

Investigation of PCB Transport from the Saginaw CDF

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**Question: Are PCBs transported
out of the Saginaw CDF in
ecologically significant amounts?**

Three-part investigation:

- **Near-field transport model**
- **Far-field transport model**
- **Bioaccumulation field study**

Modeling – Near-Field

- **WASP – TOXI-4**
- **PCB transport out of CDF**
- **Accounts for:**
 - **Ponded water, surficial sediment, buried sediment**
 - **Dissolved and particulate PCBs**
 - **PCB volatilization**
 - **Dissolved PCB transport through wall, via “hydraulic pumping”**
- **Assumes:**
 - **Disposal operation = 240,000 cubic yards**
 - **7 disposal operations over 5,000 days (13.7 years)**

Near-Field Model Predictions

PCB input to CDF = 11,270 Kg

PCB losses over 13.7 years:

- Thru dike wall = 0.22 Kg
- Volatilization = 3.32 Kg

In comparison:

A.) PCB inputs to Bay from
Saginaw River (in 1991) = 225
Kg/year

B.) Drinking Water Quality
Standard (0.079 ng/L):

- Violation = 1.58 Kg/year from
CDF
- Prediction = 0.016 Kg/year (1 %)

Modeling – Far-Field

- Custom model, WASP family
- Intended to predict increase in water column PCB concentration in the inner Bay, due to transport from the CDF

Prediction:

- One year of transport = increase of 0.0008 ng/L

In comparison:

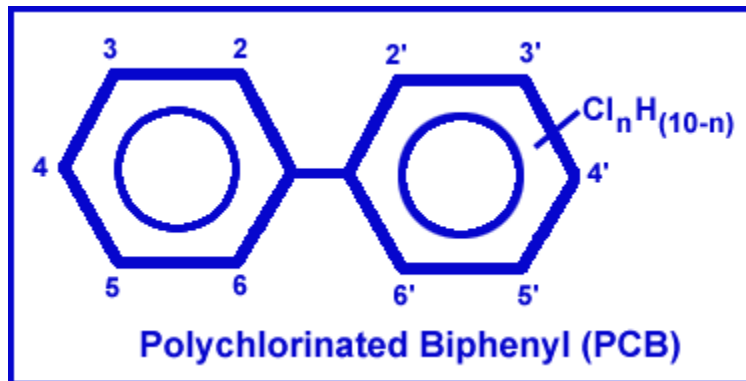
- Inner Bay = 5-30 ng/L
- Rainwater \approx 5-8 ng/L

1987 Bioaccumulation Study - Field

- Caged native mussels
- Caged adult fathead minnows
 - 8 day exposure (U.S. FWS)
 - (Current protocol = 28 days)
- Resident *Cladophora* algae
 - Several month exposure
- 3 stations, chosen after dye study
 - Inside the dike, in the pond
 - Outside the dike wall
 - A nearby reference station, at a navigation buoy “upstream” of the CDF
- Caged during sediment disposal
- Water samples collected on Days 0 and 8, for comparison to biota

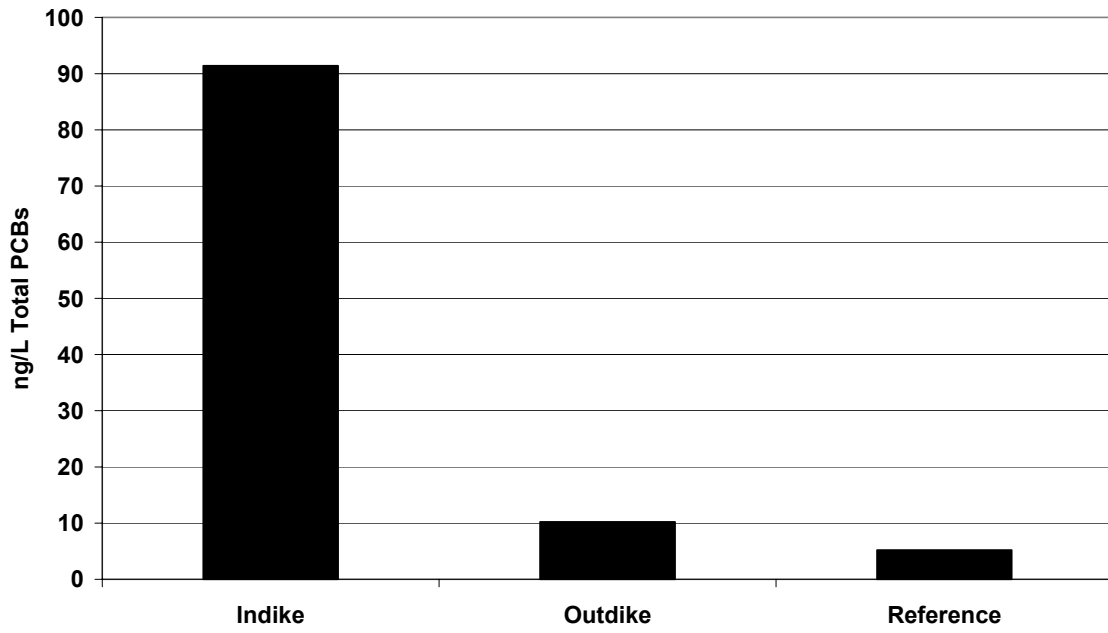
1987 Bioaccumulation Study - Lab

- PCB analysis = capillary GC = individual congeners

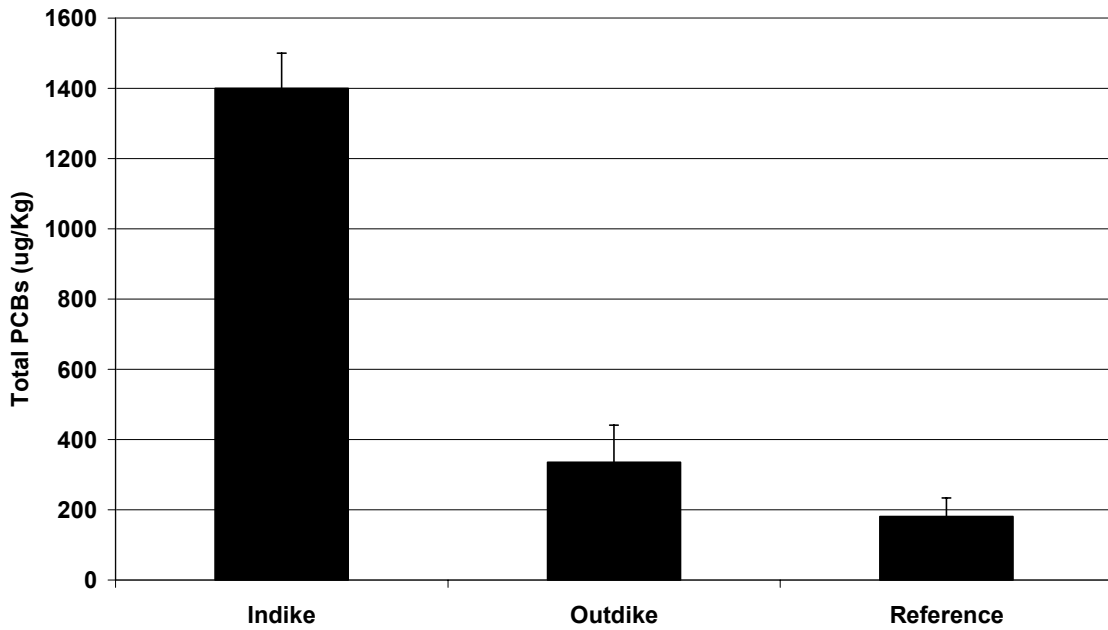


- Data analysis = Principal Component Analysis (PCA) of the PCB congeners
 - ‘chemical fingerprinting’

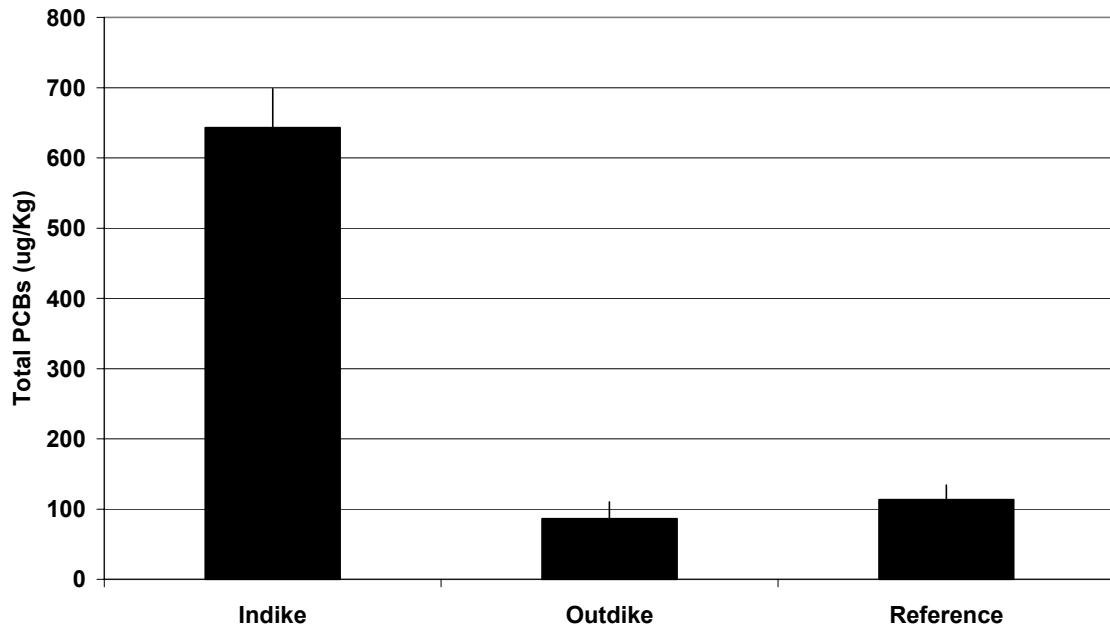
Saginaw Bay CDF Bioaccumulation Study:
Water



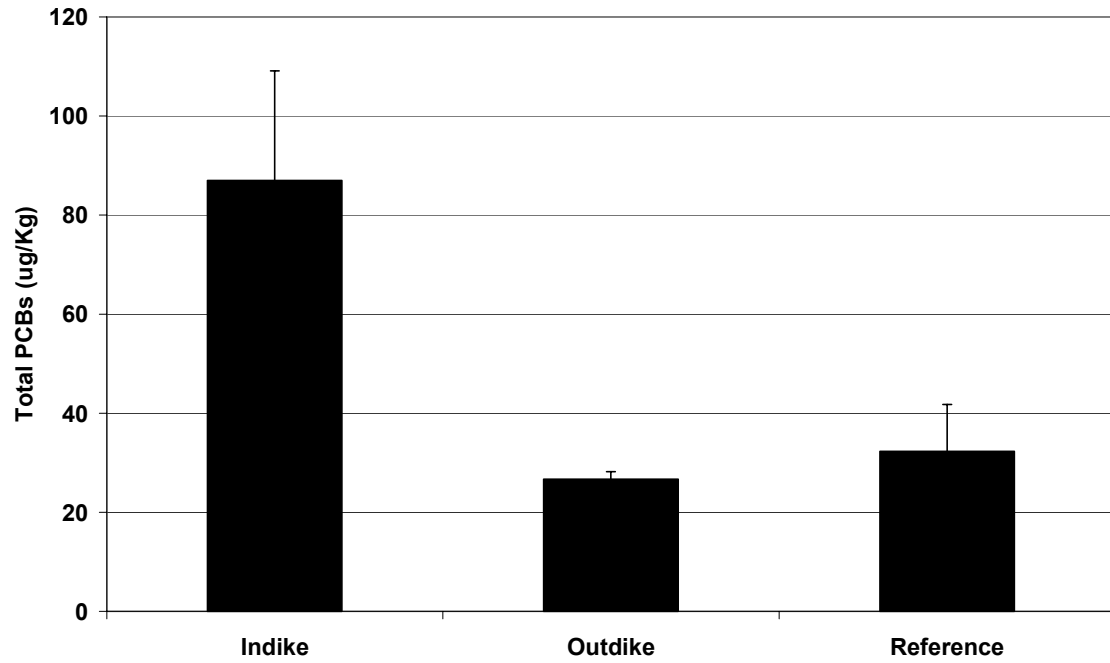
Saginaw Bay CDF Bioaccumulation Study:
Resident *Cladophora* Algae



**Saginaw Bay CDF Bioaccumulation Study:
Caged Fathead Minnows**



**Saginaw Bay CDF Bioaccumulation Study:
Caged Clams**



Results of the Bioaccumulation Study

- **PCB concentrations in the Indike water sample were substantially higher than either the Outdike or Reference station samples**
- **PCB concentrations in the Indike biota – caged clams, caged fathead minnows, resident *Cladophora* – were significantly higher than in the Outdike or Reference station biota samples**
- **PCB concentration in the Outdike and Reference station samples were not significantly different**

- **PCB congener fingerprint patterns matched the total PCB results – patterns of the Indike biota and water samples were similar to each other, and substantially different from the Outdike and Reference Station samples.**
- **Bioaccumulation study data confirmed the results of the Near-Field and Far-Field models; PCBs are not transported from the Saginaw CDF in ecologically significant amounts.**