Longitudinal Indicators of Policy Impact: PCB Ban

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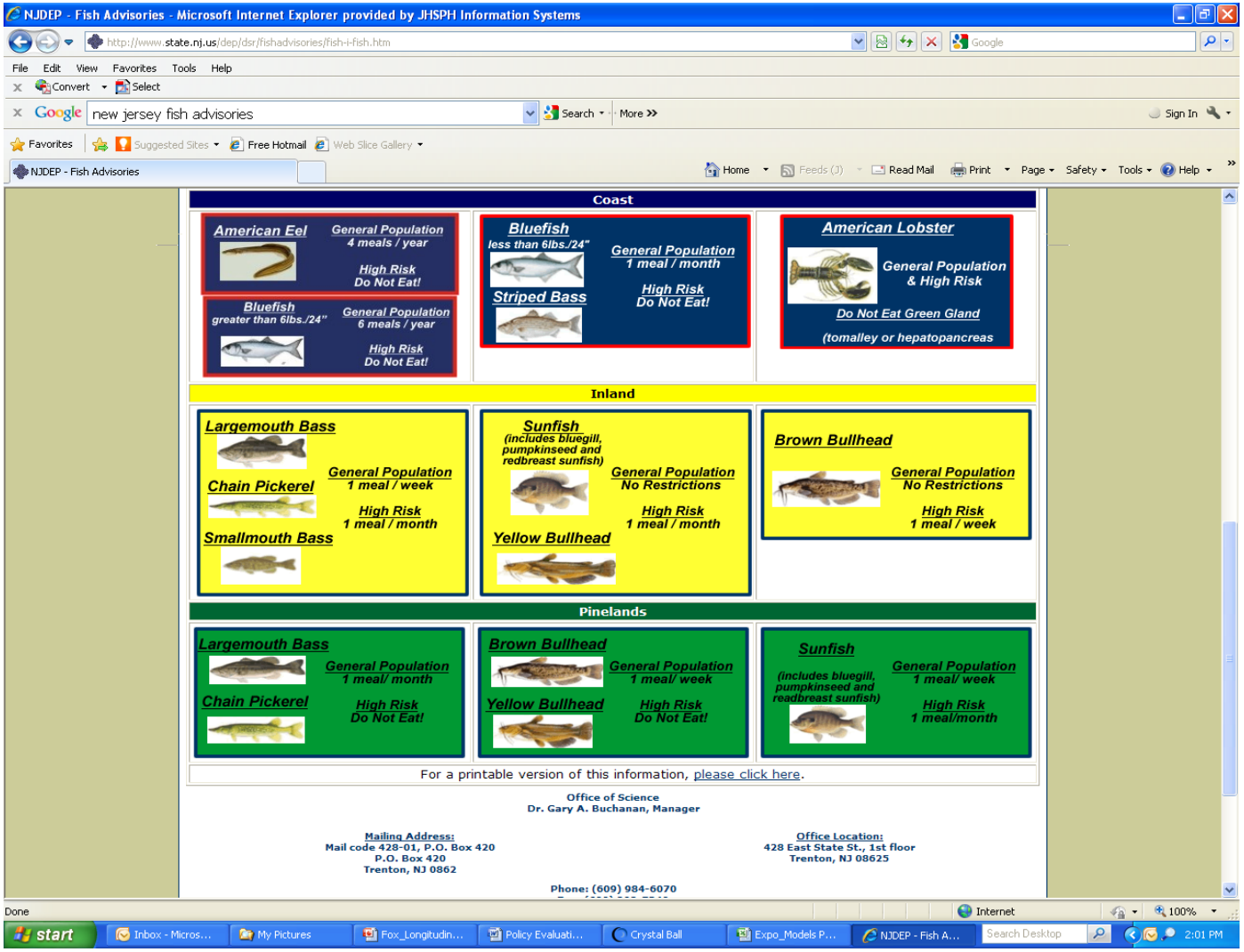
Overall Project Objectives and Approach

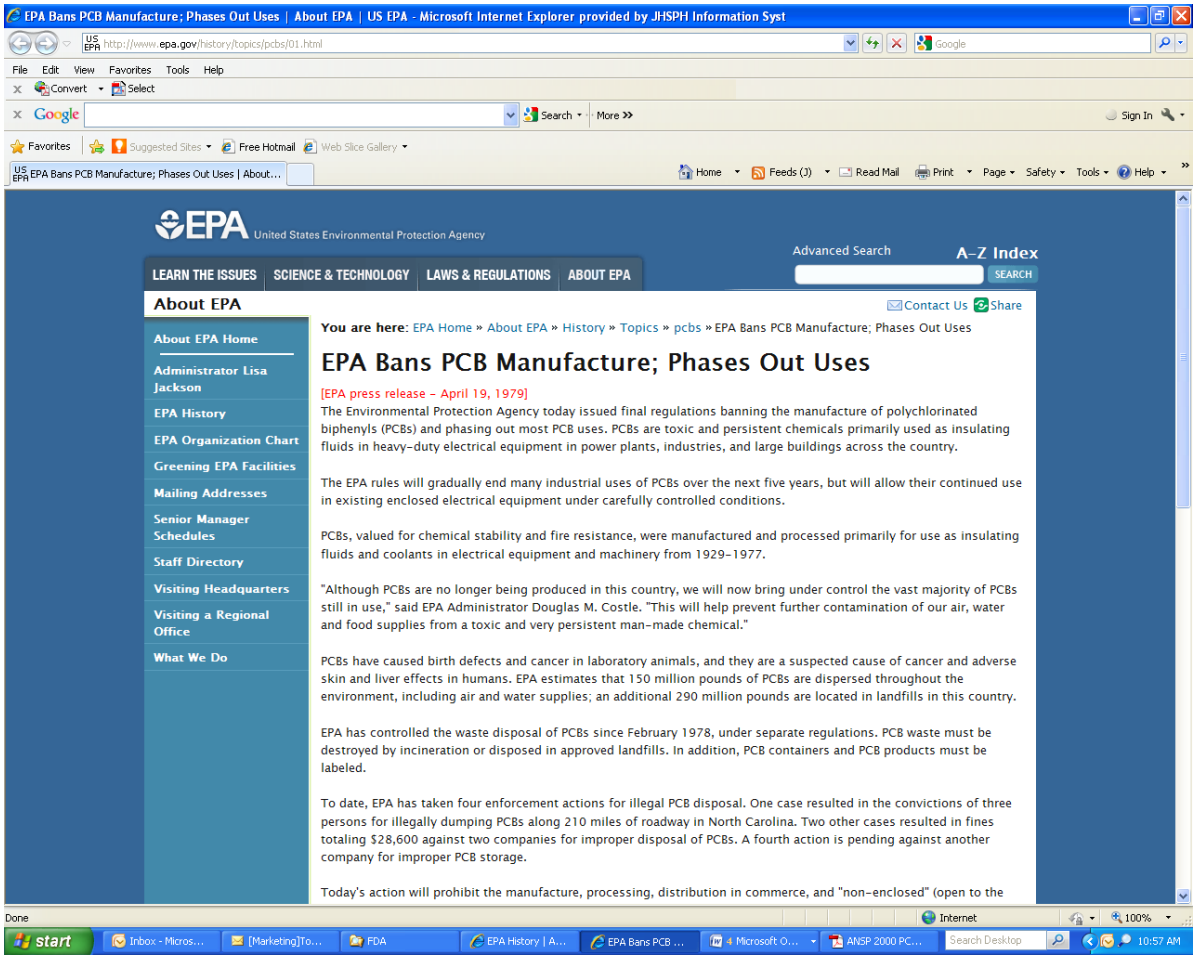
- Objectives
  - To develop and present state level environmental health outcome indicators that measure changes over time; and
  - To apply environmental health outcome indicators to evaluate the impact of environmental policies on population exposures and health risks.
- Approach: Application of risk assessment

Current context – NJ Advisories



http://www.state.nj.us/dep/dsr/fishadvisories/fish-i-fish.htm

Policy change: PCB Ban and Phase-out

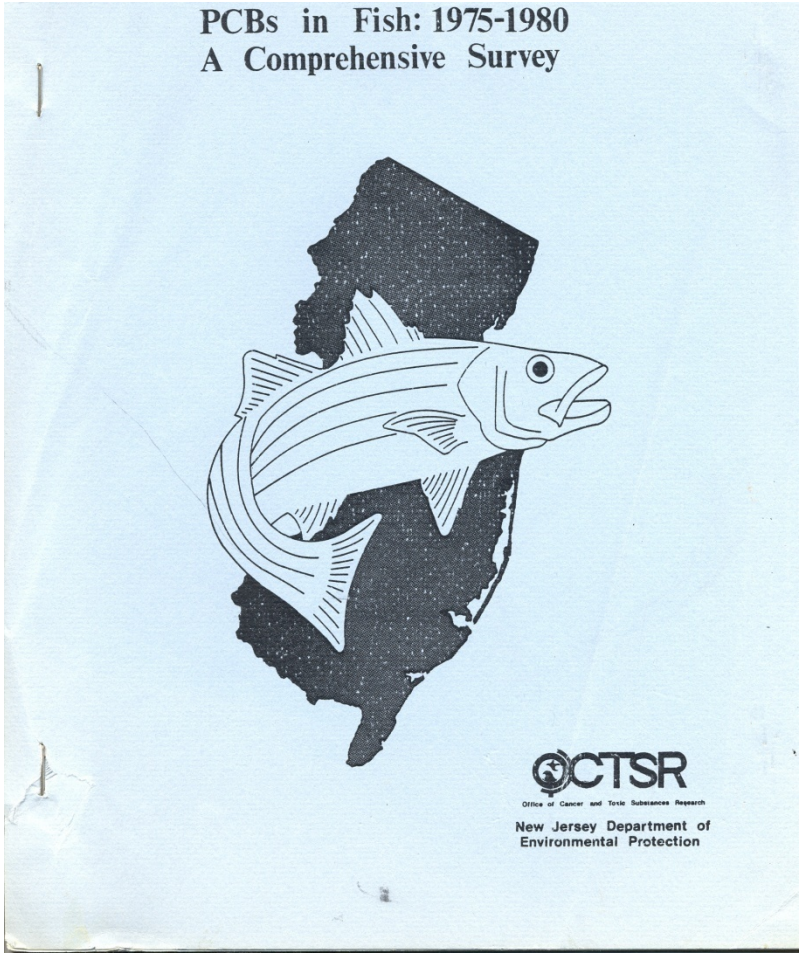


http://www.epa.gov/history/topics/pcbs/01.html

PESTICIDES FOUND IN SALT-WATER FISH

- **New York Times February 27, 1983**
- THE state's Department of Environmental Protection has determined that the same edible salt-water fish found to have potentially harmful levels of polychlorinated biphenyls also contain pesticides that could be dangerous to human health.

PCB Data Sources



- NJ fish tissue monitoring reports
  - Belton and Lockwood 1982 (shown at left)
  - Hauge et al. 1993 Results from New Jersey's Toxics in Biota Monitoring Program
  - Horwitz et al. 2008 Routine monitoring of toxics in New Jersey fish

Summary of PCB Sampling Results, Bass in New Jersey waters, ug/g wet weight

Analyte / Time Period / Number of Samples / Species	Median	Range
Arochlor 1254 / 1975-1980 / 54 / Striped Bass	1.58	0.12, 31.4
Total PCB / 1988-1989 / 55 / Striped Bass	1.24	0.48, 3.33
Total PCB / 2006 / 5 / Hybrid Striper	0.14	0.08, 0.27

Hybrid Striper

Photo source: http://srac.msstate.edu/bass.htm

Risk Assessment Approach

- Look at child and adult exposure to PCB through consumption of fish
  - Consumption on per capita basis and consumer-only
- Standard procedures to estimate average daily dose
- Characterize risk for non-cancer health effect
  - Hazard Quotient = Estimated dose / RfD

Risk Assessment Inputs

- Consumption and body weight data from EPA Exposure Factors Handbook (2009)
- Bioavailability of PCBs: Xing et al (2008) found 3% was accessible from fish

- Dose = $\frac{\text{Concentration*Intake*Bioavailability}}{\text{Body Weight}}$

Xing et al. 2008. Environmental Pollution 156:1218-1226

Indicator of Policy Impact: HQ

Population	Arochlor 1254 Striped Bass, 1975-1980 Median (Min, Max)	Ban/ Phase out	Total PCB Striped Bass, 1988-1989 Median (Min, Max)	Total PCB Hybrid Striper, 2006 Median (Min, Max)
Adult Per Capita				
Central Tendency	1.4 (0.2, 4.4)		0.2 (0.1, 0.5)	0.02 (0.01, 0.04)
High (95th%ile)	9.1 (0.1, 29)		1.5 (0.5, 3.1)	0.1 (0.07, 0.2)
Child Per Capita				
Central Tendency	1.7 (0.2, 5.5)		0.3 (0.1, 0.6)	0.03 (0.01, 0.5)
High (95th%ile)	10 (0.1, 31)		1.6 (0.5, 3.2)	0.2 (0.08, 0.3)
Child Consumer Only				
Central Tendency	32 (0.4, 101)		5.2 (1.6, 11)	0.5 (0.3, 0.9)
High (95th%ile)	102 (1.4, 325)		17 (5, 34)	1.6 (0.8, 2.8)

Findings (1)

- Median PCB concentrations declined by an order of magnitude from late ’70s to 2006
- Max PCB concentrations declined by two orders of magnitude from late ’70s to 2006
- Child exposure scenarios yielded highest exposures and risks

Findings (2)

- Pre-ban all adult and child scenarios had HQ>1 at the median
- Early post ban/phase out
  - HQ>1 for adult and child percapita consumption at 95th%ile
  - HQ>1 for the child consumer (at median and above)
- Recent sampling (2006)
  - Only child consumer at 95th%ile has HQ>1

Indicator Conclusions

- This approach illustrates the success of the ban over the long term
- Documents the continuing need for exposure reduction policies for potentially vulnerable populations

EPHI for Policy Evaluation

- Valuable tool
- Can do a lot with a little (could do more with more?)
  - Data planning
    - Maintain monitoring programs
    - Other kinds of data (biomonitoring, health outcome surveillance?)
  - Methods that make clear link to policy

Thank you!