A case study in tribal-university collaboration: Air sampling on the Swinomish Reservation

Northwest Tribal Engagement in Superfund Research--November 2010

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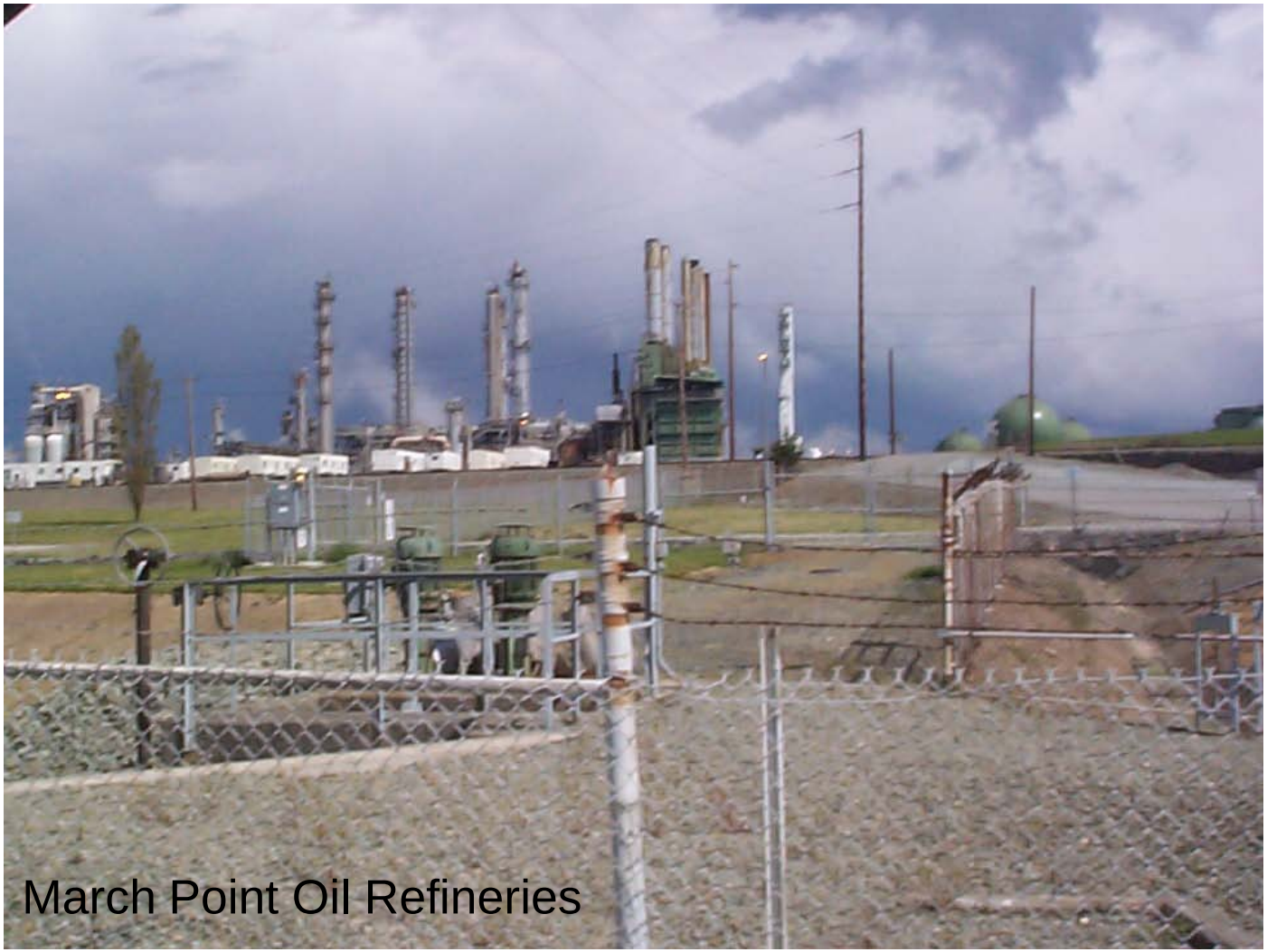
Swinomish Tribal Community Priorities

The Swinomish tribal fishing docks at dawn.

Swinomish Tribal Community Priorities


March Point Oil Refineries

Swinomish Tribal Community Priorities

LISTEN TO:

- **Tribal Community Interest**
- **Tribal Community Chemistry Data Needs**
- **Concern about lack of tribal specific information**
  - **Estimating exposure concentration**

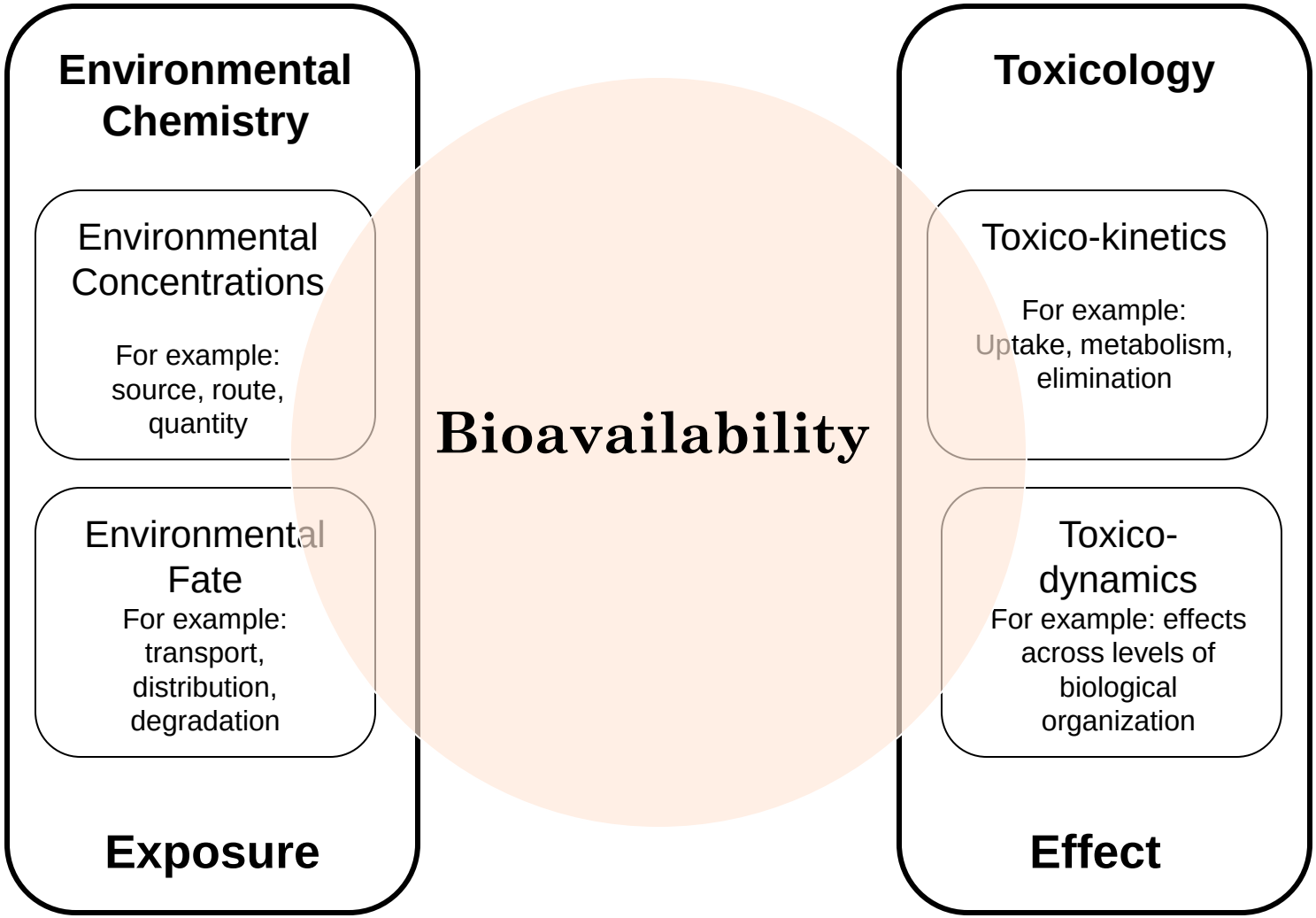
- Understanding Environmental Factors on Diseases…
  - MUST develop new bio-analytical tools to measure exposure
    - L.S. Birnbaum, EHP, 2010

Technology from Superfund Project

- Passive Sampling Devices (PSDs)
- Currently in use samplers for WATER
- ***In-progress*** laboratory & field for AIR PSDs
- Need diversity of field sites to Beta test AIR technology

- Briefly, some background on water Passive Samplers….

Current Development in Superfund project: BRIDGES



Adapted from: Anderson & Hillwalker, Ecotoxicology Bioavailability, Elsevier 2008

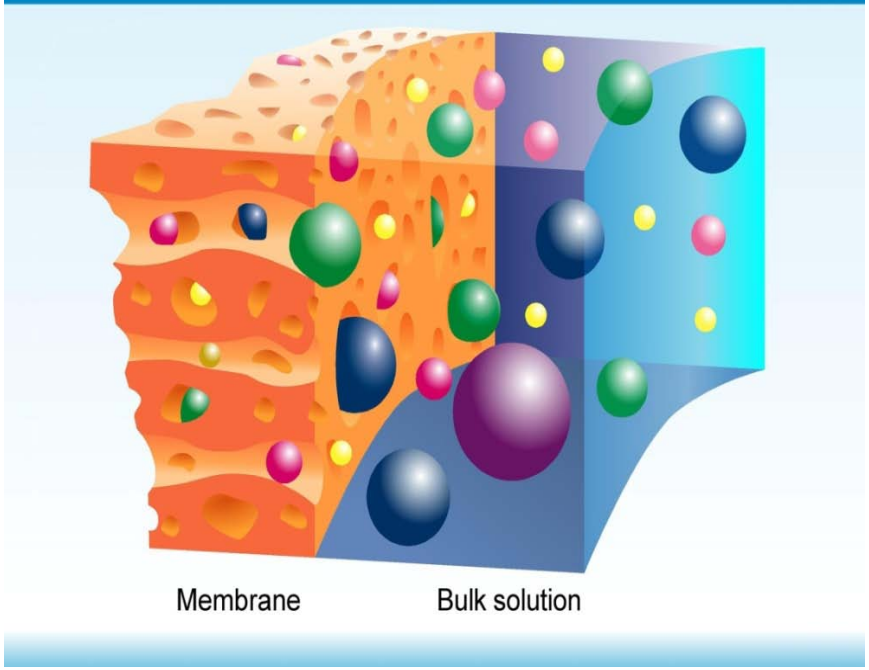
Beyond Chemical Analysis…

Concern about lack of tribal specific information

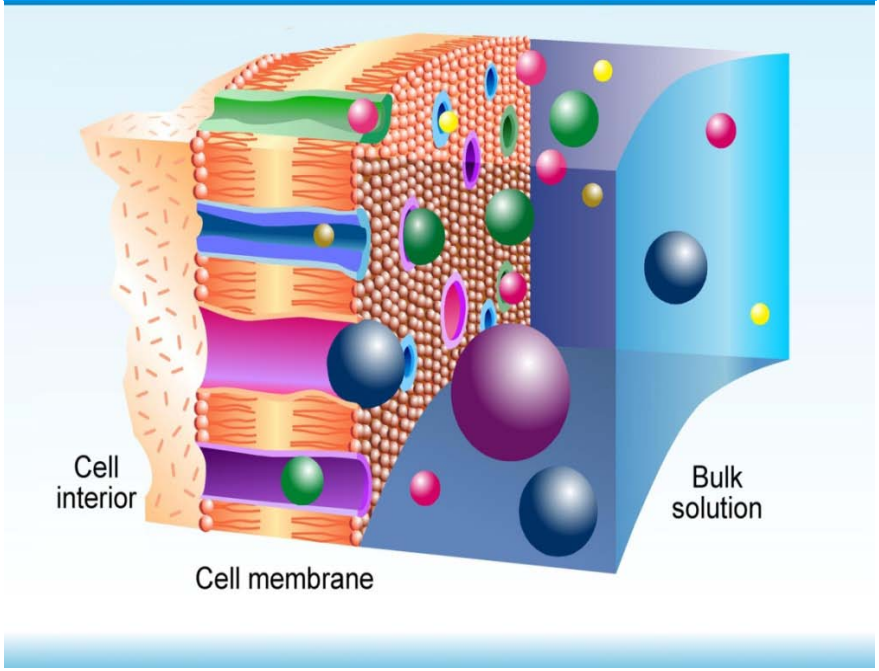
- Exposure dose (exposure concentration)
  - Chemical **mixtures**
  - Predicting environmental fate
- Advantage not to "lump" bioavailable processes
  - Insight will depend on *isolating* processes
- Integration of **space-time** into health risk framework
  - Ambient rough estimate
  - Bio-monitoring transient estimate
- Multi-media (water, air, …)
- Tribal specific locations, unique activities
  - Spatial and temporal questions well suited to technology

Passive Sampling Device
Adequate biological surrogate

LFT Membrane



Cell Membrane



LFTs are polyethylene membranes that, similar to cell membranes, passively uptake freely dissolved (bioavailable) hydrophobic compounds.

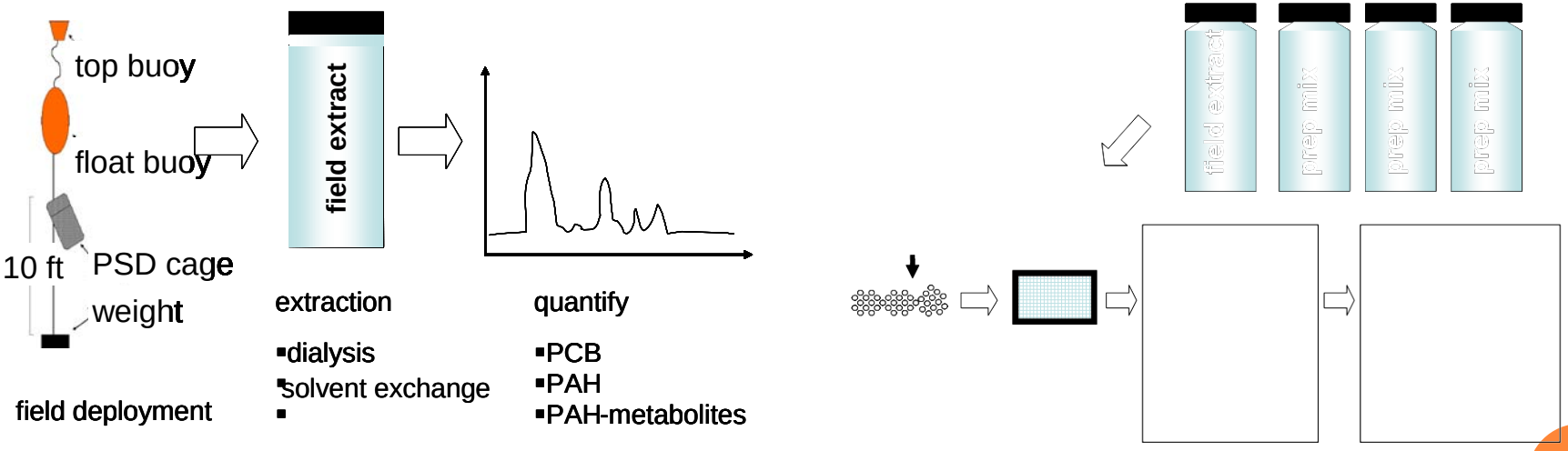
Water Passive sampling devices Deployed at Superfund sites

- **PSD theory:** our LFTs are constructed of sealed polyethylene lay flat tubes which represent an organic lipid membrane. Like a membrane, LFTs discriminate against particulate bound material. As *in situ* time integrative passive samplers, LFTs may be deployed for extended periods of time to sequester contaminants. This **overcomes potential issues such as detection limits, bioavailable fraction collection and fluctuating contaminant concentrations**.

BRIDGES: Reduce exposure uncertainty by analyzing biological responses

BRIDGES extracts with bioassay models (Zebrafish, Ames, etc)

Environmental Exposure

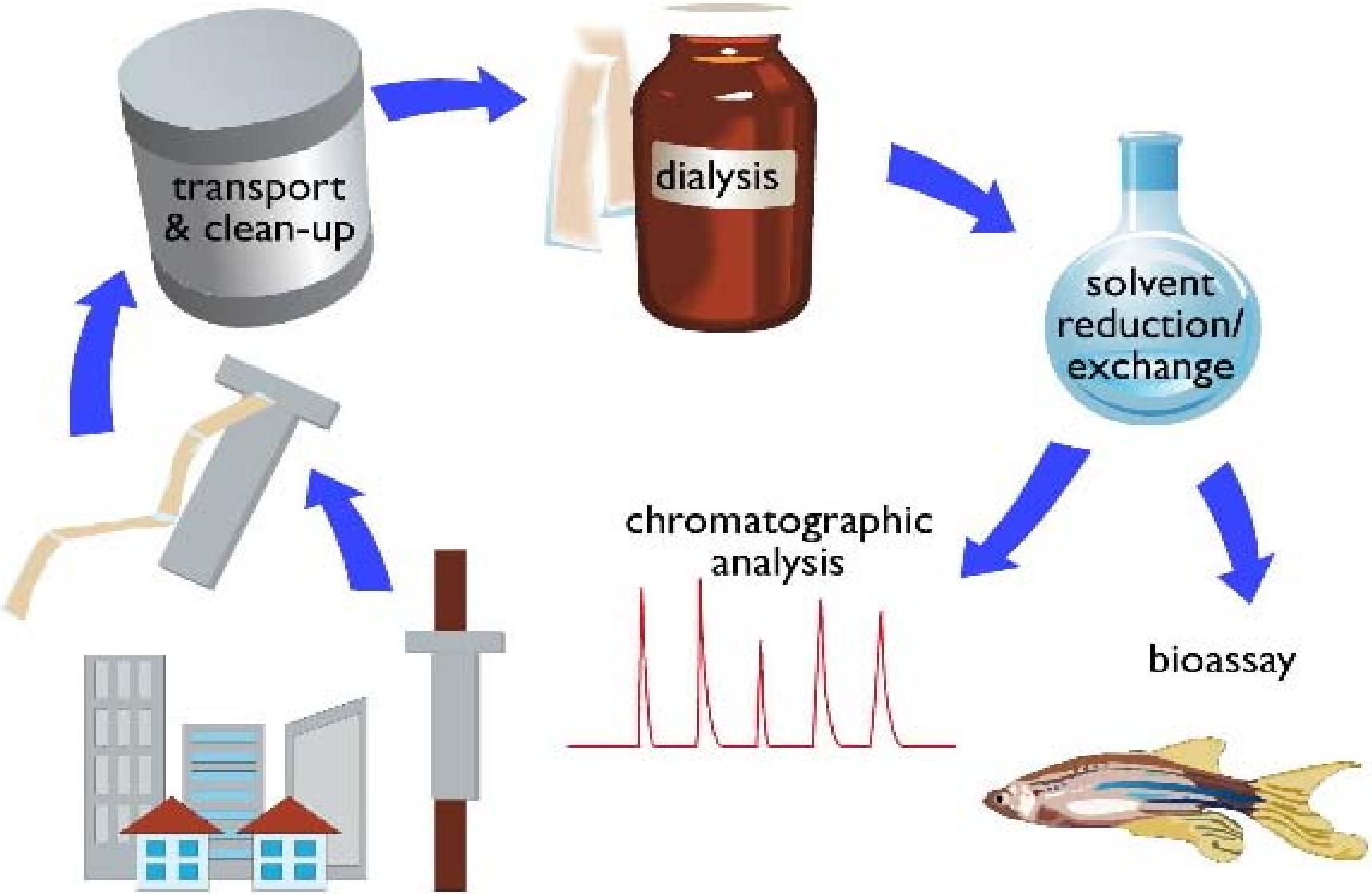


Beyond Chemical Analyses: Bio-Analytical Tools

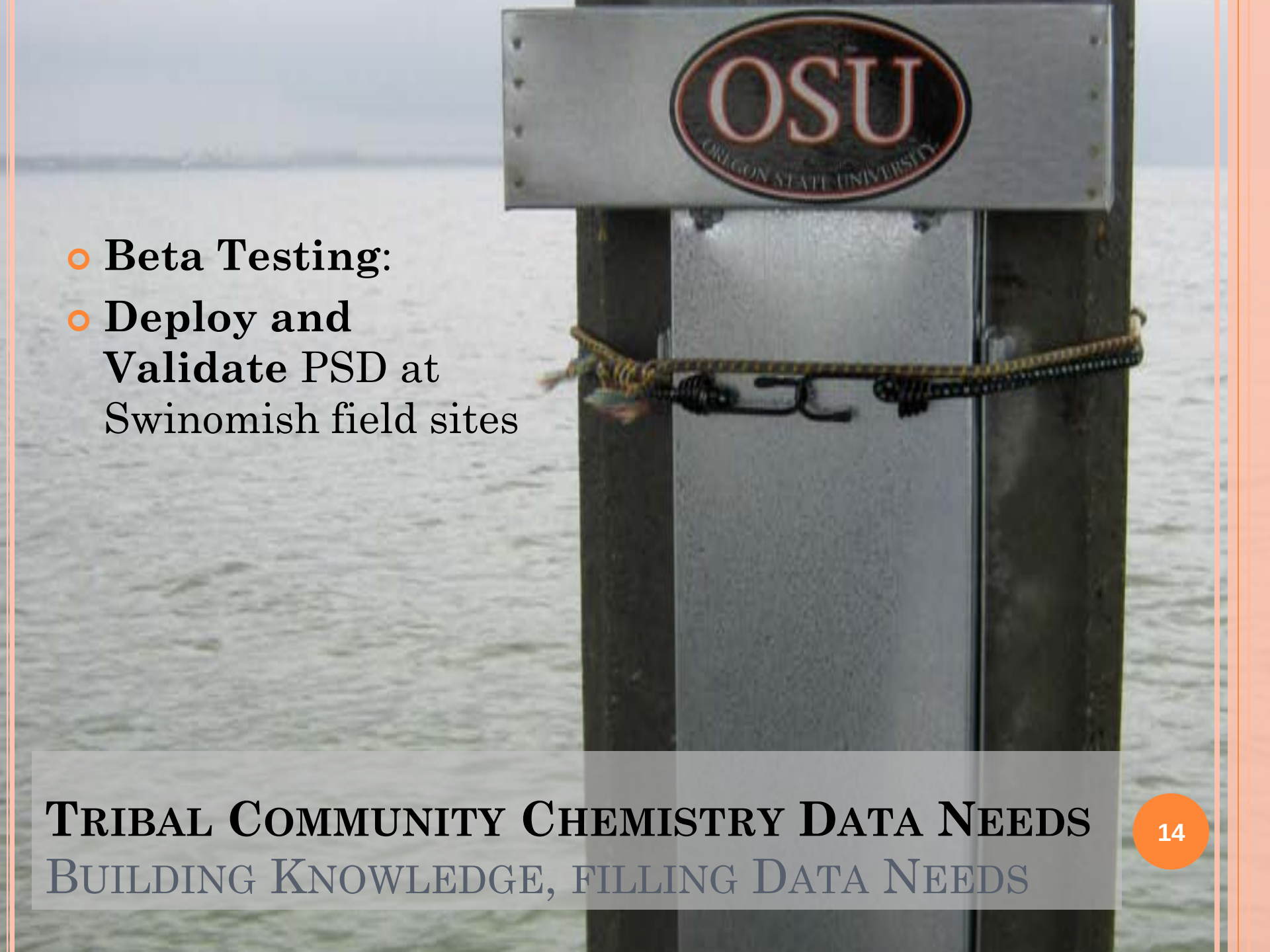
Tribal Community Chemistry Data Needs

Passive Sampling Devices

- Sources, Fate
- Space and Time-integrated flux
- Ambient solute/ vapor concentration
- Bioassays
- Personnel Exposure or Organism Exposure
- Sample Enrichment



Beta Test Air Passive Sampler



- **Beta Testing**:
- **Deploy and Validate** PSD at Swinomish field sites

Tribal Community Chemistry Data Needs

Building Knowledge, filling Data Needs

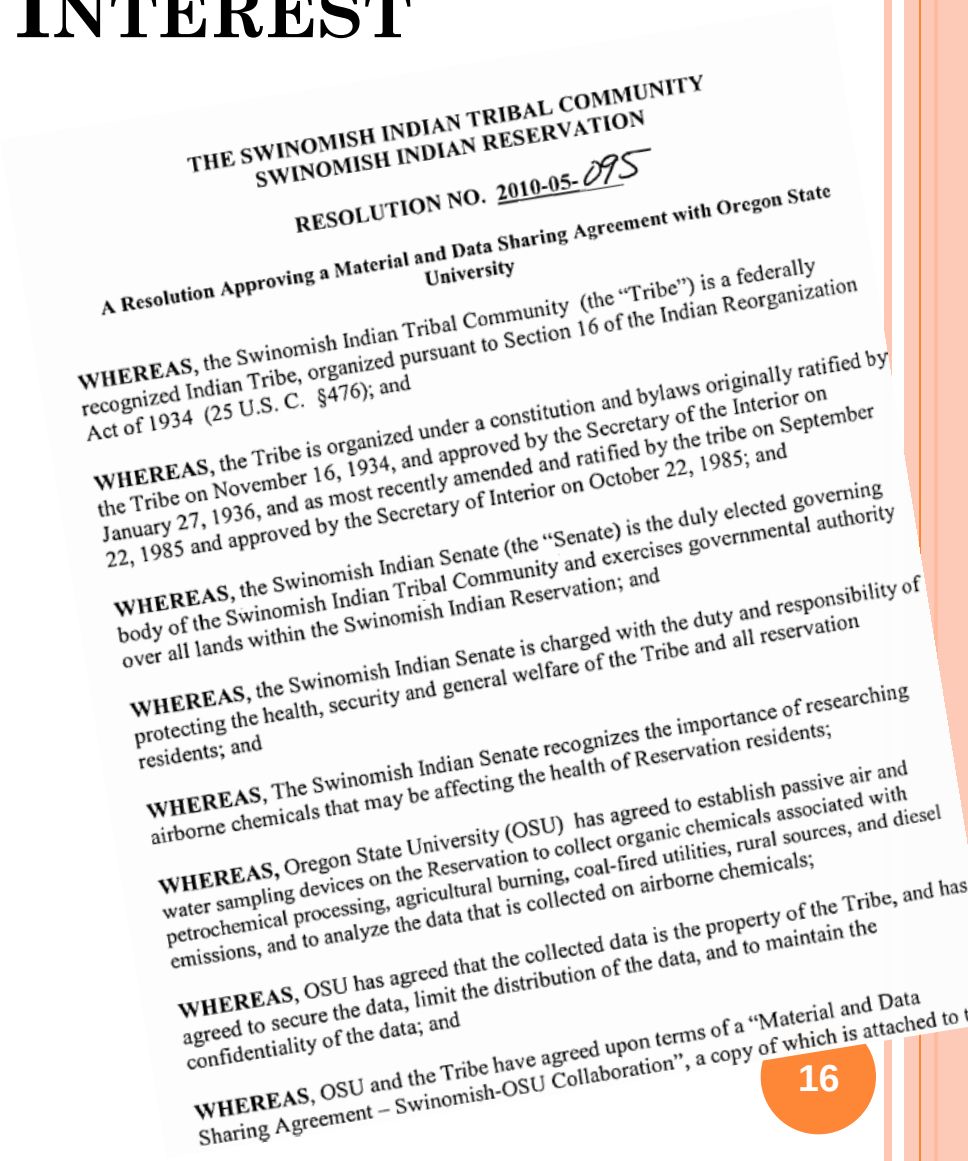
How to make it happen…

Lane Tidwell, Environmental and Molecular Toxicology Graduate Research Associate, Oregon State University. Deploying a Beta Version of the passive sampler in the Gulf of Mexico, 2010.

- Good communication
- Identify field sites of interest to Swinomish Tribal Community
- Set-up **BETA test field sites**
- "Hope" sites are not bulldozed
  - Stay tuned to PART 2

How to make it happen…
Tribal Community Interest

- **Jamie Donatuto & Anna Harding** –drive the IRB process
  - Previous expertise ***critical***
- Material and Data Sharing Agreement
  - Ownership
  - Data access, security
  - Confidentiality
  - ….



THE SWINOMISH INDIAN TRIBAL COMMUNITY
SWINOMISH INDIAN RESERVATION

RESOLUTION NO. 2010-05-095

A Resolution Approving a Material and Data Sharing Agreement with Oregon State University

WHEREAS, the Swinomish Indian Tribal Community (the "Tribe") is a federally recognized Indian Tribe, organized pursuant to Section 16 of the Indian Reorganization Act of 1934 (25 U.S.C. §476); and

WHEREAS, the Tribe is organized under a constitution and bylaws originally ratified by the Tribe on November 16, 1934, and approved by the Secretary of the Interior on January 27, 1936, and as most recently amended and ratified by the tribe on September 22, 1985 and approved by the Secretary of Interior on October 22, 1985; and

WHEREAS, the Swinomish Indian Senate (the "Senate) is the duly elected governing body of the Swinomish Indian Tribal Community and exercises governmental authority over all lands within the Swinomish Indian Reservation; and

WHEREAS, the Swinomish Indian Senate is charged with the duty and responsibility of protecting the health, security and general welfare of the Tribe and all reservation residents; and

WHEREAS, The Swinomish Indian Senate recognizes the importance of researching airborne chemicals that may be affecting the health of Reservation residents;

WHEREAS, Oregon State University (OSU) has agreed to establish passive air and water sampling devices on the Reservation to collect organic chemicals associated with petrochemical processing, agricultural burning, coal-fired utilities, rural sources, and diesel emissions, and to analyze the data that is collected on airborne chemicals;

WHEREAS, OSU has agreed that the collected data is the property of the Tribe, and has agreed to secure the data, limit the distribution of the data, and to maintain the confidentiality of the data; and

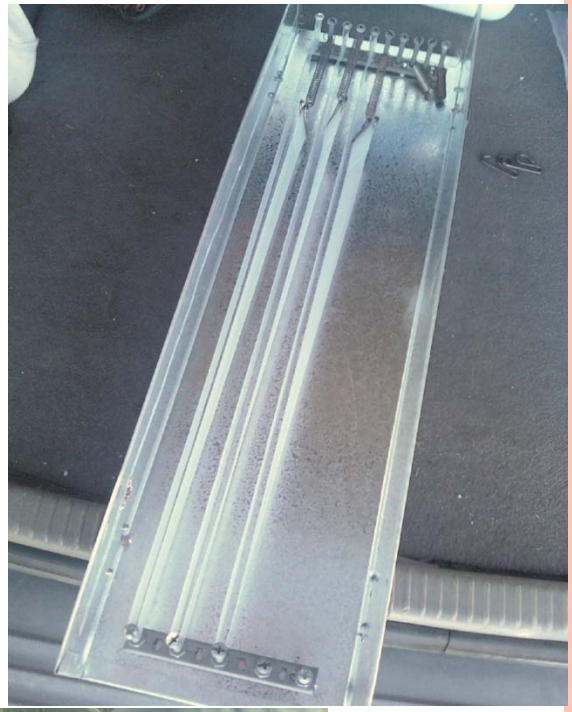
WHEREAS, OSU and the Tribe have agreed upon terms of a "Material and Data Sharing Agreement – Swinomish-OSU Collaboration", a copy of which is attached to t

Building Collaborations & Training

Post Swinomish “leveling” project

Building Capacity

- Train Swinomish staff to deploy and retrieve PSD
  - Develop sampling strategy and pilot field exercise
  - Full chain of Custody, Full Quality Assurance
  - Technical skills for trace residue environmental sampling



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Food Safety & Environmental Stewardship

Interest in Passive Sampling Devices
PSD provided to SBR Researchers upon request

- **Passive Sampling Devices Attributes:**
  - sequesters specific fraction (dissolved, bioavailable)
  - comparative data rapidly developing
  - iterative (captures episodic events)
  - composite without mechanical equipment or on-site power requirements
  - no seasonal issues with PSD compared w/ organisms
  - very low detection limits possible with relative analytical ease
  - minimizes decomposition or chemical change transport/storage
  - does not lump biological processes
  - Less expensive
  - Easier to replicate spatially
  - Greener technology
  - adequately mimics biological
  - not as many negatives as organisms with more positives than grabs…
  - *in-situ* assessment of environmental contaminants that are most biologically relevant
  - have ability to use in bio-assays
  - easily able to do exposure concentration dependent bio-assays

- **Using PSDs for Risk Assessment**
- Advantages
  - Inexpensive
  - Easy to analyze
  - Site specific
  - Bio-available fraction
  - No metabolic activity
  - Nondestructive

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