Baseline Human Health Risk Assessment

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TECHNICAL ASSISTANCE SERVICES FOR COMMUNITIES
TASC

Agenda

1. Purpose
2. Process
3. Models and methods
4. Research needed
5. Final report and decision making

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Purpose

Purpose of Baseline Human Health Risk Assessment

- To understand potential risks to human health from PCBs in floodplain soils and sediments
  - Supports site-specific decision making

Process

Risk Assessment Process

Four steps:

1. Hazard identification
2. Exposure assessment
3. Dose-response assessment
4. Risk characterization

Step 1. Hazard Identification

- What chemicals have been released?
  - PCBs
- Where?
  - Upper Hudson River floodplain
- What concentrations?
  - Variable
    - Exposure areas (EAs)
    - Flood frequency units (FFUs)

What Happens When PCBs Are Released into the Environment?

- PCBs tend to:
  - Stick to soil or sediment
  - Wash into bodies of water
  - Stay in the environment for a long time

Where Is the Hazard?

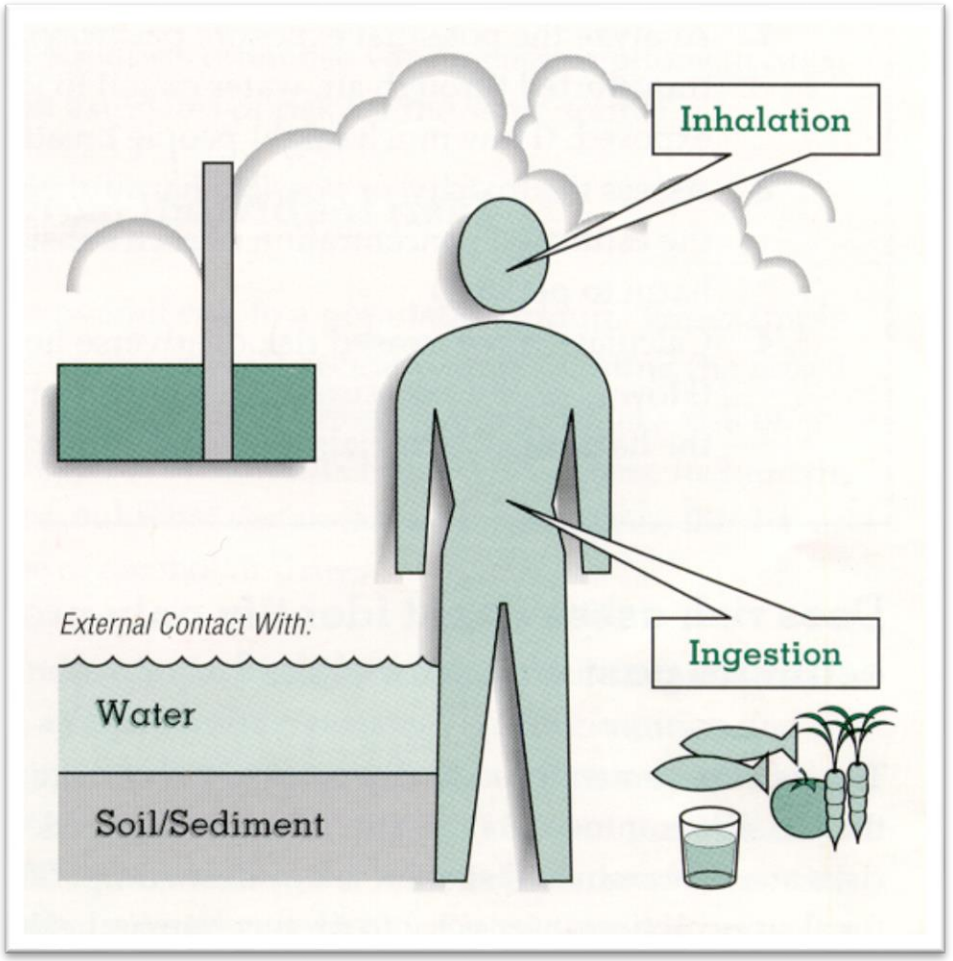
- Patterns detected
  - In general, PCB levels:
    - Are highest close to the river
    - Decrease further out in the floodplain
    - Decrease downstream of Fort Edward
    - Are affected by the frequency of flooding and ground surface elevation
    - Are lower at higher elevations

Step 2. Exposure Assessment

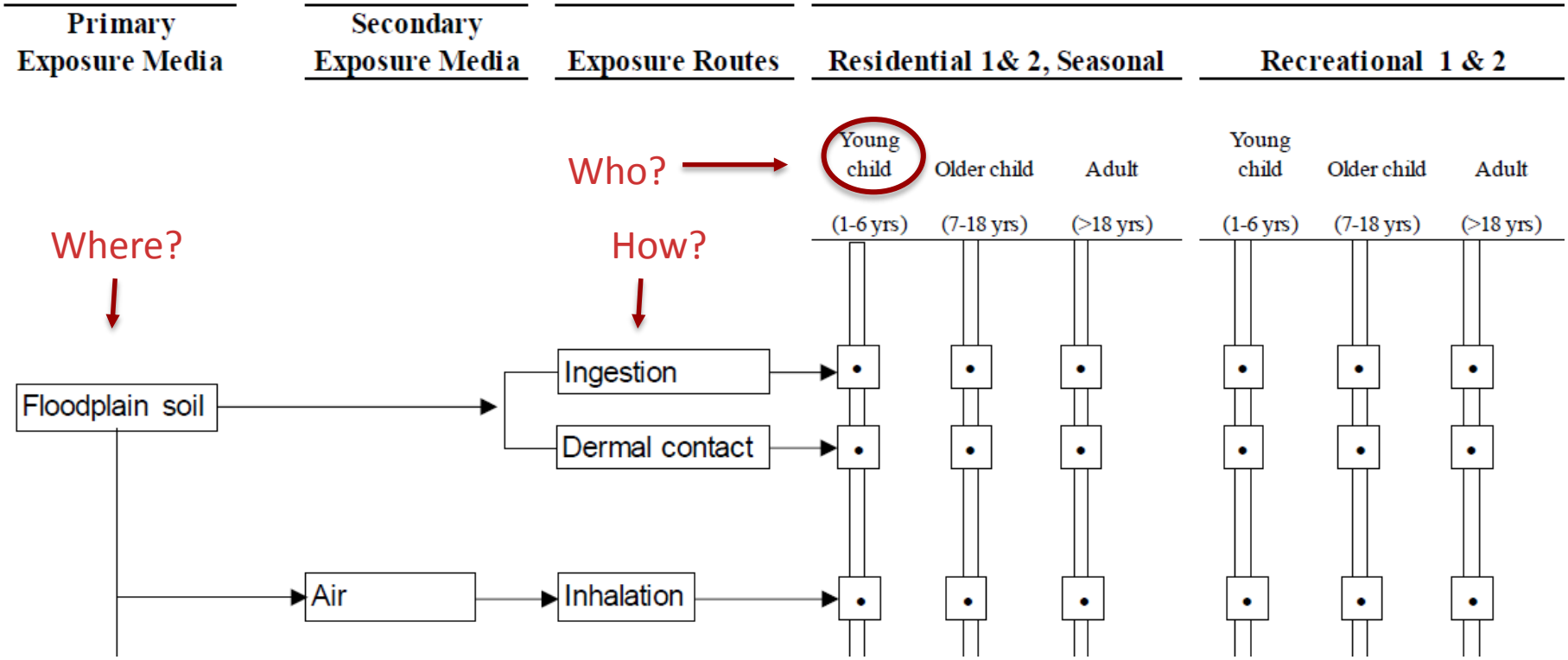
- How are people exposed?
- Who is exposed?
- Where is exposure happening?
- What concentrations are people exposed to?

How Are People Exposed?

- Ingestion
  - Touching contaminated soil or sediment and putting hands in mouth
  - Eating contaminated foods
- Inhalation
- Absorption through skin



Exposure Pathways



RI/FS Work Plan Figure 3-1

Exposure Point Concentrations

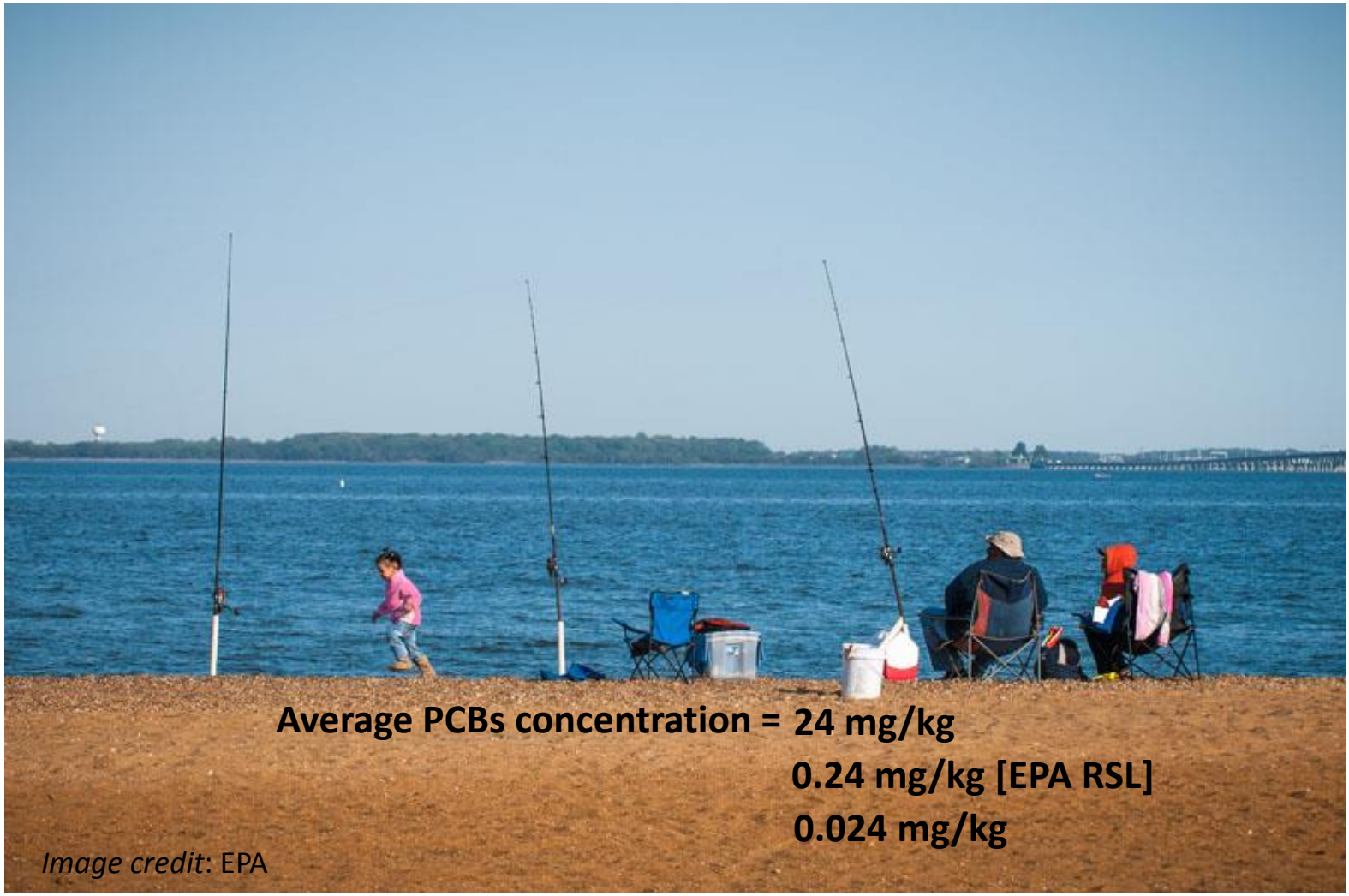


Image credit: EPA

No Exposure = No Risk

Exposure Assessment

- Reasonable maximum exposure (RME) scenario – highest exposure reasonably expected to occur at a site
- Central tendency exposure (CTE) assumptions reflect more typical exposures

Exposure Assessment

Property use scenarios:

- Residential
- Agricultural
- Commercial/industrial
- Recreational

Step 3: Dose-Response Assessment

Estimates relationship between amount of exposure and health effect

Estimates based on:

- health data
- animal studies
- assumptions about long-term exposure

Dose-Response Assessment

- Noncancer health effects:
  - Measured by the hazard index (HI)
    - If HI is less than one, no adverse health effect is expected
  - Reference Dose (RfD)
    - Daily oral exposure not likely to cause adverse noncancer health effects in humans, usually including sensitive subgroups
  - Reference Concentration (RfC)
    - Concentration in air where continuous inhalation is not likely to cause adverse noncancer health effects during a lifetime.

Dose-Response Assessment

- Cancer health effects:
  - Calculated differently than potential for noncancer health effects
  - Risk assessment assumes “no safe threshold value”
  - Risk is expressed as the potential for extra lifetime risk of cancer:
    - $1x10^{-4}$ means a risk of one in ten thousand
    - $1x10^{-6}$ means a risk of one in a million

Step 4. Risk Characterization

Extra risk associated with PCBs present in a defined exposure area

- Based on:
  - hazard identification
  - exposure assessment
  - dose-response assessment
- EPA's default screening value in residential soil
  - 0.24 milligrams per kilogram (mg/kg) of soil

Methods and Models

GE's Approach and Deliverables

1. Screening level assessment (SLA)
   - Is maximum concentration of PCBs in FFUs on tax parcel above or below 0.24 mg/kg?
     - Properties are "in" or "out" for further evaluation
     - Consideration given to any circumstances that warrant further analysis
2. Data gap analysis/data collection

GE's Approach and Deliverables

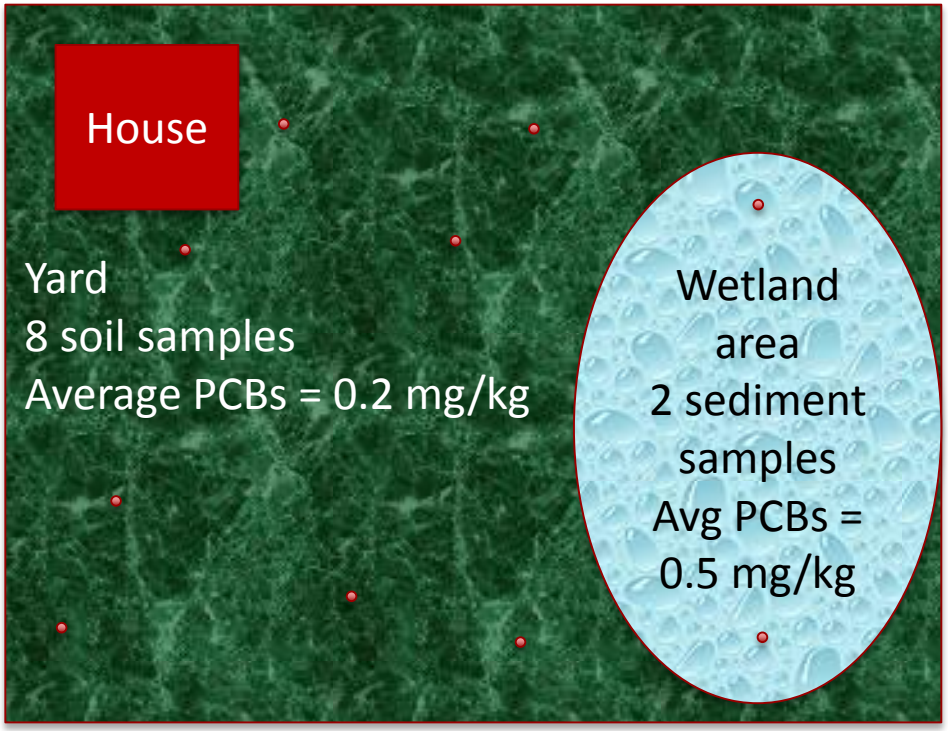
3. Pathway analysis report (PAR)
   - Will determine for each remaining parcel and exposure area :
     - Current and reasonably anticipated future uses
     - Exposure scenario to be evaluated
     - Age groups to be considered
     - Specific exposure parameters and toxicity values to be used
       - Exposure point concentrations (EPCs)

Risk Assessment Refinements

4. Phase 1 risk assessment
   - Uses EPCs from the Pathway Analysis Report
5. Collect additional data to support Phase 2, if needed
6. Phase 2 risk assessment
7. Final report

Refinement Example

- Property A



Research Requirements

Research Needed

- For properties not excluded by screening level analysis
  - Careful exposure analysis is needed
    - Property owner and community input on:
      - Current and future uses
      - Acceptable level of exposure
        - » Reasonable maximum level
        - » Central tendency level
  - Acceptable level of risk needs to be set
    - Property owner and community input on risk acceptance

Final Report and Decision Making

Final Report and Decision Making

Final report to include:

- Overview and summary of entire BHHRA process
  - SLA, Phase 1 and Phase 2
  - Results of data collection after completion of Phase 1
  - Summary of all exposure areas (EAs) evaluated in Phase 2
    - Exposure scenarios and EPCs
    - Estimated risks and hazards associated with each
- A single table, including:
  - All EAs in the study area
  - Maximum concentration used for the SLA
  - General exposure scenario assigned to each EA carried beyond the SLA
  - Phase 1 EPC and risk results
  - Identification of all parcels carried forward into Phase 2
  - Refined and default exposure scenarios assigned to each parcel for Phase 2
  - Phase 2 EPC and risk results
- All information will be provided electronically to EPA, to be incorporated into GIS systems for review and future use.

Final Report and Decision-making

- EPA will continue giving individual handouts to homeowners
  - Summarize results for all EAs owned
  - Indicate whether maximum concentration used in the SLA exceeded conservative screening level
  - Present results of each phase of risk assessment evaluated

Questions and Comments?

CONTACT INFORMATION

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