you eat animal/fish tissues (raw or cooked) that have been hunted or fished at or near the HWS?

Required Questionnaires (Click to Activate)

Inhalation (Dust)

Inhalation (Smoke)

Inhalation (Water)

Ingestion (Diet)

Ingestion (Soil)

Hand to Mouth

Dermal (Non-Water)

Dermal (Water Swim)

Dermal (Water Non-Swim)

Continue

Cancel



User Information

Name: Katherine Marsh
 Height (m): 1.75
 Weight (kg): 50
 Age (yr): 35
 Gender: Female

Chemical Information

Name: methylmercury
 Carcenogenicity Status: Non-Carinogenic
 Reference Dose: 0.0001

Update User/Chemical Information

Risk Summary

ID	Description	Category	Activity
1	bass consumption	Animal use and consumption, including fish (impacted by a HWS)	Preparing and co
2	scallop consumption	Animal use and consumption, including fish (impacted by a HWS)	Preparing and co

Activity Entry Controls

New

Edit

Delete

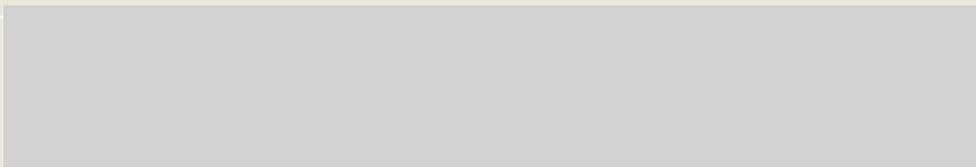
Total Daily Dose (mg/kg-day) 0.0067494

Hazard Index (HI) 67.494

Native American Exposure and Risk Assessment Model



File Help



User Information

Name: Katherine Marsh
 Height (m): 1.75
 Weight (kg): 50
 Age (yr): 35
 Gender: Female

Chemical Information

Name: methylmercury
 Carcinogenicity Status: Non-Carinogenic
 Reference Dose: 0.0001

Update User/Chemical Information

Risk Summary

	Activity	Daily Dose
▶	a HWS) Preparing and consuming raw, dried, smoked, cured, or cooked animal tissues	0.0065594
	a HWS) Preparing and consuming raw, dried, smoked, cured, or cooked animal tissues	0.00019

Activity Entry Controls

Total Daily Dose (mg/kg-day) 0.0067494

Hazard Index (HI) 67.494



File Help

User Information

Name: Katherine Marsh
 Height (m): 1.75
 Weight (kg): 50
 Age (yr): 35
 Gender: Female

Chemical Information

Name: methylmercury
 Carcenogenicity Status: Non-Carinogenic
 Reference Dose: 0.0001

Update User/Chemical Information

Risk Summary

ID	Description	Category	Activity
1	scallop consumption	Animal use and consumption, including fish (impacted by a HWS)	Preparing and co

Activity Entry Controls

New Edit Delete

Total Daily Dose (mg/kg-day) 0.00019

Hazard Index (HI) 1.9



Recommended model work:

- ◆ **Additional characteristics of the modeled individual and their environment may be added.** To make the model more user-friendly, additional characteristics of the modeled individual and their environment may be input. These characteristics may be used to provide default values for certain exposure factors that the user can accept or alter.
- ◆ **The model could be made to account for more advanced exposure scenarios.** Unsteady dermal absorption from the aqueous phase, dermal vapor absorption, liquid phase inhalation, and incidental ingestion of water could be taken into account in future versions of the model.
- ◆ **More activity categories and exposure pathways could be added.** After feedback is received from the Native American community, activity categories and exposure pathways can be removed, modified, clarified, or added to the model.
- ◆ **More case examples are needed.** One case example was provided to demonstrate the basic software capabilities and to illustrate the requirements of the user inputs. Several more case examples may be built for additional activities categories and exposure pathways.
- ◆ **A user manual should be developed that highlights additional case examples, and targets the novice user.** A technically-defensible focus group should be performed with this effort.



Software Development

- ◆ **Essential software development requirement** The Native American Exposure and Risk Assessment Computer Model was created on an accelerated development cycle and has not completed beta-stage testing. As with all software, the first implementation of this computer model will likely have programming errors that may result in abnormal termination (crashes) or logical errors (bugs) that may result in errant risk assessment calculations. Given that the model has not gone through a full quality assurance/quality control (QA/QC) software development cycle, it can not be distributed in its current form to end users until the software has been reviewed and further verified.
- ◆ **Additional file manipulation capacity requirement** Currently the model can only save information for a single user. If one attempts to modify the risk assessment information, the original data will be replaced. To allow for the simulation of more than one user the input/output file system management aspects of the software must be enhanced to enjoy the richness of a typical Windows program whereby the user has the ability to save and load multiple files through the standard windows file selection interface.



- ◆ **Report generation based on model calculations** Currently the model does not generate a report documenting the user, chemical, and activity information in user-friendly form. If the model is to be used in a meaningful capacity, documentation files indicating exposure pathways and associated risk calculations are essential. This capability should be incorporated into future versions of the model so that the user can create and 'print-out' risk assessment input, calculations, reports, and conclusions.
- ◆ **Enhanced user interface** The model in its current form only provides a computer framework for calculation of risk to Native Americans from Hazardous waste sites based on the conceptual model developed and documented by Zender Environmental. Several key calculations such as exposed surface skin area and inhalation rates which are difficult to determine currently must be calculated by hand and entered into the computer model manually. Most of these calculations can be incorporated into the model by enhancing the user interface and augmenting the numerical routines. Additionally, default values for various contact rates and exposure factors can be made to appear as inputs in the pertinent model windows; the user could accept or change these default input values. Updates to the user interface are essential to make it more user-friendly.

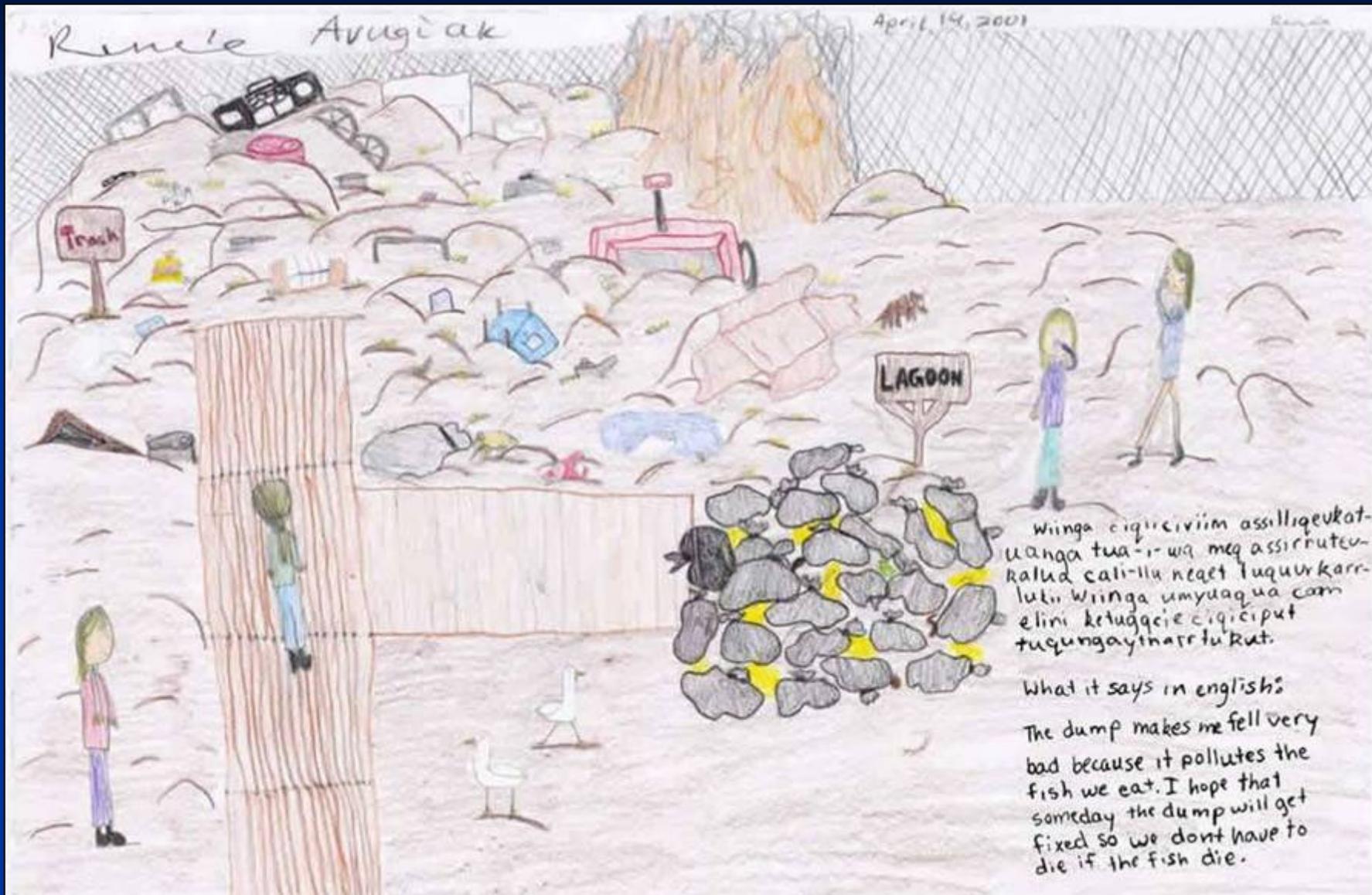
Finally,

- ◆ **Enhance model documentation** While it is very straightforward, the model currently does not have a robust help system to guide the novice user through model usage. To reduce the training time for a new user, and to ensure that model inputs are meaningful, additional 'help' and assistance routines must be built into the computer model.
- ◆ **Dynamic linking to databases** It may be possible to link to government or other chemical databases directly from the software, which would make input of physical and toxicological characteristics of the chemical of interest much easier for the user. If we are given permission to link to government chemical databases, and if the URLs of the databases do not change, the user would simply have to type the name of the chemical of interest or use a pull-down menu to select the chemical of interest, and then would be able to conveniently upload chemical properties into the risk assessment program. There are some chemicals this approach will not work for, if, for example, they are not listed in the databases of interest or physical/toxicological data is lacking. However, the majority of the chemicals of interest could be easily accessed by the risk assessment software.

Renee Arugiak

April 14, 2001

Renee



Wiinga cigiciviim assilliqevkat-
uanga tua-i-wa meq assirru-
rallud cali-llu neqet tuquurkarr-
luti. Wiinga umyuagua cam
elini ketugqie cigiciput
tuqungaytharrtuRut.

What it says in english:
The dump makes me fell very
bad because it pollutes the
fish we eat. I hope that
someday the dump will get
fixed so we dont have to
die if the fish die.