

# **You Are What You Eat:**

## **Evaluating Exposures by Subsistence Exposure Scenarios**



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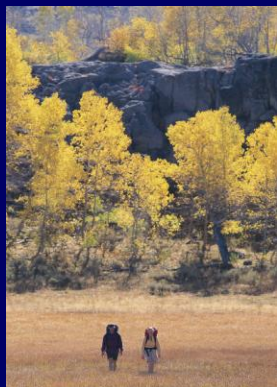
**Santa Ana Pueblo and EPA Region 6  
August 31, 2005**

**Exposure scenarios are narrative and numerical descriptions of how a person interacts with the environment. Any risk-based decision uses exposure factors.**

**Exposure scenarios used to:**

- **Evaluate multipathway exposure and risk (Superfund site);**
- **Evaluate single exposure pathways (water);**
- **Develop environmental codes and standards (Cleanup goals, Water quality standards)**

**Scenario =**



**Where you go**

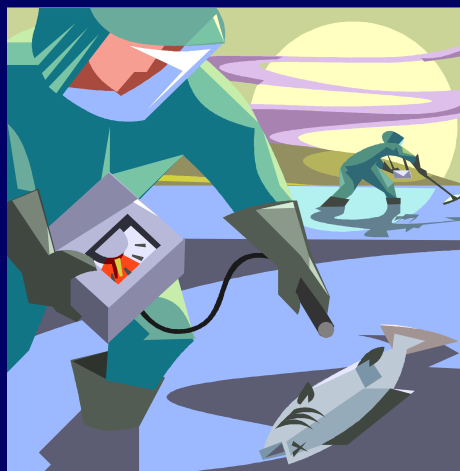


**What you do**



**What you eat**

**Exposure =**



**What contaminants  
are in each medium –  
air, water, soil, food...**

**(Sampled or modeled)**

**+**

**=**

**DOSE**



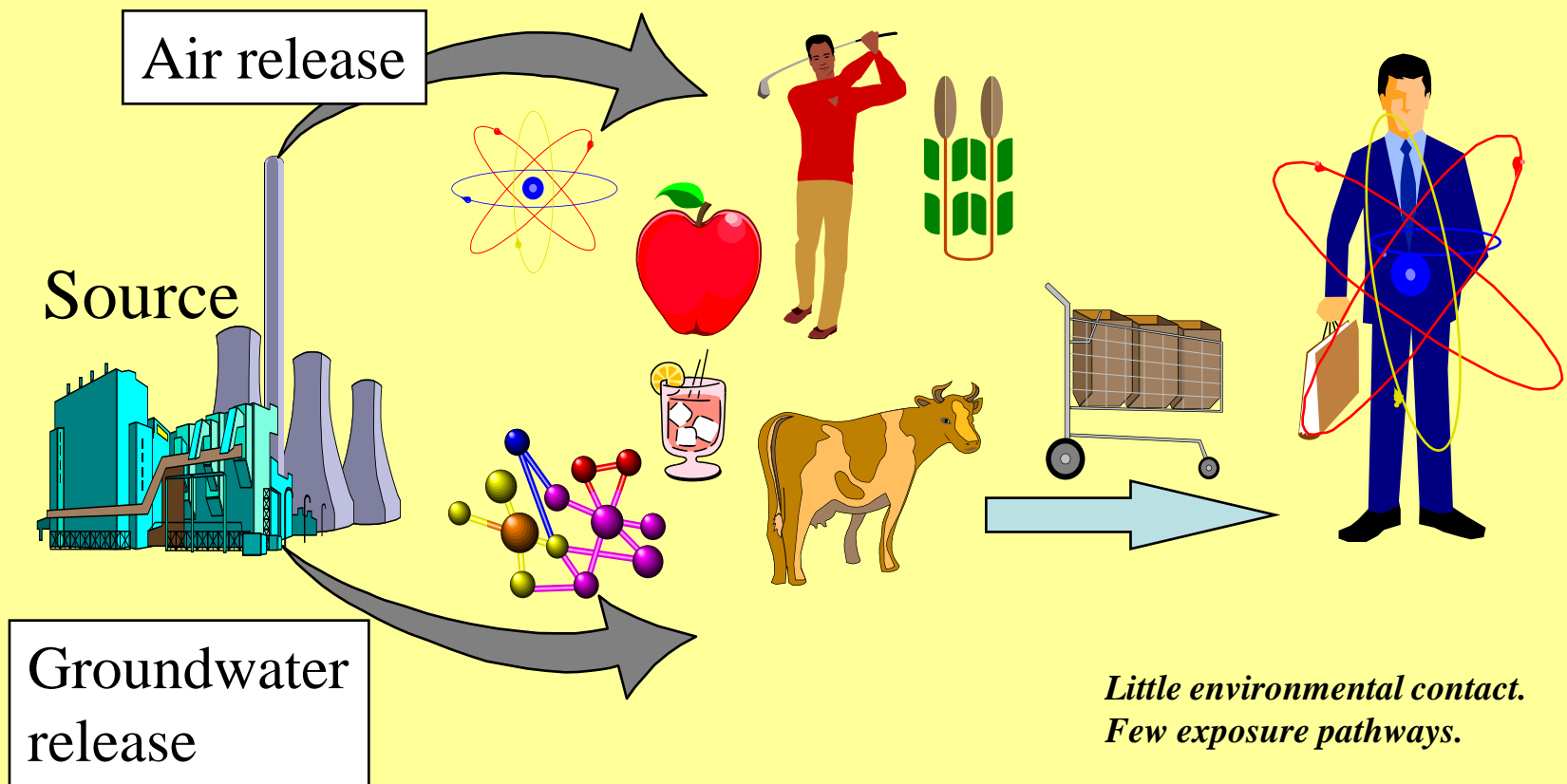
**RISK**

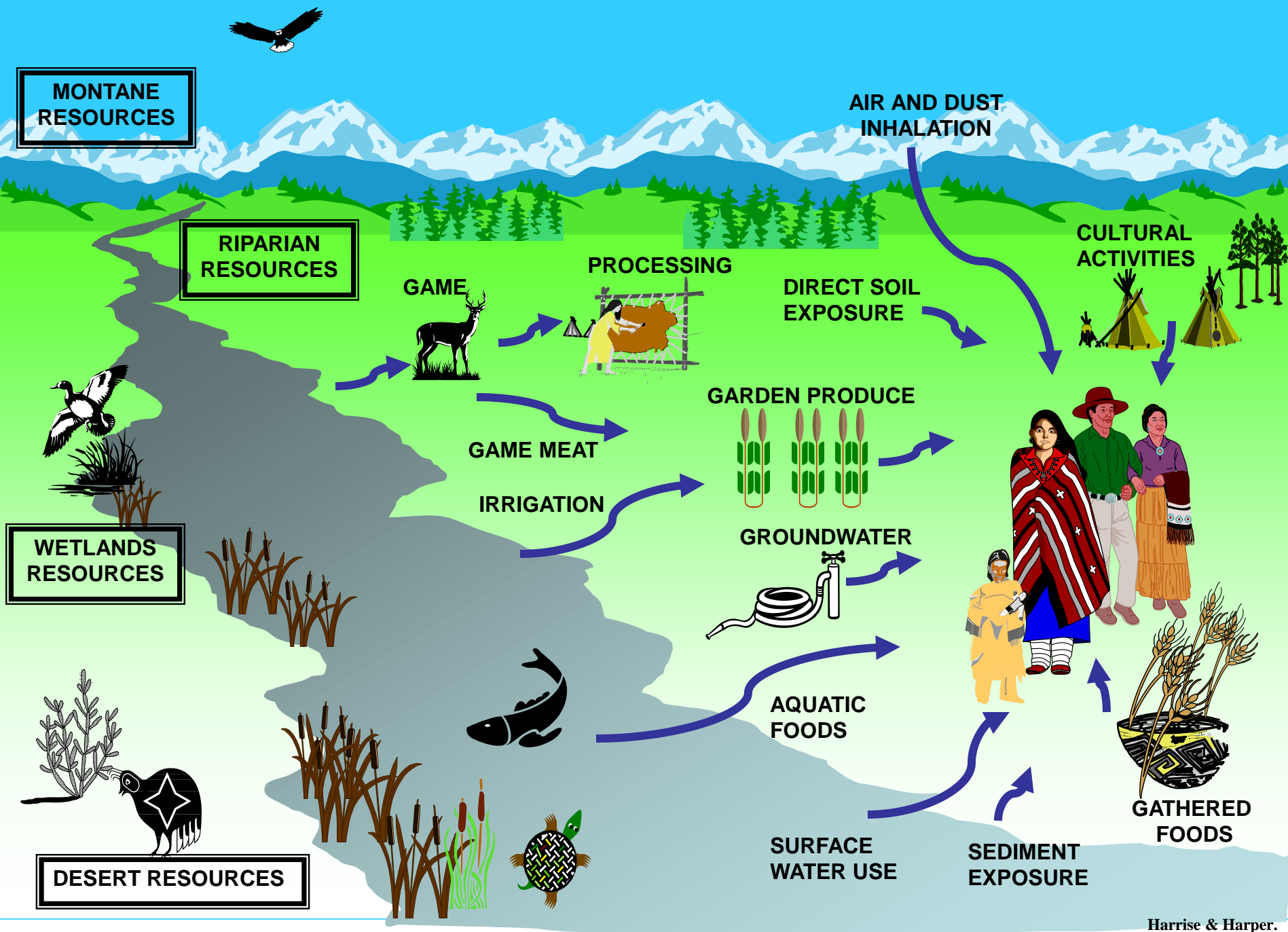


**How toxic is  
each chemical**

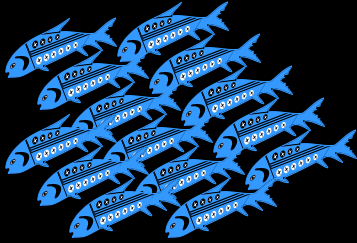
## ***The Risk Assessment Process***

# Typical Exposure Assessment Model - Suburban lifestyle

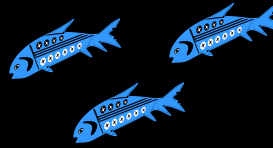




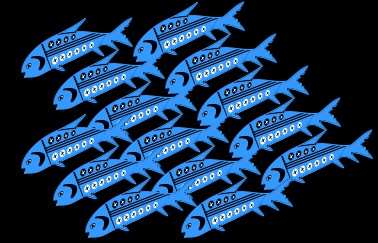
# Defining temporal scope of the scenario



**Past**



**Present**



**Future**

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**What were  
past doses?**

**What are the  
risks now?**

**What could risks  
be in the future?**

Past ingestion rates

Current ingestion rates

Future ingestion rates

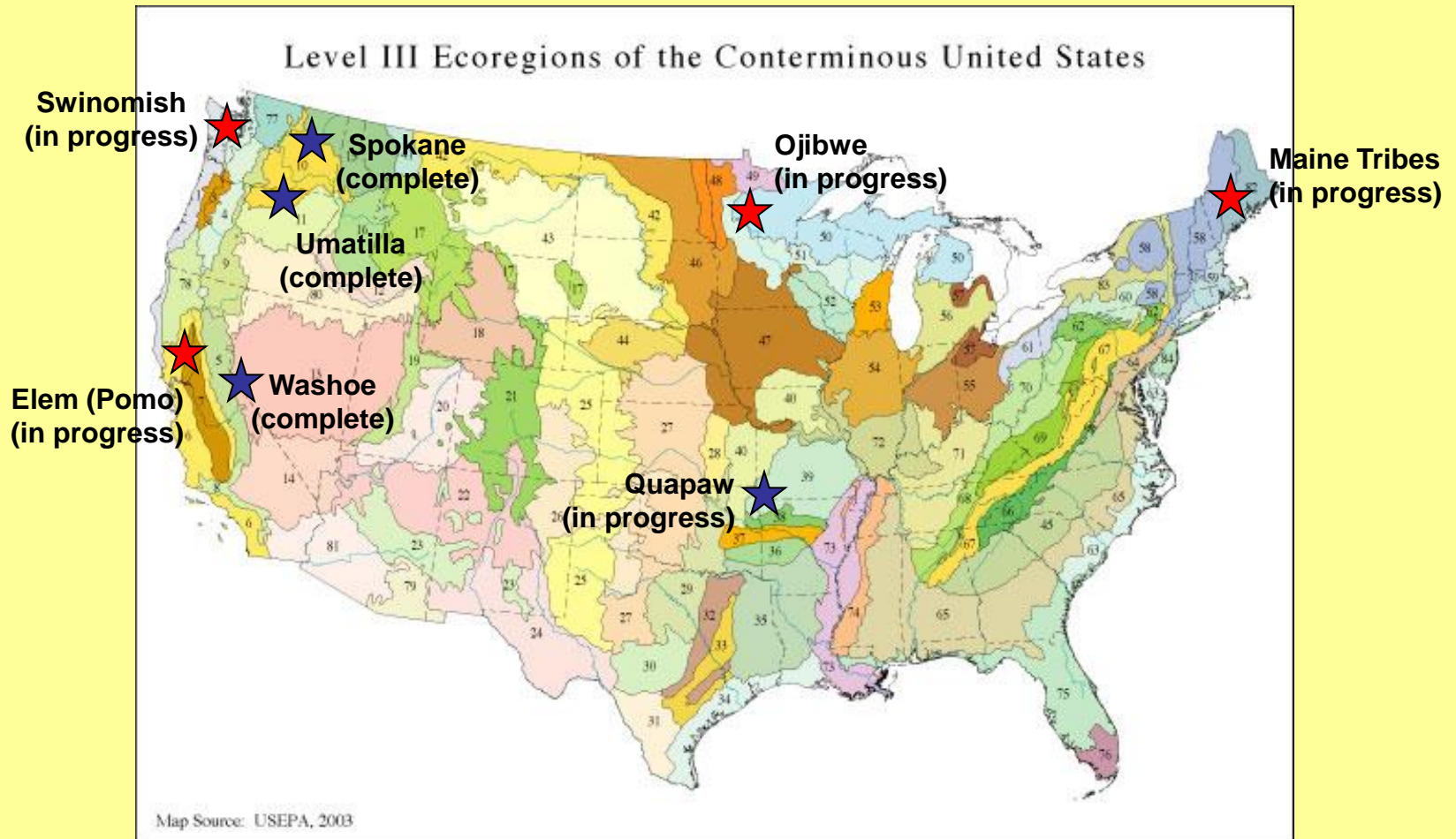
***Original  
conditions***

***Current  
(contaminated)***

***Restored  
(residual)***



# EPA (Omernick) Ecoregions



★ Scenarios – EPA Star Grant (OSU; Harper) and/or mixed funding

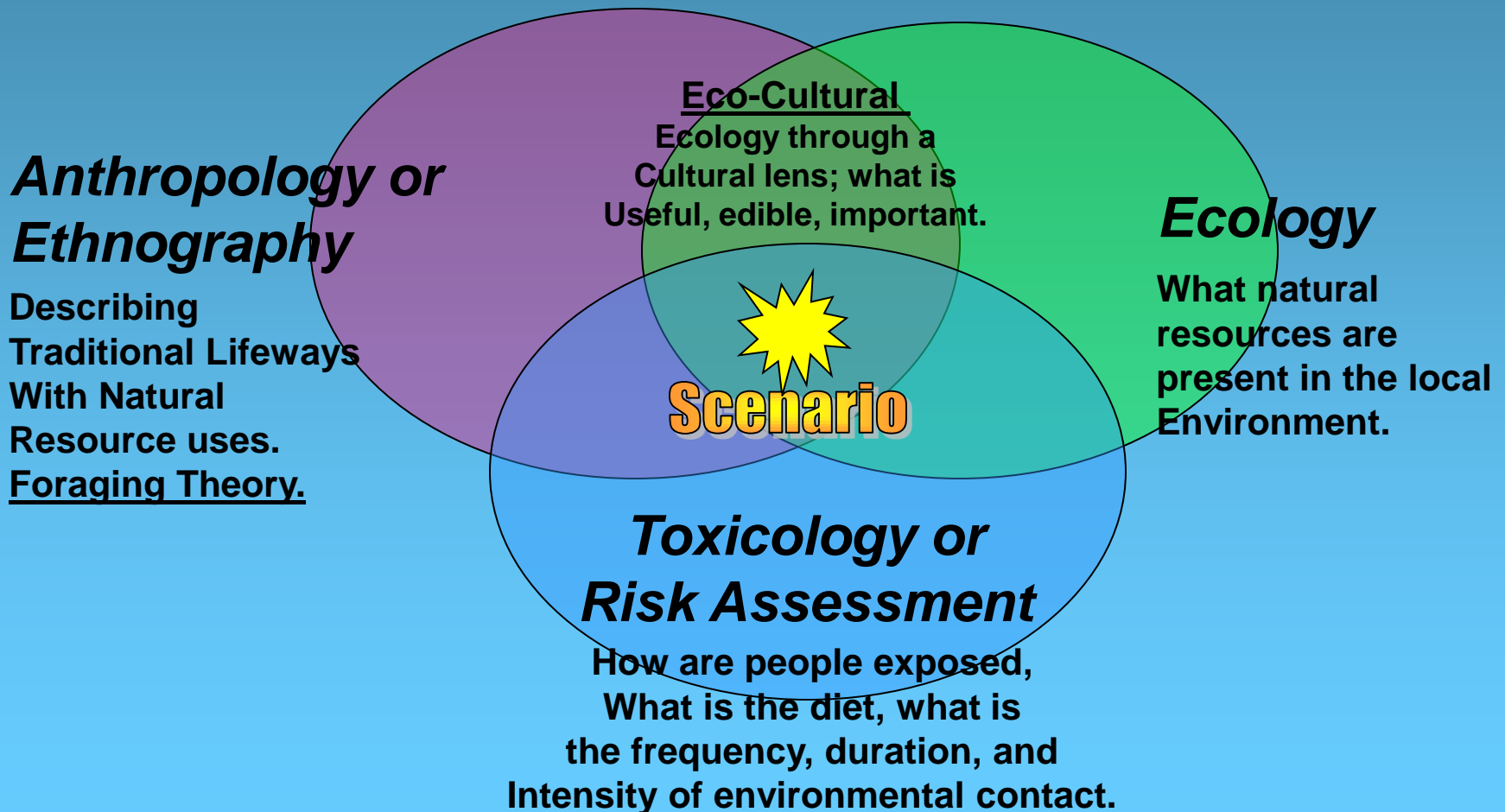
★ Scenarios – other funding sources

# Data Needs

- **What types of information and what level of detail?**
  - **Team – toxicologist, ethnohistorian/anthro, ecologist, tribal cultural/nat. resources.**
  - **Ecological description. Scenarios are habitat-based, first and foremost.**
  - **Tribal lifestyle, general resource use**
  - **TEK, interviews, ethnobotany**
  - **Literature – biomedical, anthro, historical, other.**
  - **Specific dietary studies, foraging theory.**

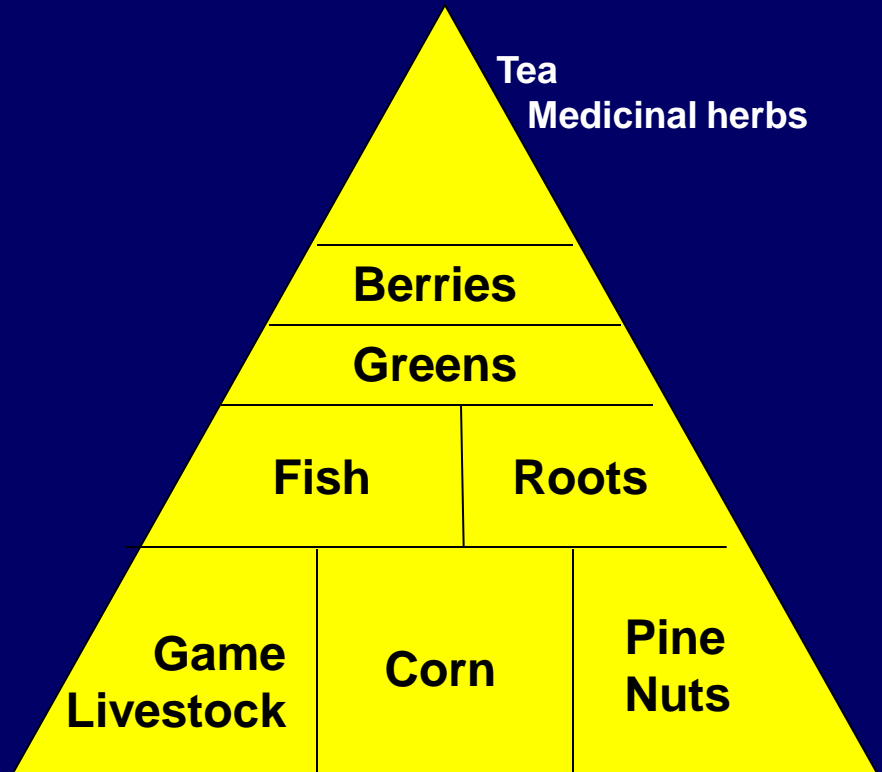


# Tribal Scenarios or Exposure Factors are at the intersection of three areas:



**Risk  
Assessment  
can handle only  
limited detail,  
so we must be  
complete but  
low precision.**

**Not an exhaustive  
species list. Probably  
proprietary. Only major  
staples and most  
important foods and  
medicines as surrogates  
for entire food categories  
and genera.**



**XX Tribe's Food Pyramid  
2500 kcal/day –  
(Quantities of each food group by %)**



## **Columbia River Tribes**

**500 pounds of fish per capita per year (620 grams per day).**

**Boldt decision and extensive documentation**

**NOT  
6.5, 17.5, or 142 gpd.**

# **The Diet – Multiple Lines of Evidence**

- 1. Direct Observation (early explorers and naturalists)**
- 2. Early Records (e.g. traders, fish buying records)**
- 3. Foraging Theories –**
  - Return rates of calories expended vs calories obtained**
  - Ecological-based data – patch choice etc.**
- 4. Ecology and ecoregions, habitat types, potential natural veg.**
- 5. Archaeology – hard vs soft remains, excreta microscopy**
- 6. Paleomedicine – skeletal evidence, bone isotopes**
- 7. Traditional Environmental Knowledge, language, oral history and current use by a subset of tribal members.**
- 8. Ethnobotany**

*"a day in the life of " ... through the seasons, over the years*

## **Hunting**

**Learn skills, TEK**

**Making tools**

**Sweat Purify**

**Vigorous  
activity in  
hunting**

**Pack meat out**

**Process**

**Scrape hides**

**Tan, use other  
parts**

**Cook, smoke,  
dry, eat meat  
and organs**

## **Sweatlodge**

**Learn skills, songs**

**Build lodge from  
natural materials**

**Gather rocks**

**Chop firewood**

**Prepare for use,  
get water**

**Use Lodge, sing,  
drink water,  
inhale steam  
and smudges**

**Close area & fire**

## **Gathering**

**Learn skills, TEK**

**Previous gathering**

**Make baskets, bags**

**Hike to areas**

**Cut, dig, harvest**

**Carry out items**

**Wash, peel, process,  
split, spin, dye**

**Cook and eat or  
make product or  
make medicine**

## **Fishing**

**Learn skills, TEK**

**Make nets, poles,  
platforms, tools**

**Travel to location**

**Catch fish, haul out**

**Clean, can, hard dry,  
soft dry, smoke,  
eat whole fish or  
fillet or liver or soup**

**Return carcasses  
to ecosystem,  
use as fertilizer**

**Soil Ingestion  
Sediment Ingestion  
Water Ingestion  
Inhalation**

# ***Examples of Exposure Factors***

<b><i>Exposure Factor</i></b>	<b><i>Suburban</i></b>	<b><i>Subsistence</i></b>
Drinking water	2 liters/day	2+ L/d
Fish ingestion	17.5 grams/d	up to 2-3 lbs/d
Soil ingestion	50/100 (adult) 200 mg/d (child)	400 mg/d (all ages)
Inhalation rate	20 m <sup>3</sup> /d	30 m <sup>3</sup> /d
Frequency of exposure	varies	continual
Duration of exposure	24-30 yrs	lifetime
Sweat lodge use	NO (showering)	YES

***RESULT: Subsistence lifestyles result in 10 to 1000 times more exposure than suburban lifestyles.***





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