

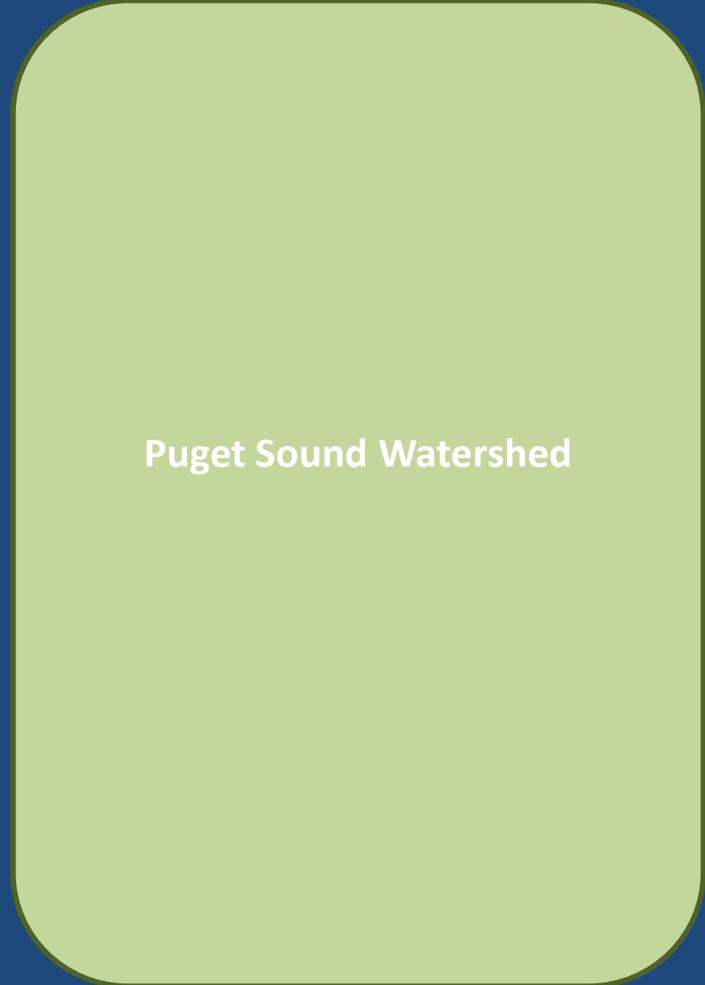
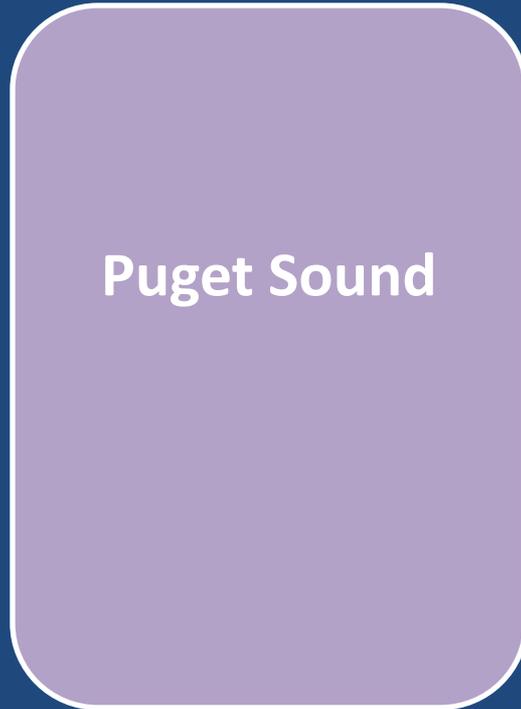
# PCB Sources and Pathways Overview

PCB CAP Advisory Committee

January 14 2014

# Puget Sound Toxic Chemical *Delivery*

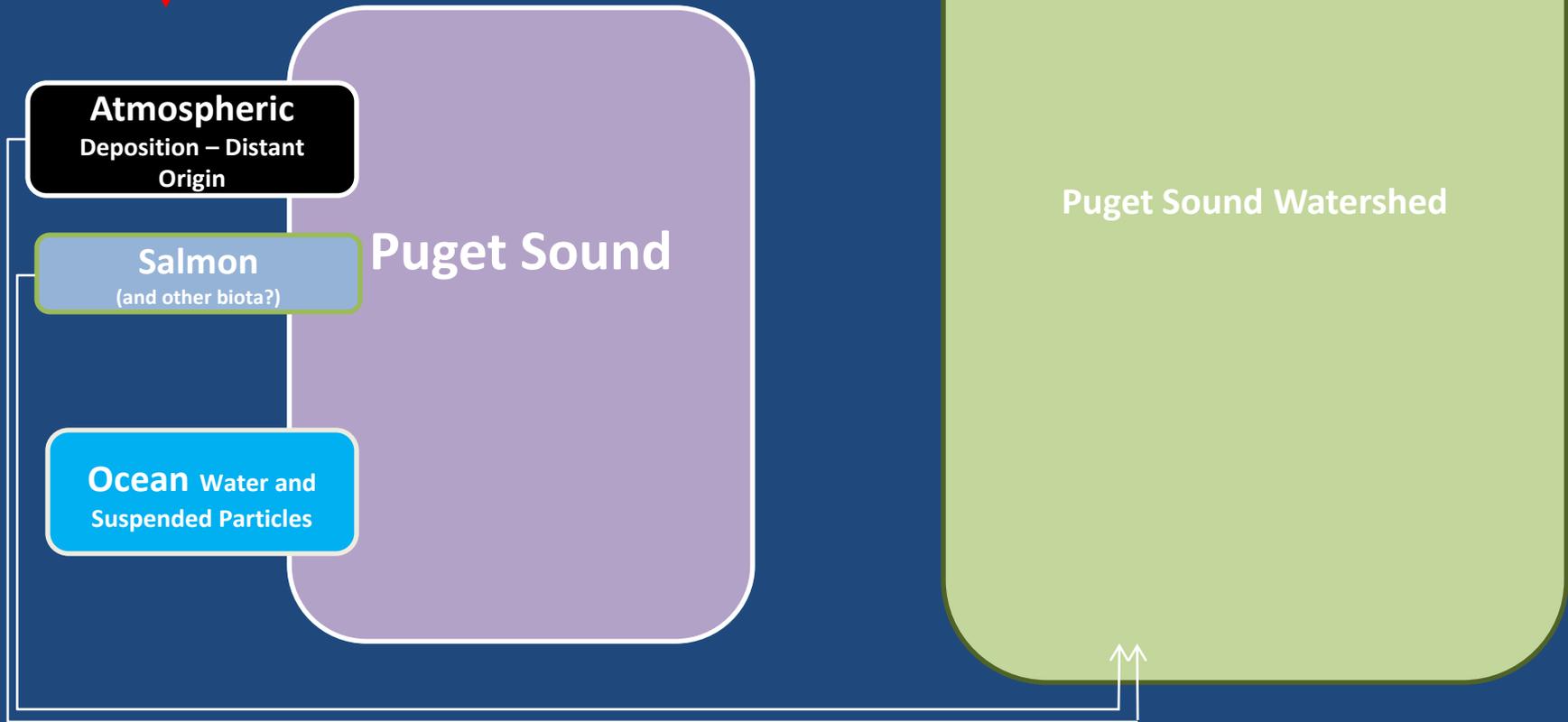
*Conceptual Model*



# Puget Sound Toxic Chemical *Delivery*

*Conceptual Model*

Out of Basin  
Pathways



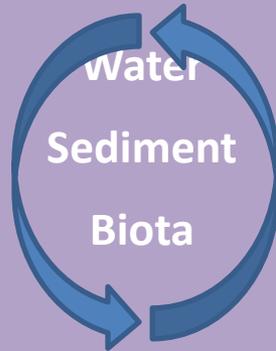
# Puget Sound Toxic Chemical *Delivery*

*Conceptual Model*

Internal  
Pathways



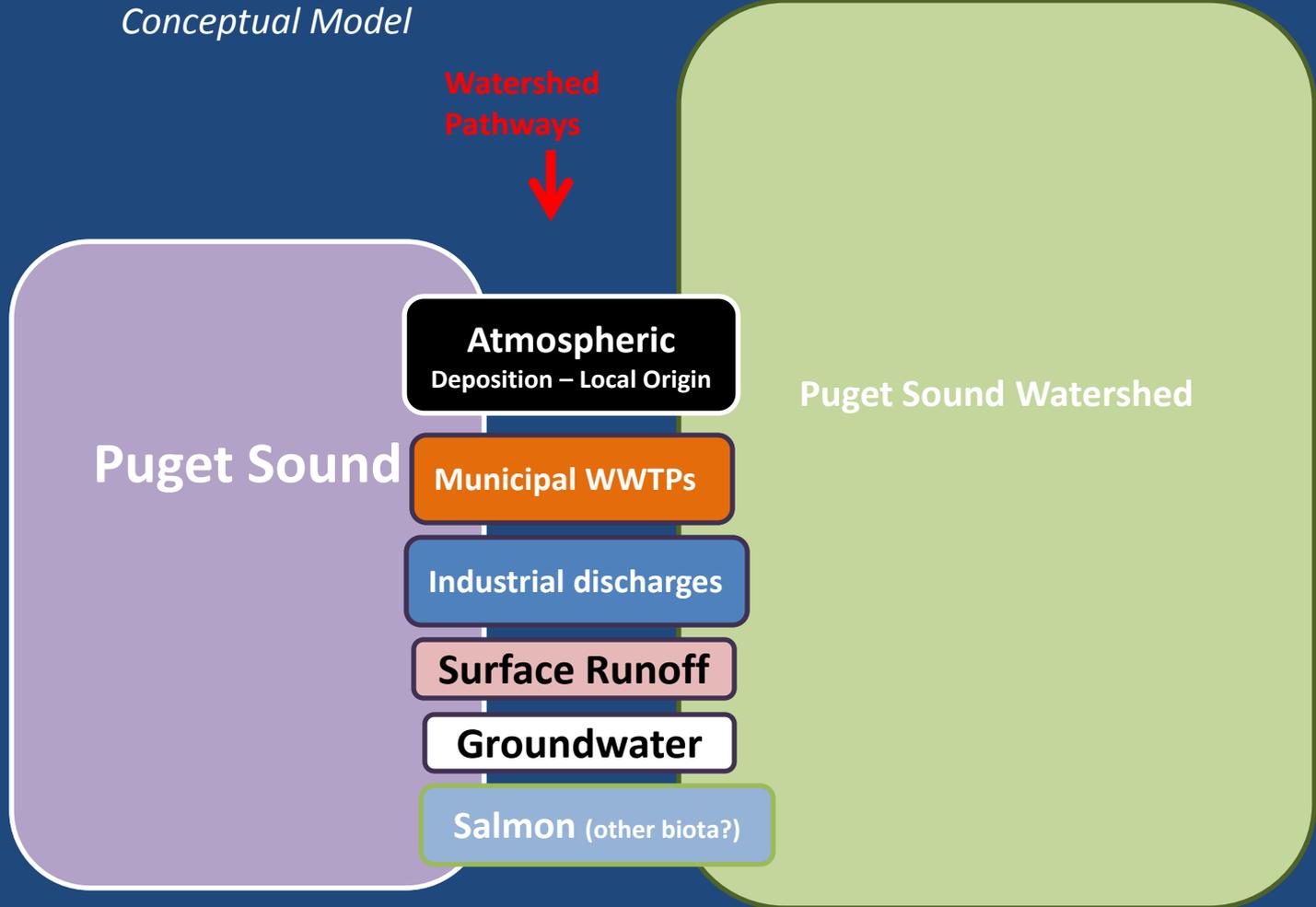
Puget Sound



Puget Sound Watershed

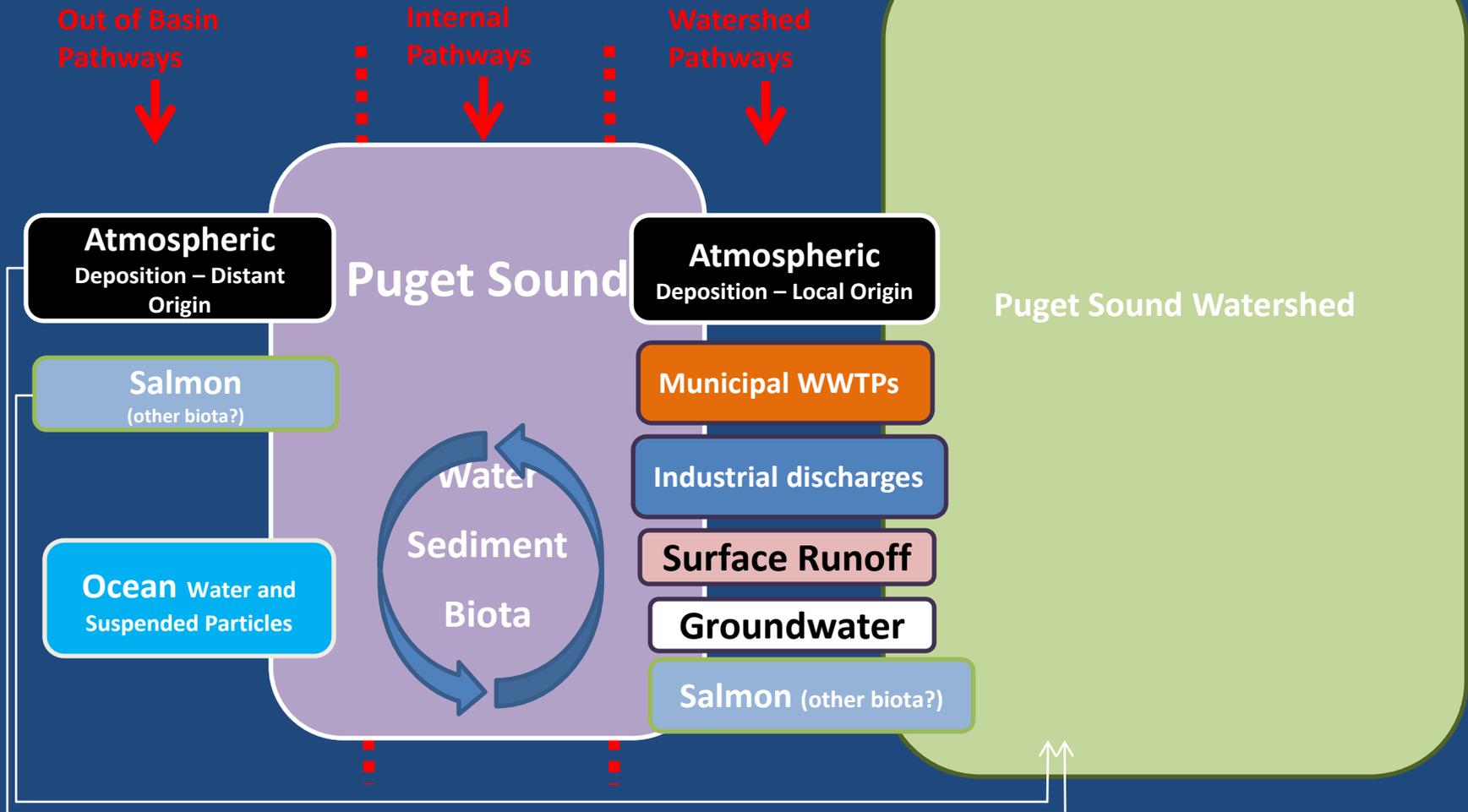
# Puget Sound Toxic Chemical *Delivery*

*Conceptual Model*



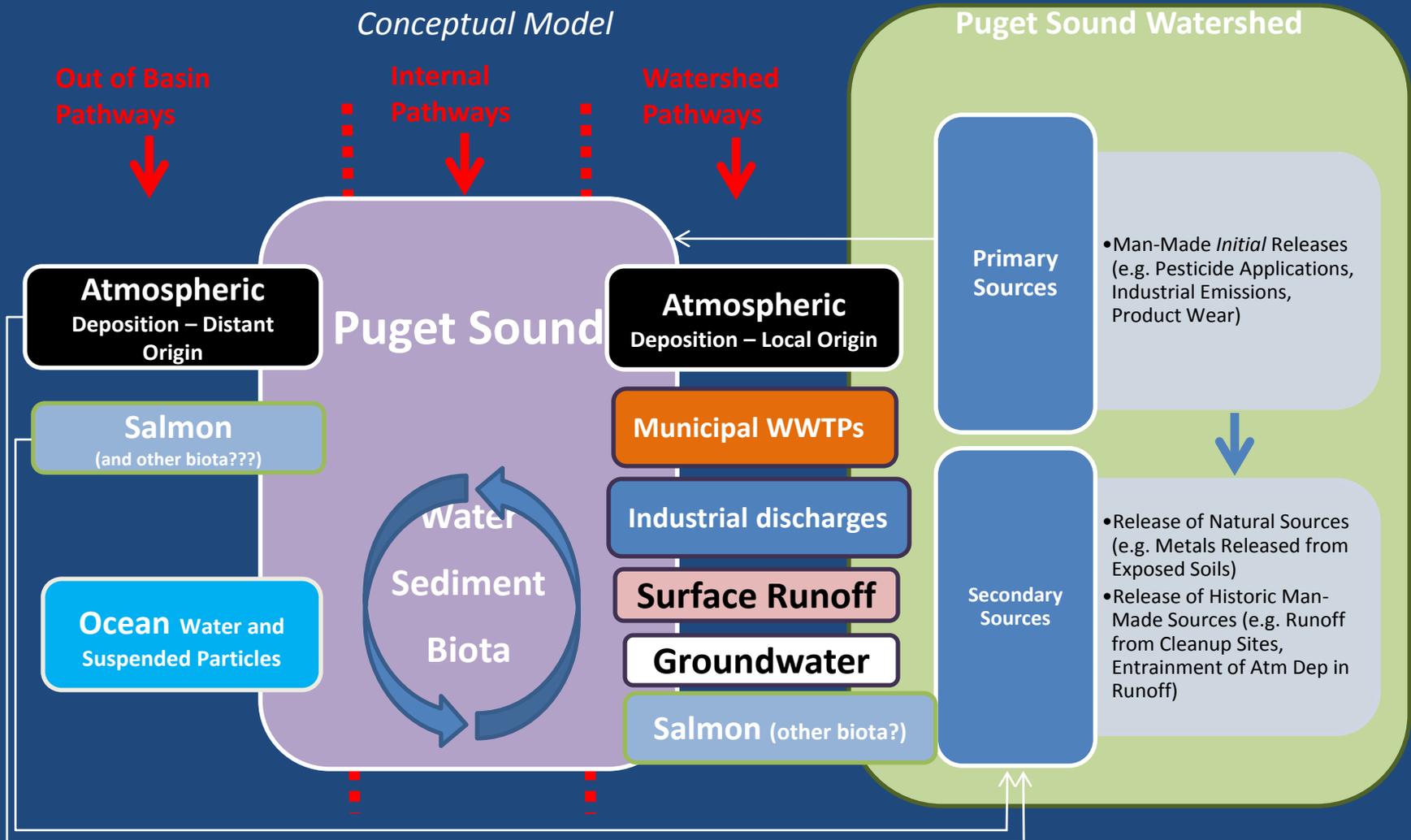
# Puget Sound Toxic Chemical Delivery

## Conceptual Model



# Puget Sound Toxic Chemical *Delivery*

## Conceptual Model



Out of Basin Pathways

Internal Pathways

Watershed Pathways

Puget Sound Watershed

Primary Sources

- Man-Made *Initial* Releases (e.g. Pesticide Applications, Industrial Emissions, Product Wear)

Secondary Sources

- Release of Natural Sources (e.g. Metals Released from Exposed Soils)
- Release of Historic Man-Made Sources (e.g. Runoff from Cleanup Sites, Entrainment of Atm Dep in Runoff)

Atmospheric Deposition – Distant Origin

Salmon (and other biota???)

Ocean Water and Suspended Particles

Puget Sound

Water

Sediment

Biota

Atmospheric Deposition – Local Origin

Municipal WWTPs

Industrial discharges

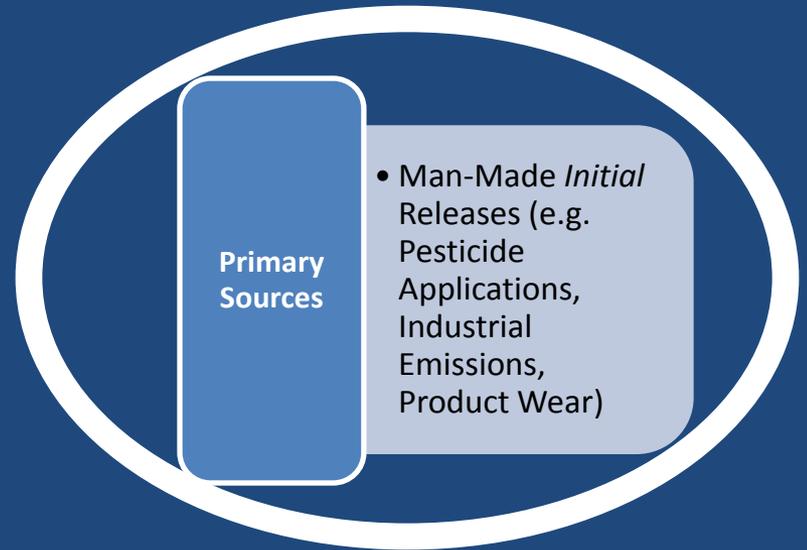
Surface Runoff

Groundwater

Salmon (other biota?)

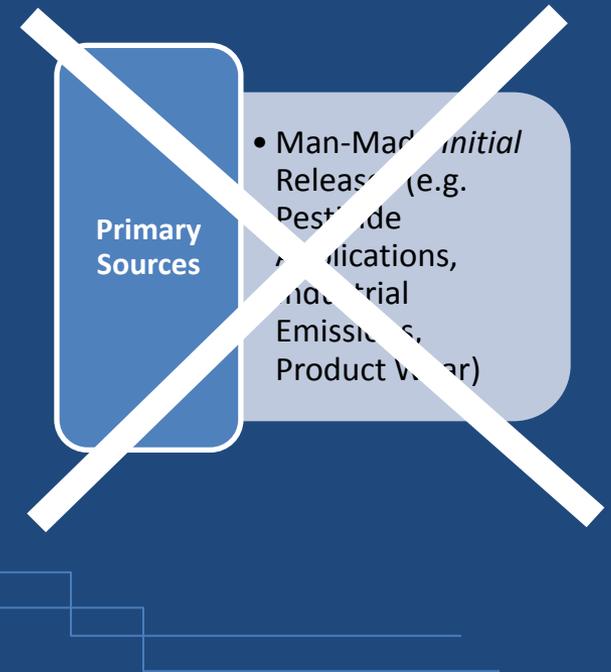
# Sources

- **What do we mean by *Primary Source*?**
  - *The source from which a COC is initially released to environmental media or released in a form which can be mobilized and transported in an environmental pathway*
  - **Examples of Primary Sources are:**
    - PCBs from transformer leakage
    - PCBs from residential trash burning
    - Copper from brake pad wear
    - Triclopyr from roadside ditch application
    - PBDEs from fabric washing

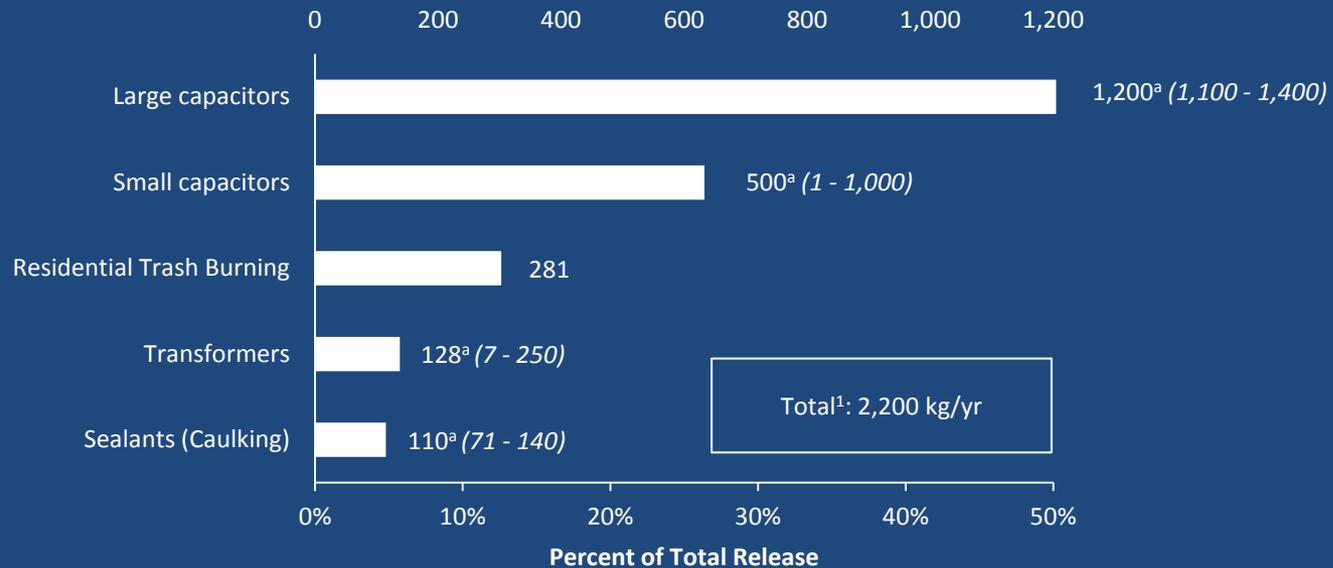


# Pathways

- **These are Delivery Pathways, *not* Primary Sources:**
  - Atmospheric deposition
  - Surface runoff
  - Municipal WWTPs
  - Industrial discharges
  - Groundwater



# Estimated PCB Releases to the Puget Sound Basin (Kg/yr)



Source: Puget Sound Toxic Chemical Assessment, 2011

1= Sum of best estimate. Best estimates are either the mean, mid-point, median or most reasonable estimate

A= Mid-point of range

# Estimated PCB Loading to Puget Sound (Kg/yr)

| Pathway            | 25th | Median | 75th |
|--------------------|------|--------|------|
| Surface Runoff     | 2.6  | 5.3    | 16   |
| Air Deposition     | 0.68 | 1.3    | 3.8  |
| WWTP               | 0.13 | 0.34   | 1.8  |
| Ocean Exchange (a) | -1.4 | 0.8    | 0.6  |
| Salmon (b)         | 0.27 | 0.27   | 0.27 |
| Groundwater        | NA   | NA     | NA   |
| Total              | 2.3  | 8.0    | 22   |

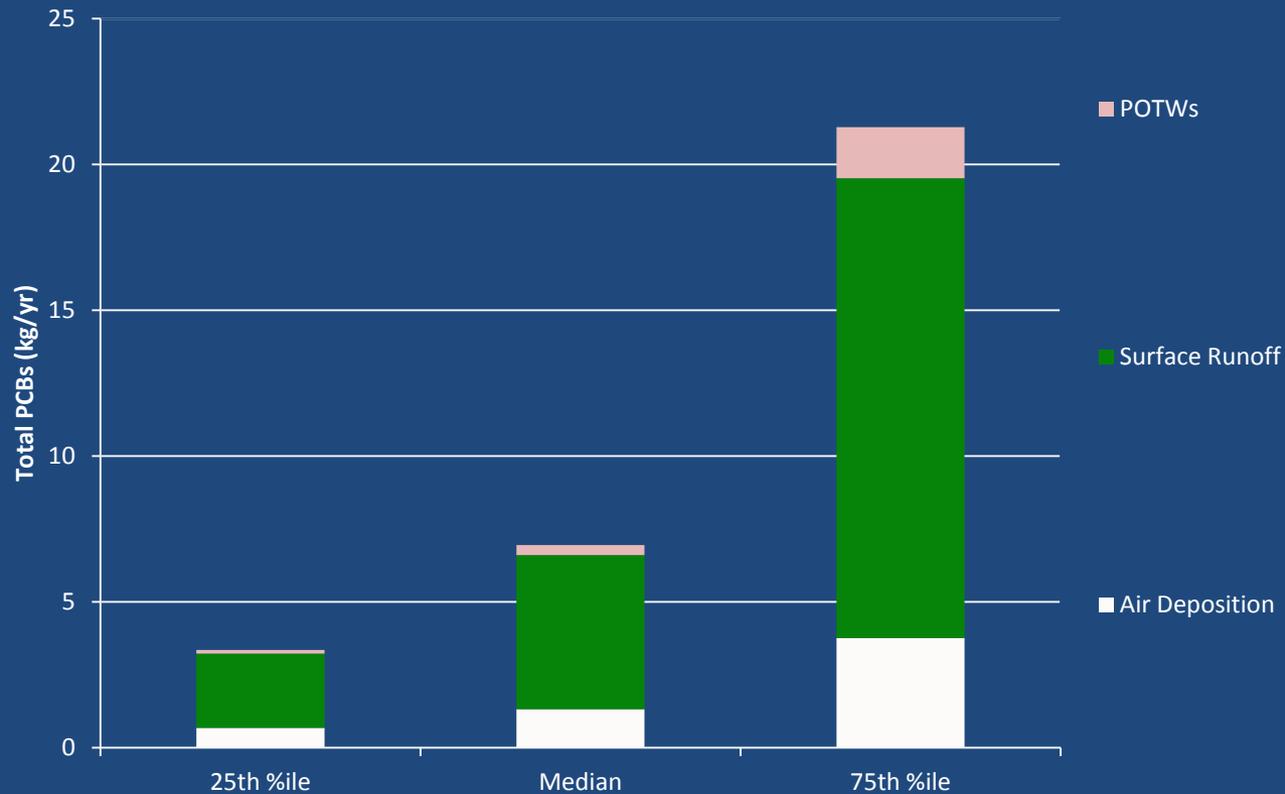
Source: Puget Sound Toxic Chemical Assessment, 2011

NA=not analyzed

(a) Negative values indicate a net outflow at the ocean boundary

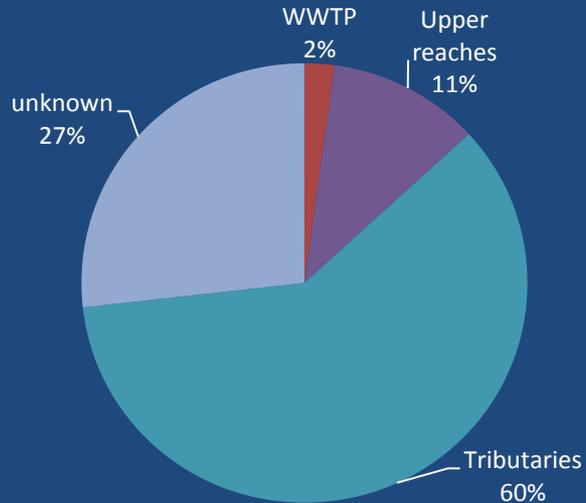
(b) Best estimate using available data

# Total Estimated PCB Loading to Puget Sound (Kg/yr)

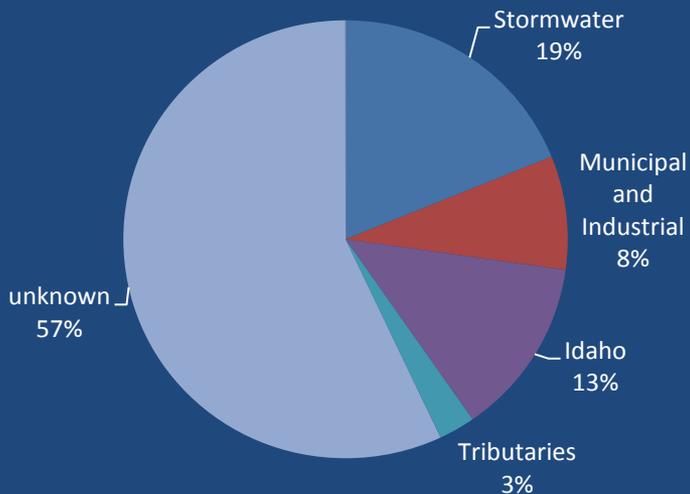


# Relative Importance of Pathways Assessed in Freshwater Systems

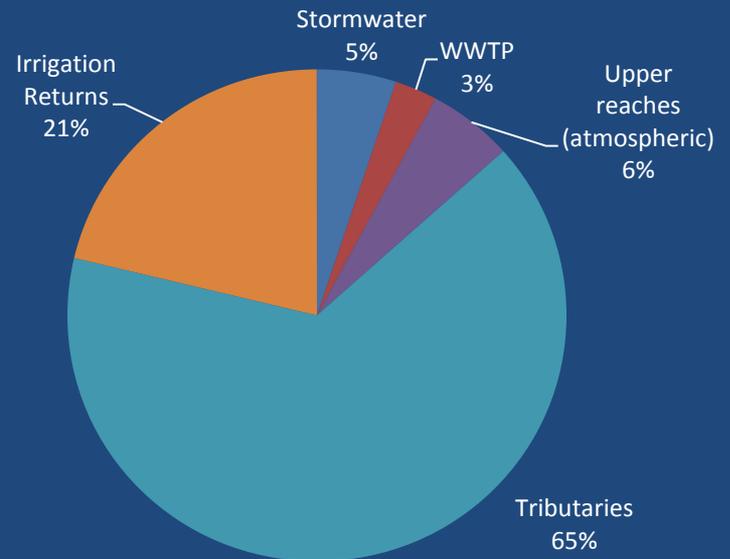
## Walla Walla River PCBs



## Spokane River PCBs



## Yakima River PCBs

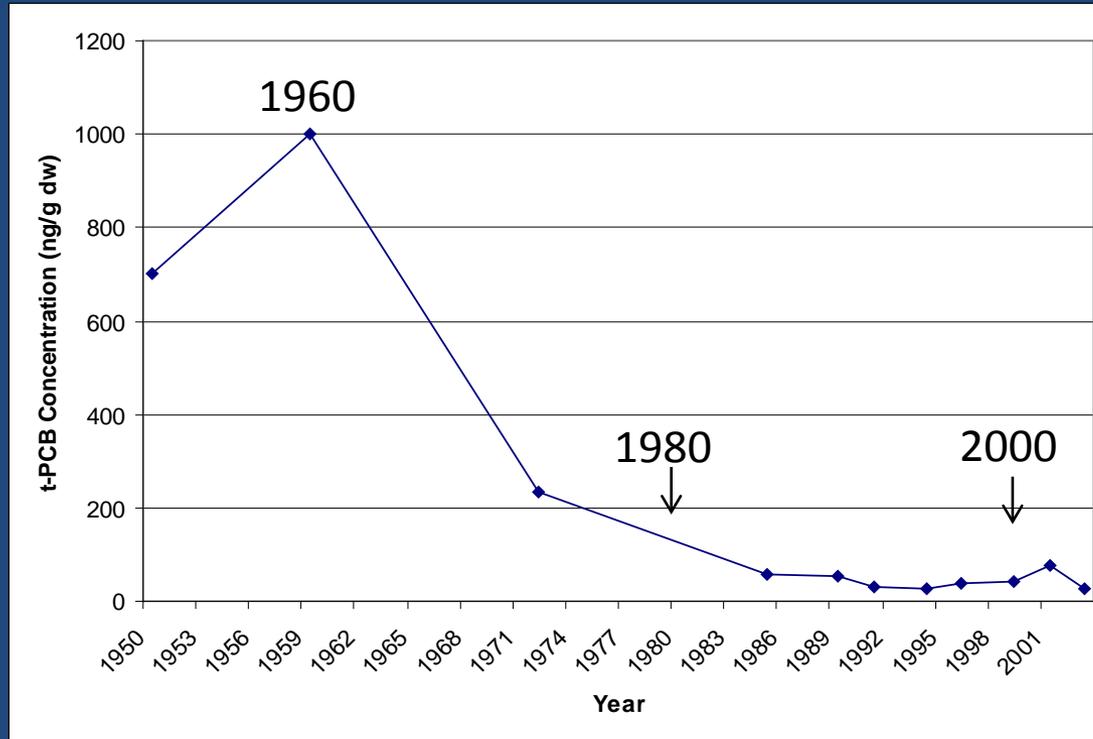


# Spokane River PCB Effluent Loading Data 1994-2004 mg/day

| Discharge                     | 1994 | 1995 | 2000 | 2001 | 2002 | 2003-04 |
|-------------------------------|------|------|------|------|------|---------|
| Kaiser Trentwood              | 2300 | 2600 | 2400 | 480  | 140  | 65      |
| Spokane WWTP                  | -    | -    | -    | 260  | -    | 194     |
| Inland Empire<br>Paper        | -    | -    | -    | 40   | 94   | 45      |
| Liberty Lake<br>WWTP          | -    | -    | -    | 4.3  | -    | 2.9     |
| City of Spokane<br>Stormwater | -    | -    | -    | -    | -    | 690     |

**- = No data**

# PCBs History from Sediment Record Lower Lake Spokane



## Total PCBs in Age Dated Sediment Core (2003)

- Steep declines from 1960s through mid-1980s
- Approximately 50% decline in 20 years (1980-2000)

# Summary

- Surface runoff is the largest delivery pathway for PCBs statewide
- Point source loading from municipal WWTPs is typically <10% of total loading
- Loading from atmospheric deposition is similar in importance to WWTP
- Lack of good information on contribution from industrial discharges
- Non-point releases becoming increasingly important to control to reduce overall PCB delivery