Washington State Toxics Monitoring Program

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PNW Contaminants Workshop, November 2010

- Fish Tissue Goals:
  - Exploratory monitoring
  - Long Term monitoring – select sites
  - Cooperative efforts; address new needs
  - Website: access results and information

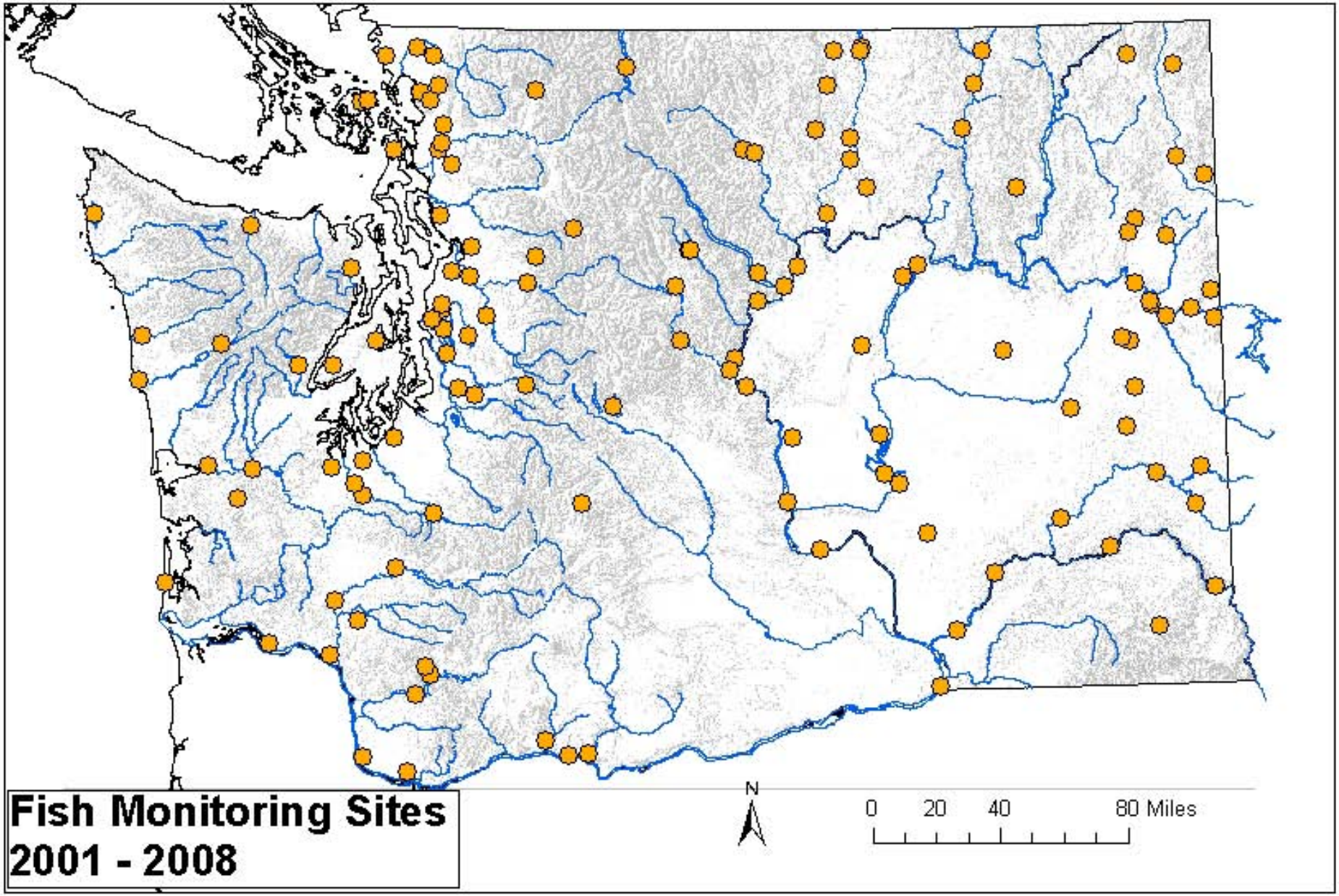
DEPARTMENT OF ECOLOGY
State of Washington

Fish Contaminant Monitoring in Washington

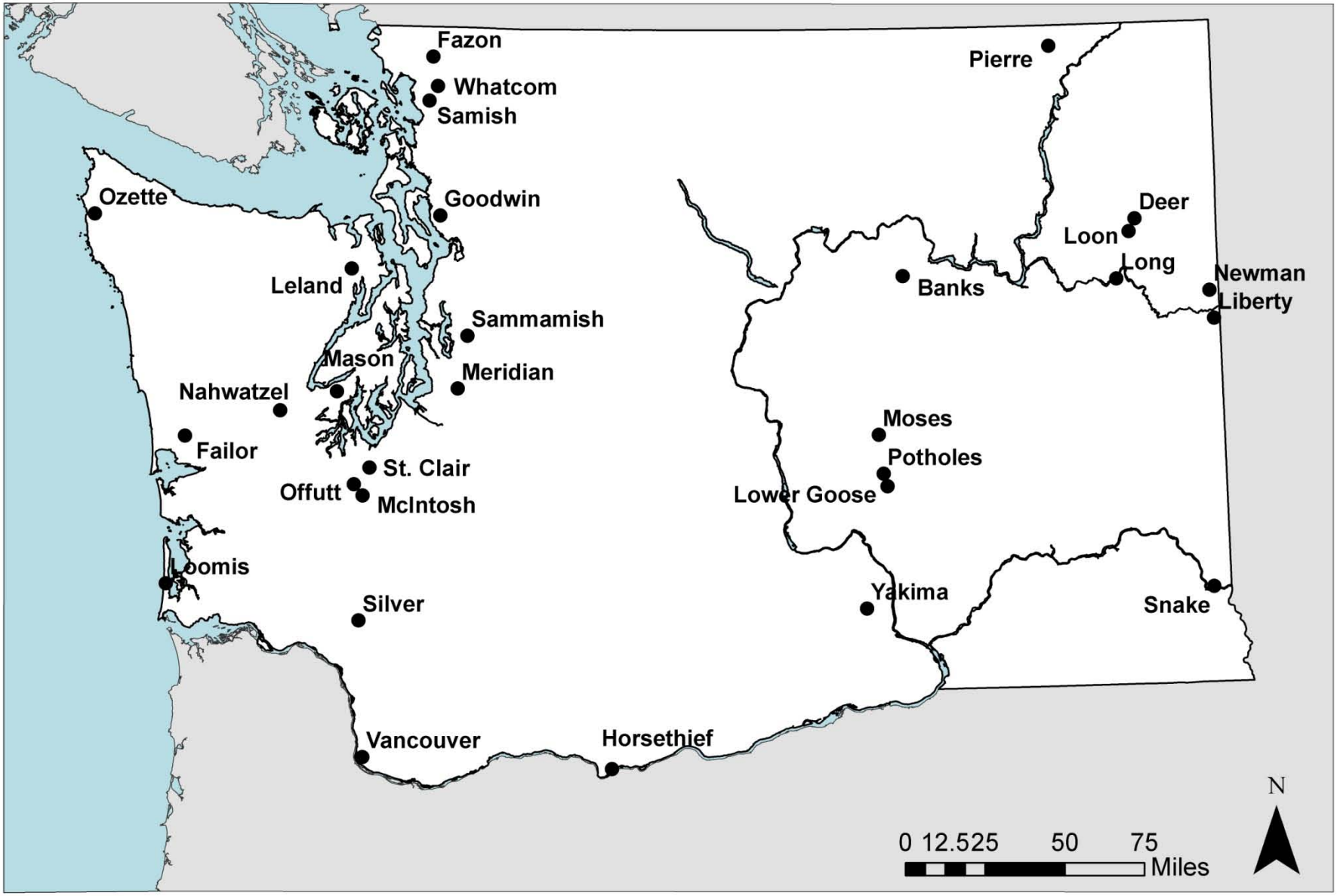
1970's	Columbia, Snake: NCBP-USFWS	Palouse R - Ecology
1980's	BWMP statewide	Yakima, Spokane , Roosevelt, Columbia
1990's	Yakima, Spokane, Roosevelt	WSPMP (6 yrs)
	Columbia basin - EPA CRITFC	Osoyoos, Whatcom, bogs, other
	10 Lakes (2x)	Yakima, CCP: USGS NAWQA
2000's	Statewide: Hg, PBDEs, As, PFC	EPA Nat'l Lakes, USGS Alpine Lakes
	303d Verifications, Hatchery Fish	TMDLs: Okan, Chel, Wall, Palo, Spok, Yaki
	Whatcom, Vancouver, Washington	WSTMP (9yrs)
	Roosevelt: EPA, USGS	Hg Trends, SPMD Trends
2010's	WSTMP Long Term + Exploratory	Hg Trends, other projects as requested

WSTMP Goals

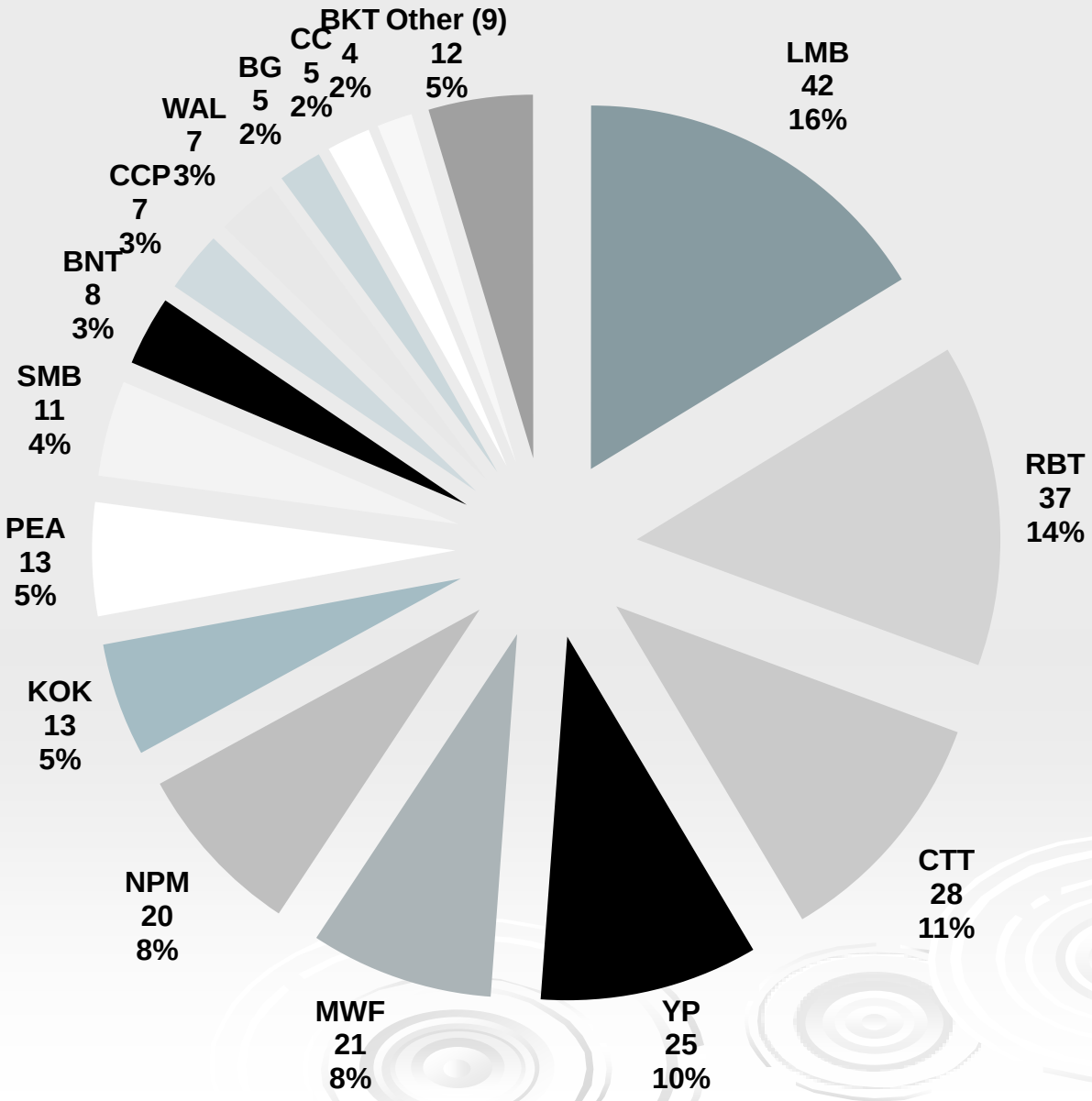
- Exploratory monitoring
- Long Ter monitoring
- Cooperative efforts; address new needs
- Web Site


Fish Monitoring Sites
2001 - 2008
N
0 20 40 80 Miles

Sites for Long Term Monitoring of Mercury in Fish



Species Collected for WSTMP 2001-08



Analytical Methods for Fish Tissue Samples, WSTMP 2008.

Parameter	Description	Method	Reporting Limit
PCB Aroclors	GC/ECD	EPA 8082	1.1 ug/kg, wet wt
PCB Congeners	HiRes GC/MS	EPA 1668A	0.03 - 0.09 ug/kg, wet wt
Chlorinated pesticides	GC/ECD	EPA 8081 [1]	0.48 - 10 ug/kg, wet wt
PBDEs	GC/MS SIM	EPA 8270 [2]	0.38 - 4.3 ug/kg, wet wt
PCDD/PCDFs	HiRes GC/MS	EPA 1613B	0.03 - 0.93 ng/kg, wet wt
Mercury (total mercury)	CVAA	EPA 245.6	0.017 mg/kg, wet wt
Lipids - percent	gravimetric	MEL SOP 730009	0.1 percent

1 - MEL 730073, a modification of EPA 8081 and others, was used in sample analyses.

2 - MEL SOP 730096, a modification of EPA 8270, was used in sample analyses.

SOP = Standard Operating Procedure.

GC = Gas Chromatography.

ECD = Electron Capture Detection.

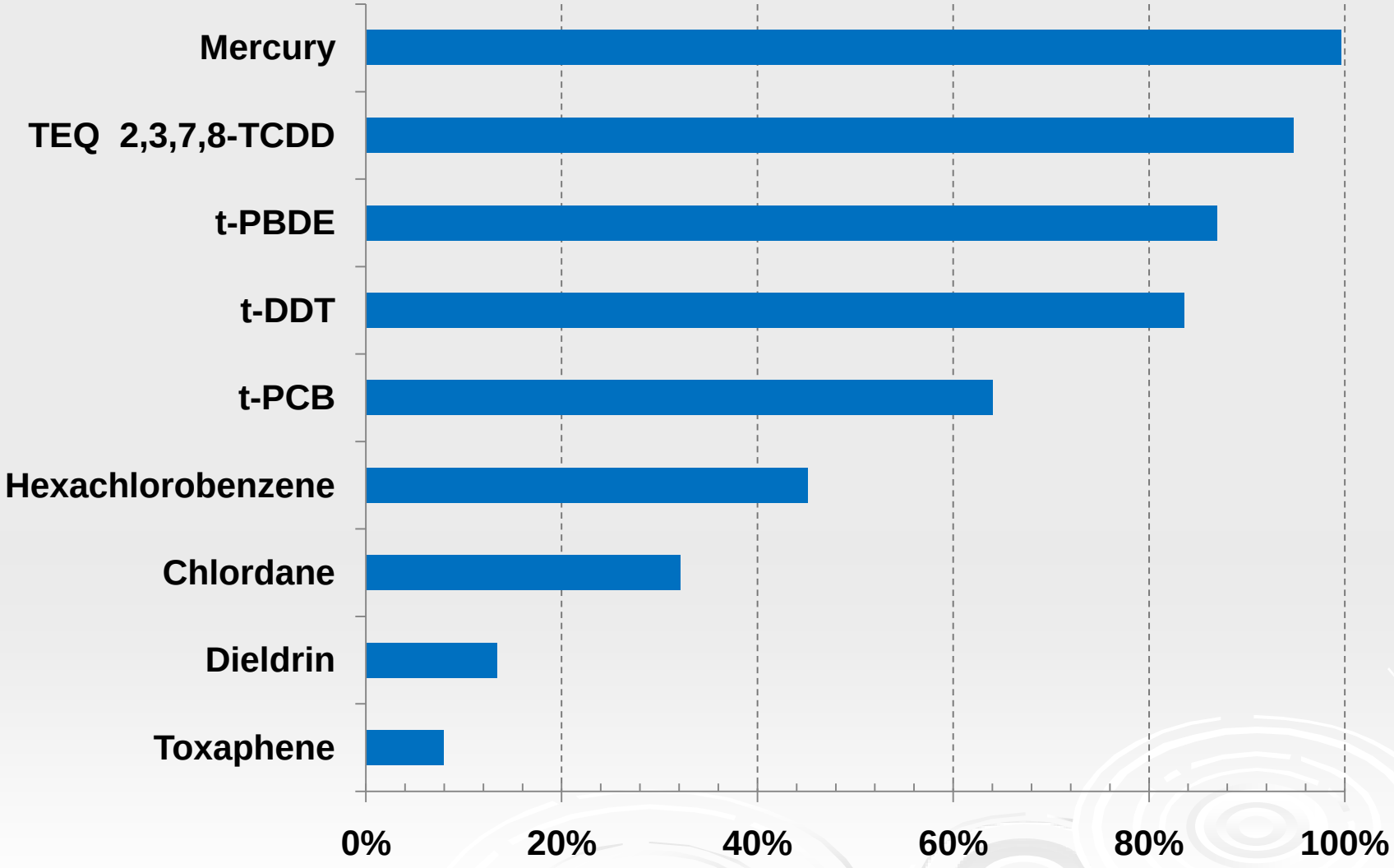
HiRes = High Resolution.

MS = Mass Spectrometry.

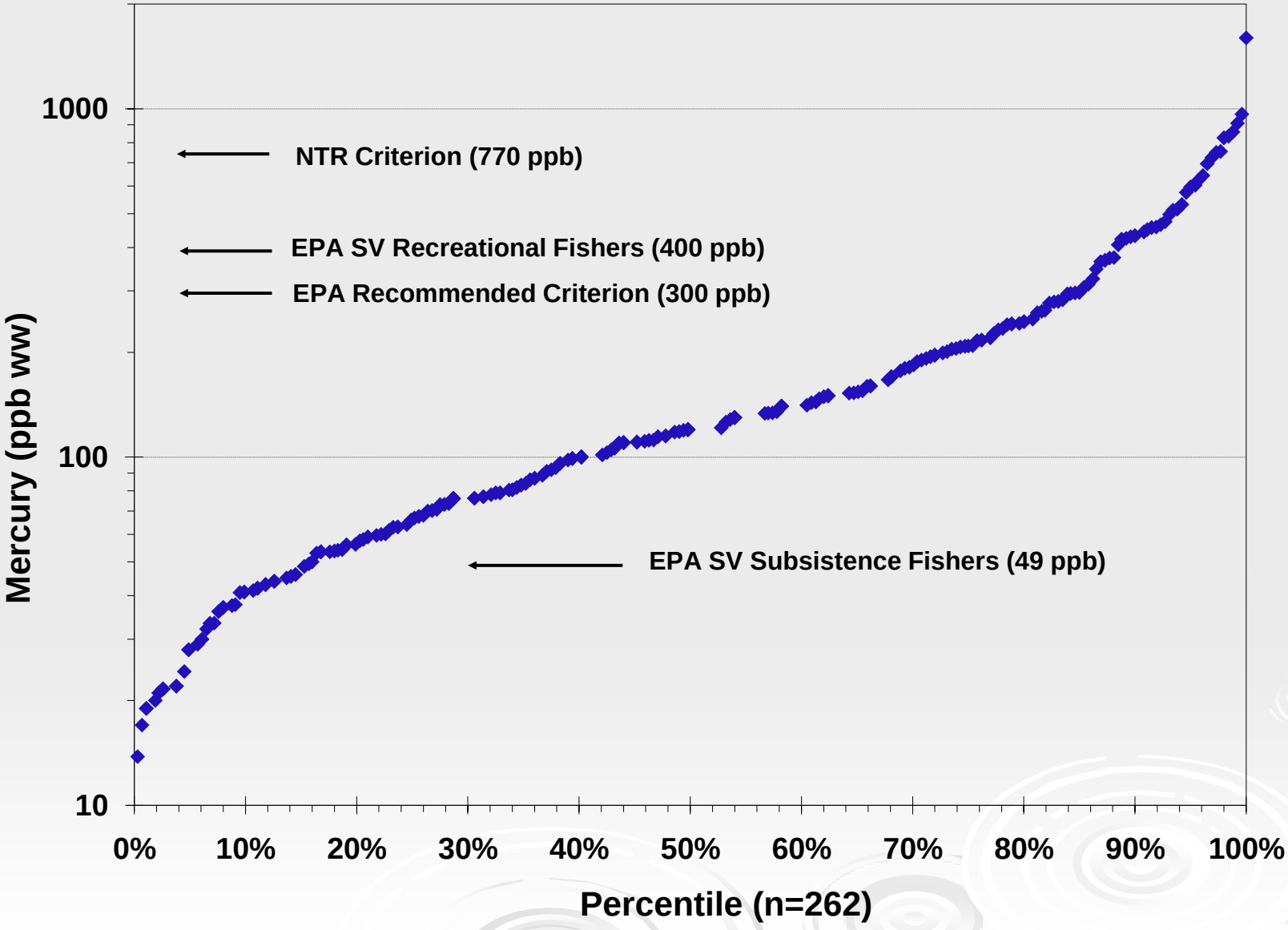
SIM = Single Ion Monitoring.

CVAA = Cold Vapor Atomic Absorbance.

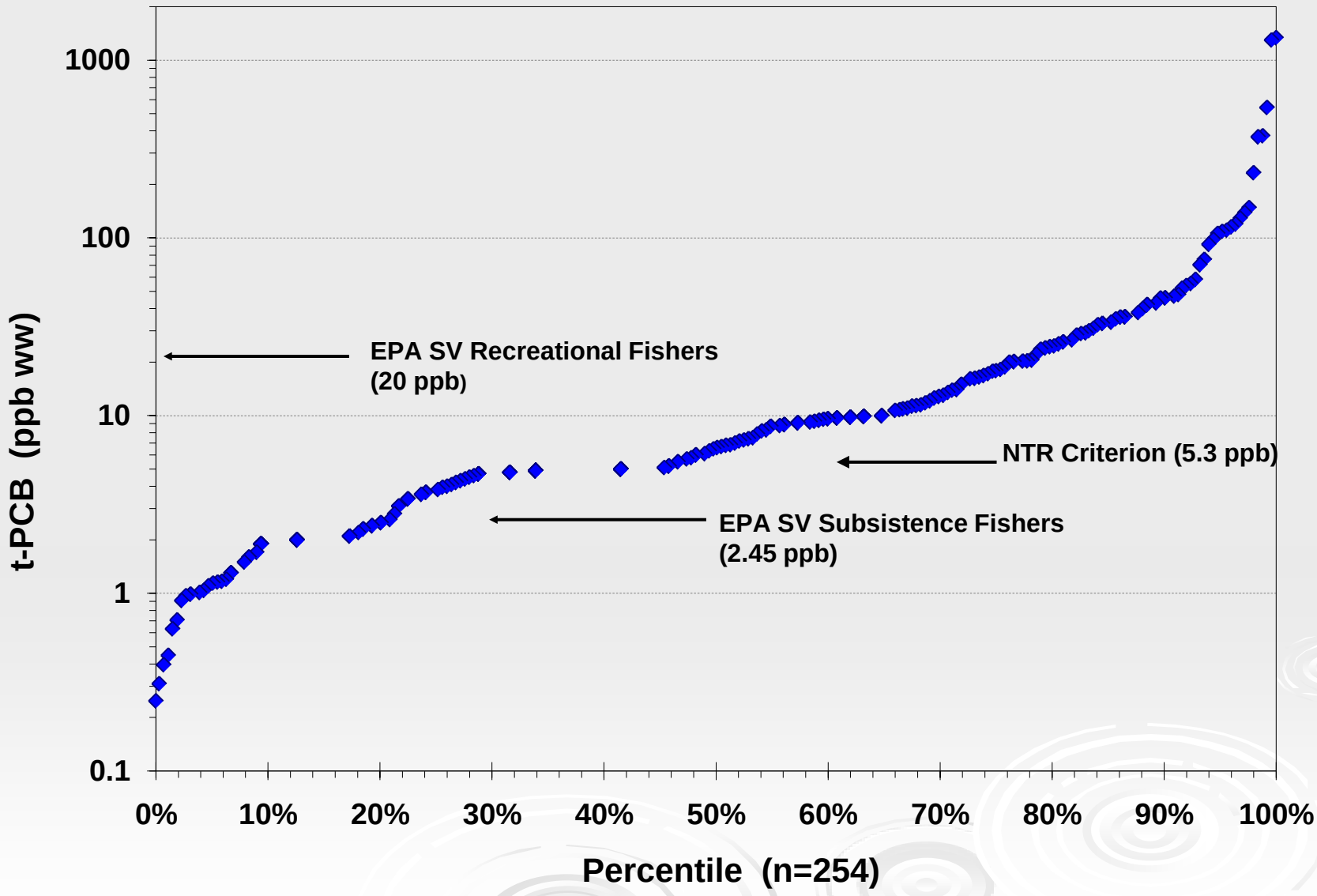
Detection Frequency: 2001-2008



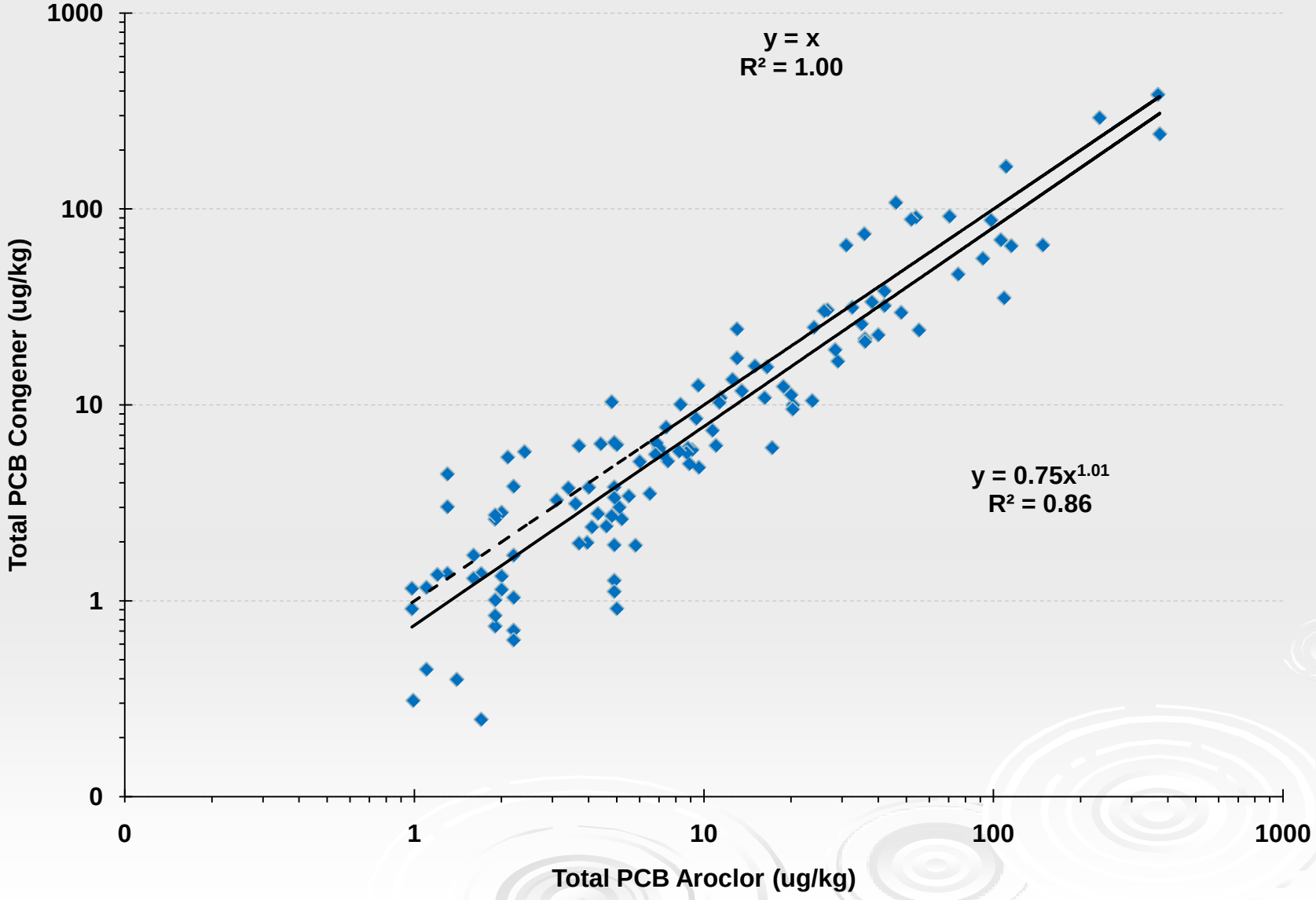
Mercury: WSTMP 2001-08



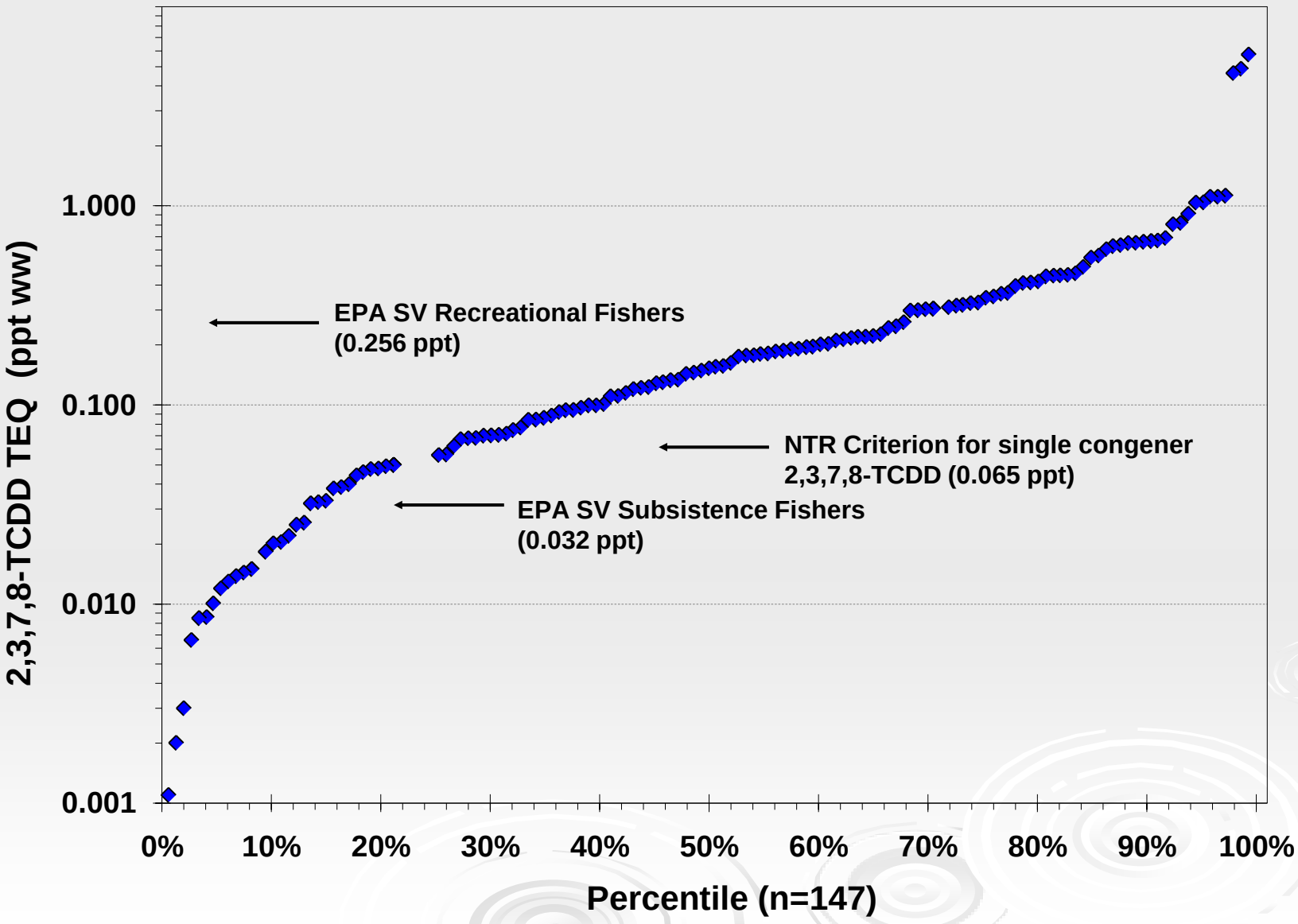
t-PCB: WSTMP 2001-08



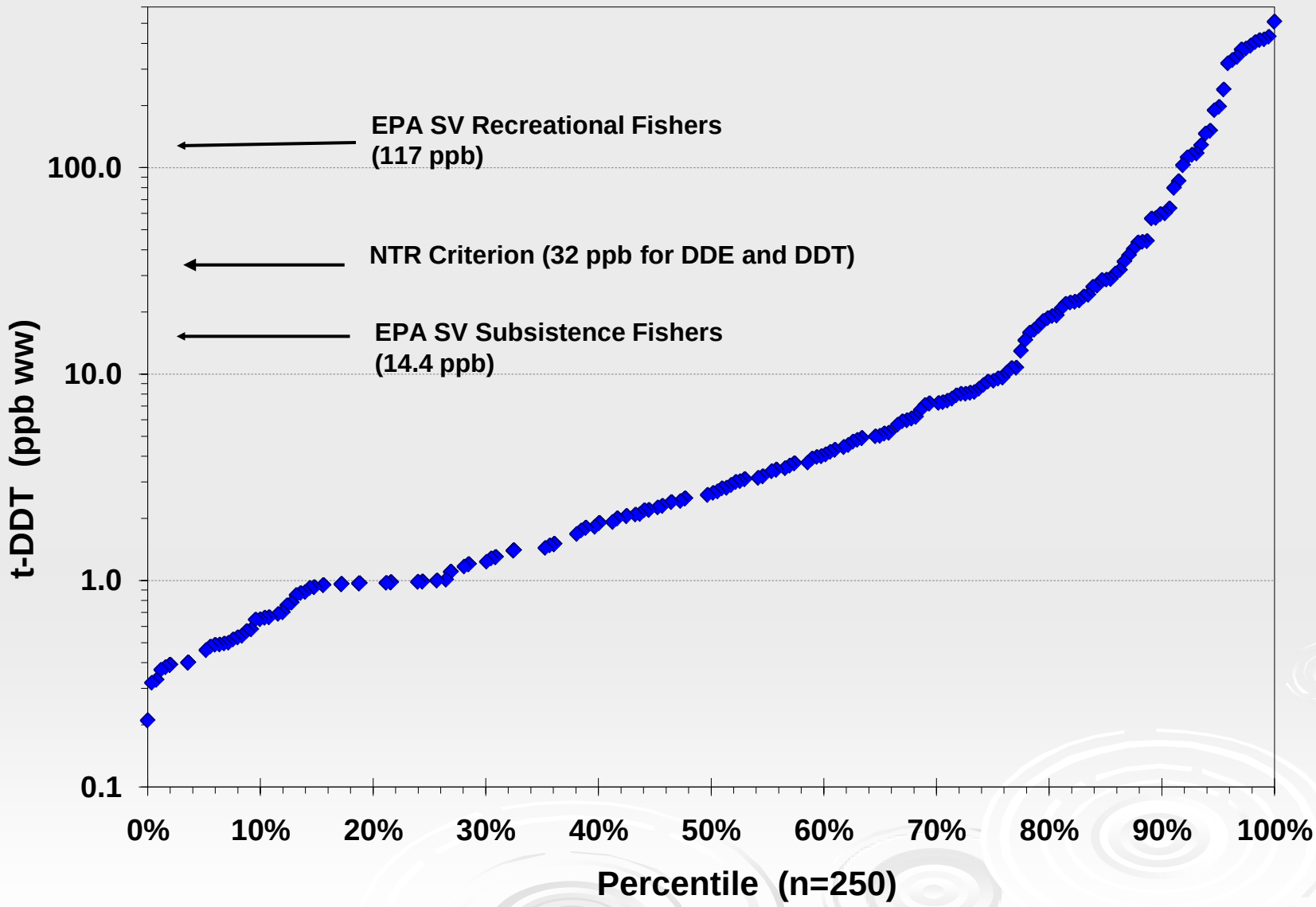
T-PCBs: Aroclors vs Congeners



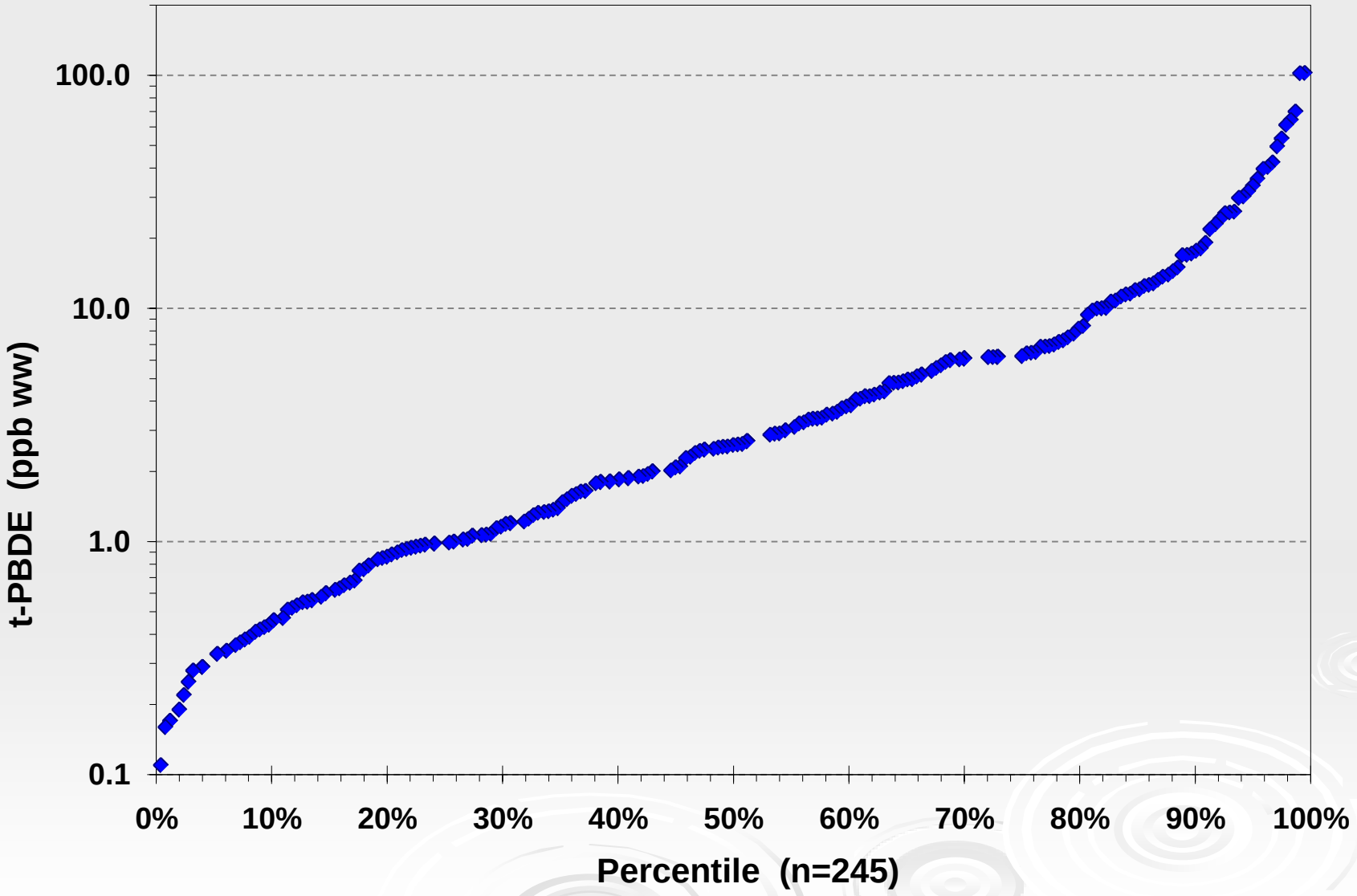
Dioxin TEQ: WSTMP 2001-08

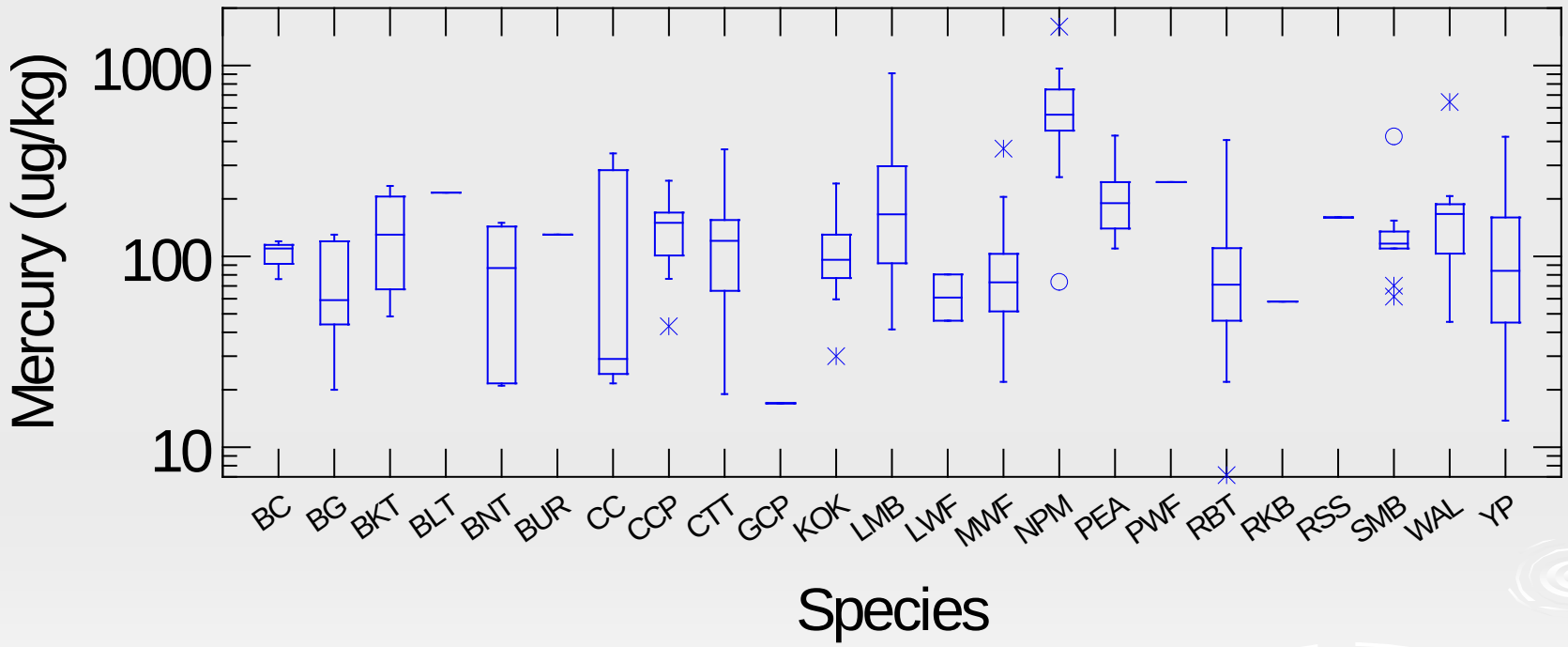


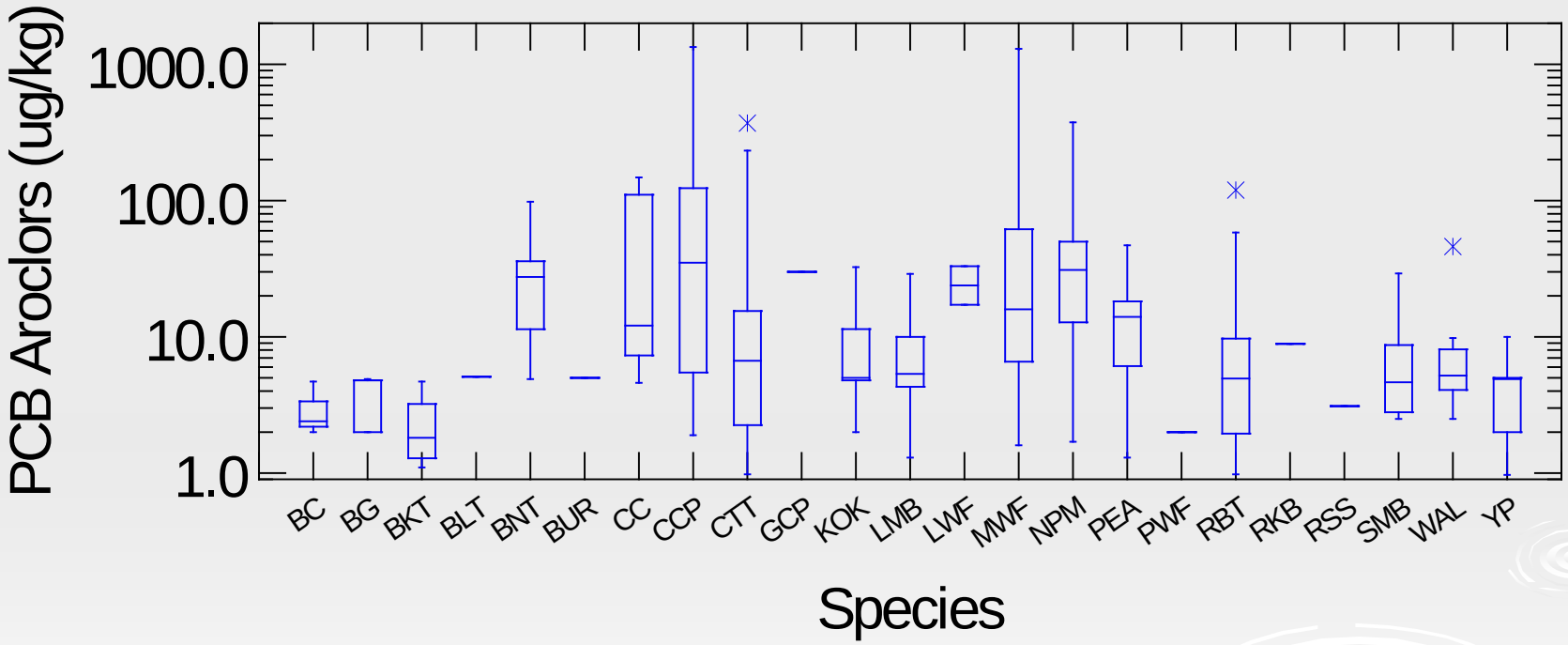
t-DDT: WSTMP 2001-08

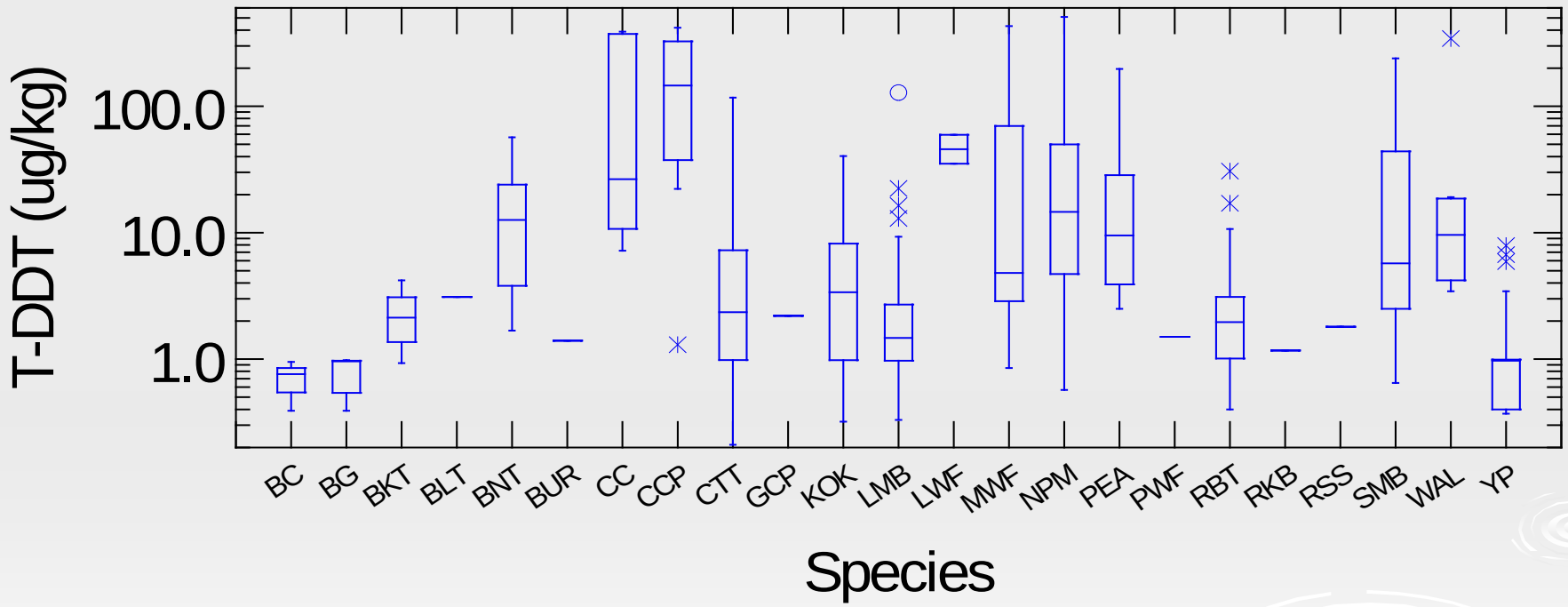


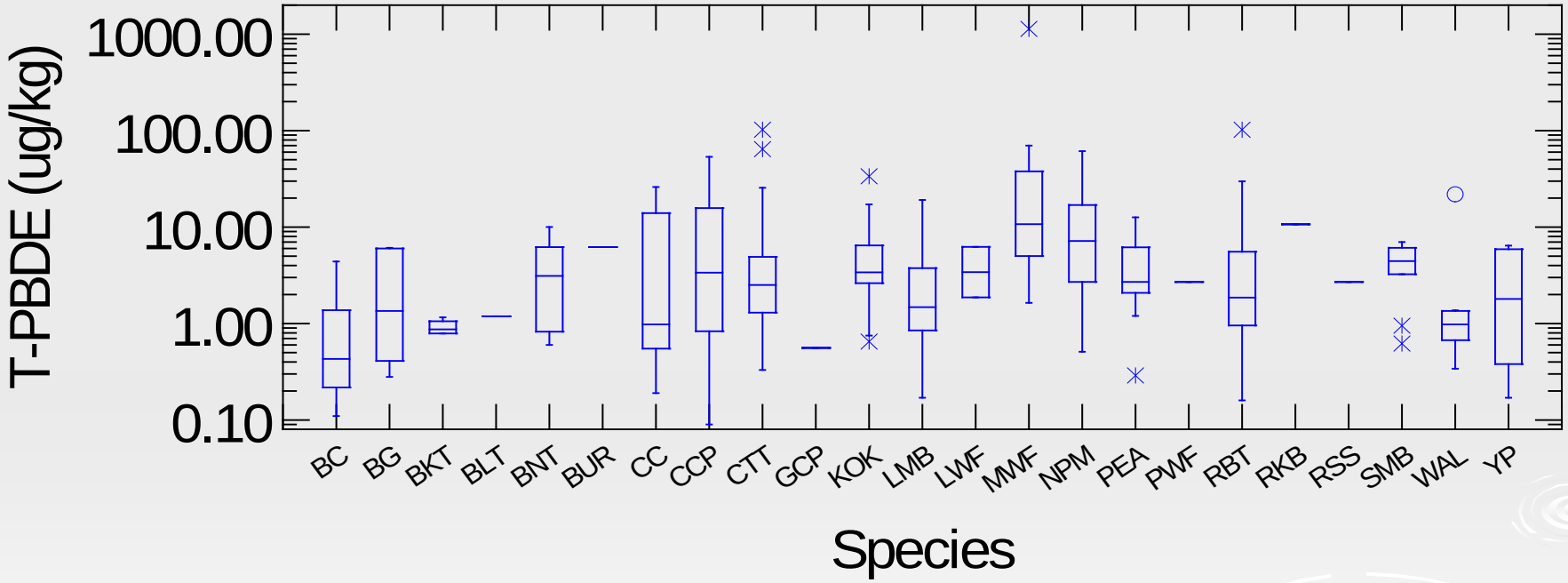
t-PBDE: WSTMP 2001-08

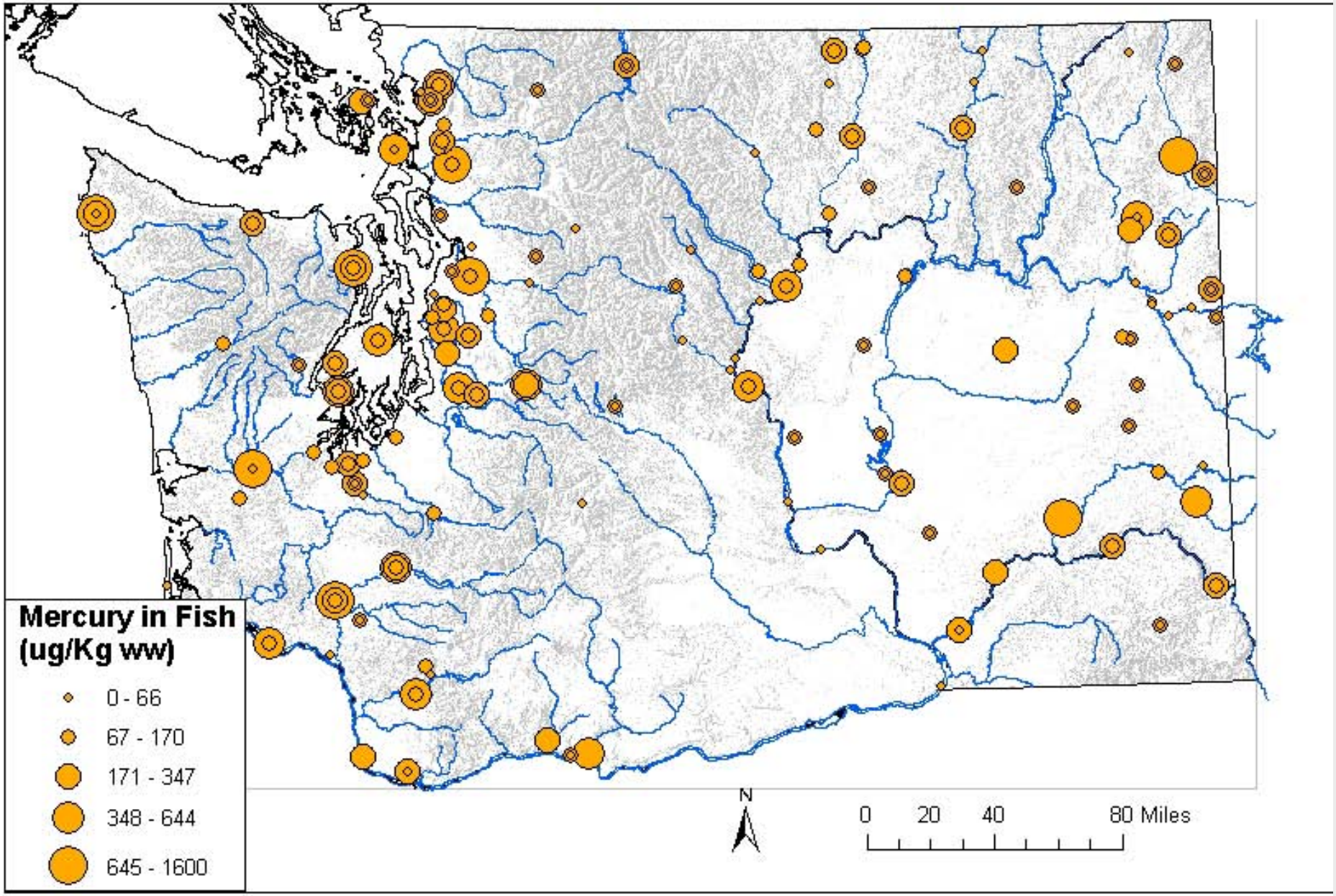


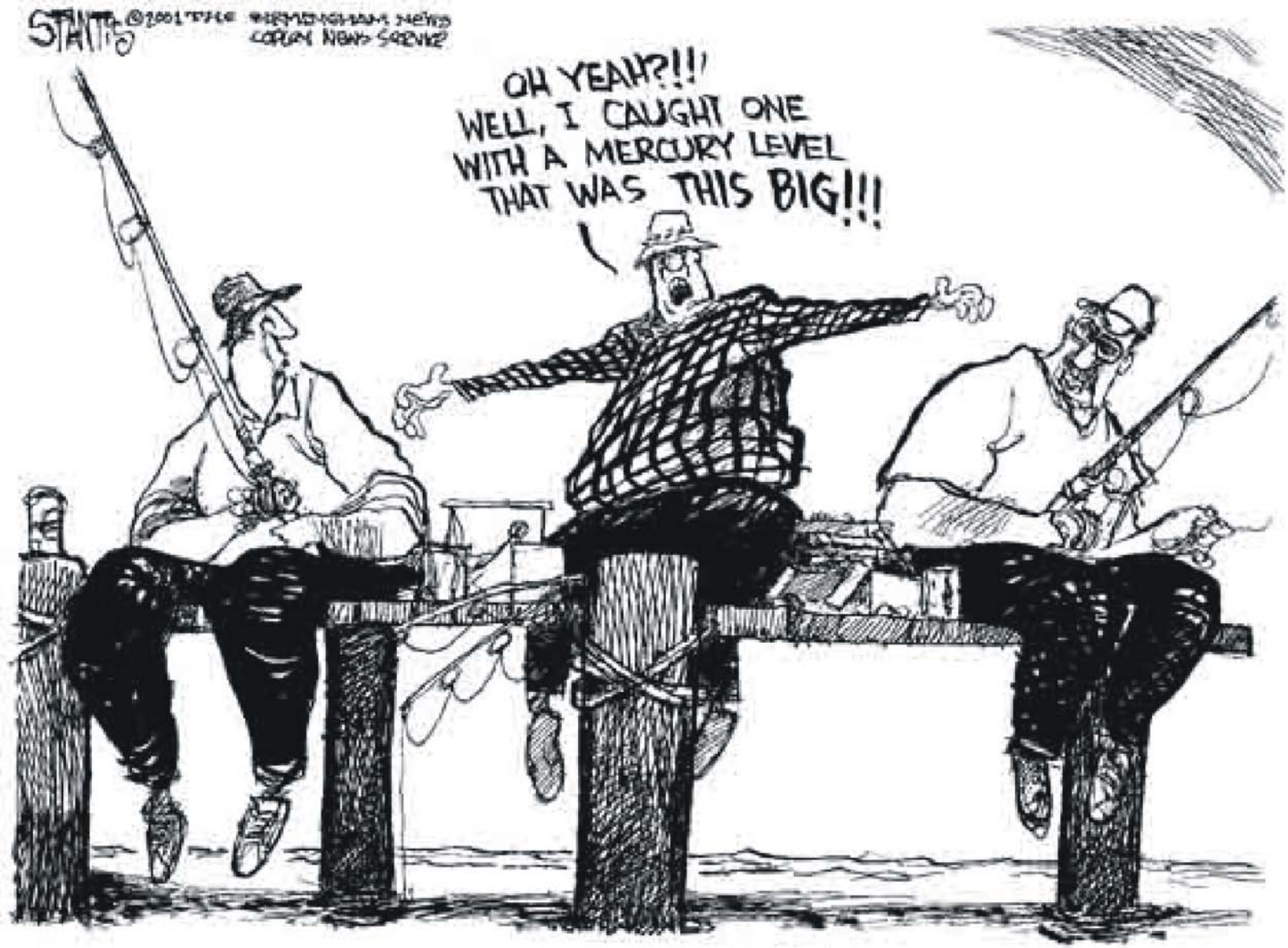

Mercury (ug/kg)
1000
100
10
BC
BG
BKT
BLT
BNT
BUR
CC
CCP
CTT
GCP
KOK
LMB
LWF
MWF
NPM
PEA
PWF
RBT
RKB
RSS
SMB
WAL
YP
Species


PCB Aroclors (ug/kg)
1000.0
100.0
10.0
1.0
BC
BG
BKT
BLT
BNT
BUR
CC
CCP
CTT
GCP
KOK
LMB
LWF
MWF
NPM
PEA
PWF
RBT
RKB
RSS
SMB
WAL
YP
Species

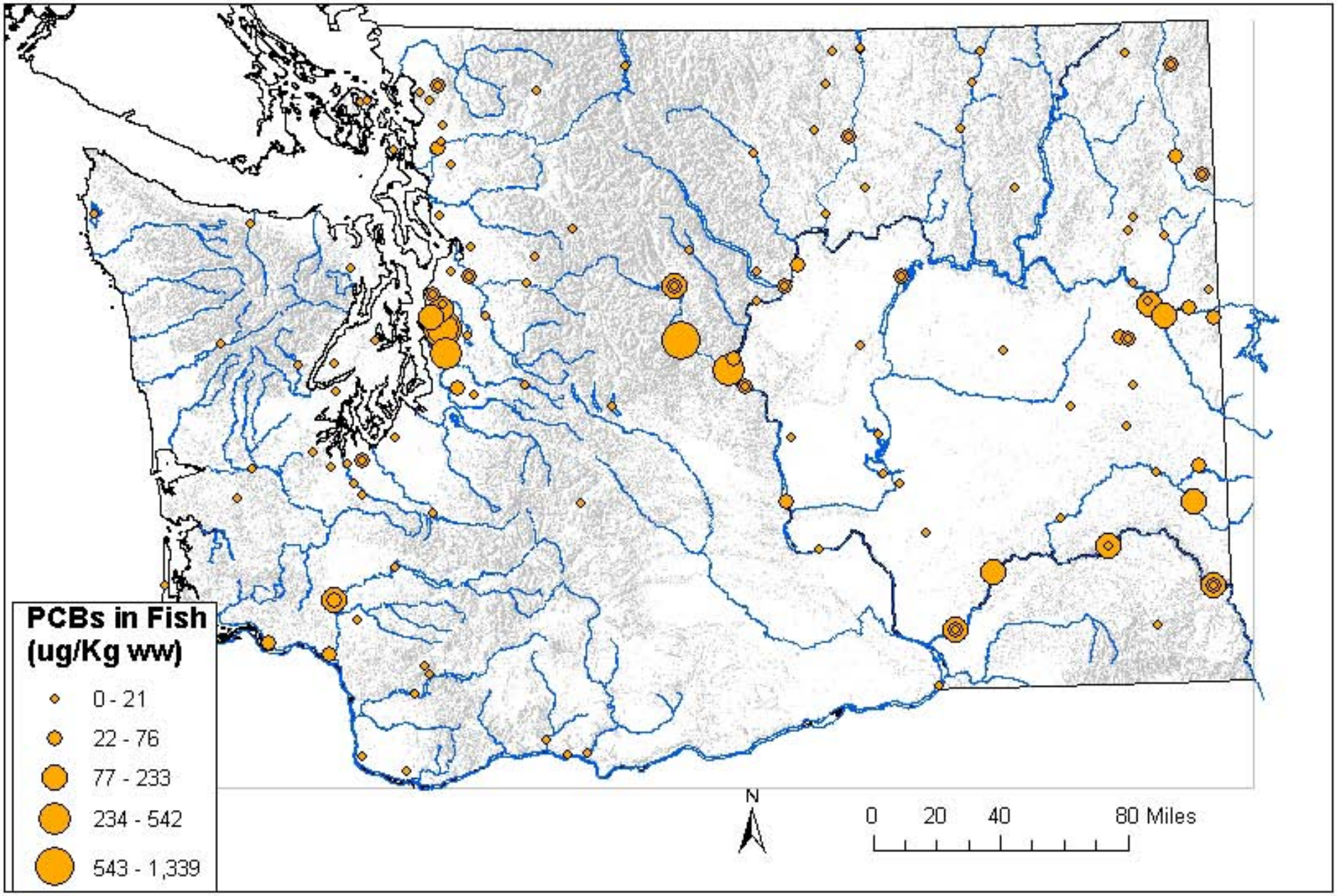

T-DDT (ug/kg)
100.0
10.0
1.0
BC
BG
BKT
BLT
BNT
BUR
CC
CCP
CTT
GCP
KOK
LMB
LWF
MWF
NPM
PEA
PWF
RBT
RKB
RSS
SMB
WAL
YP
Species

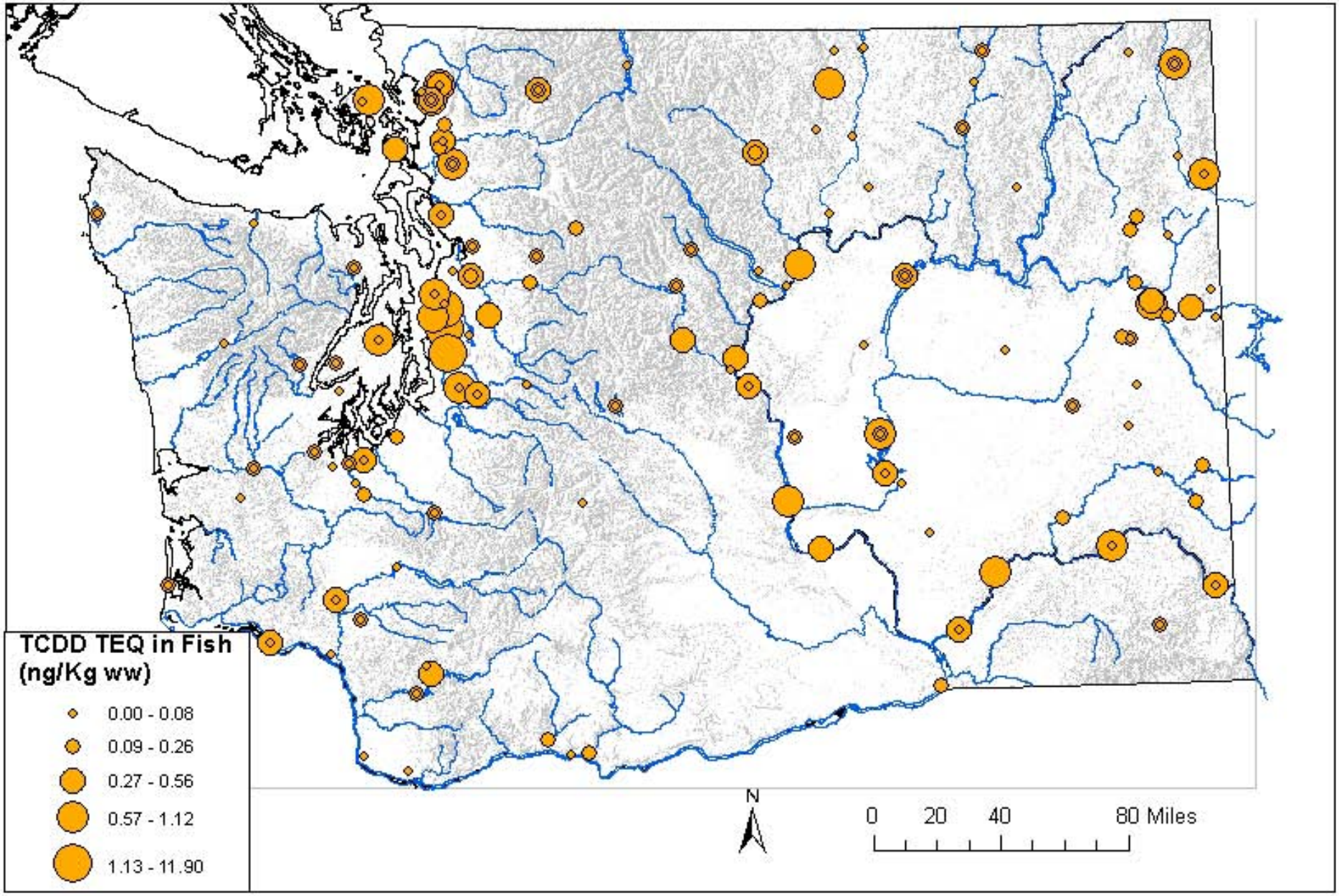

T-PBDE (ug/kg)
1000.00
100.00
10.00
1.00
0.10
BC
BG
BKT
BLT
BNT
BUR
CC
CCP
CTT
GCP
KOK
LMB
LWF
MWF
NPM
PEA
PWF
RBT
RKB
RSS
SMB
WAL
YP
Species

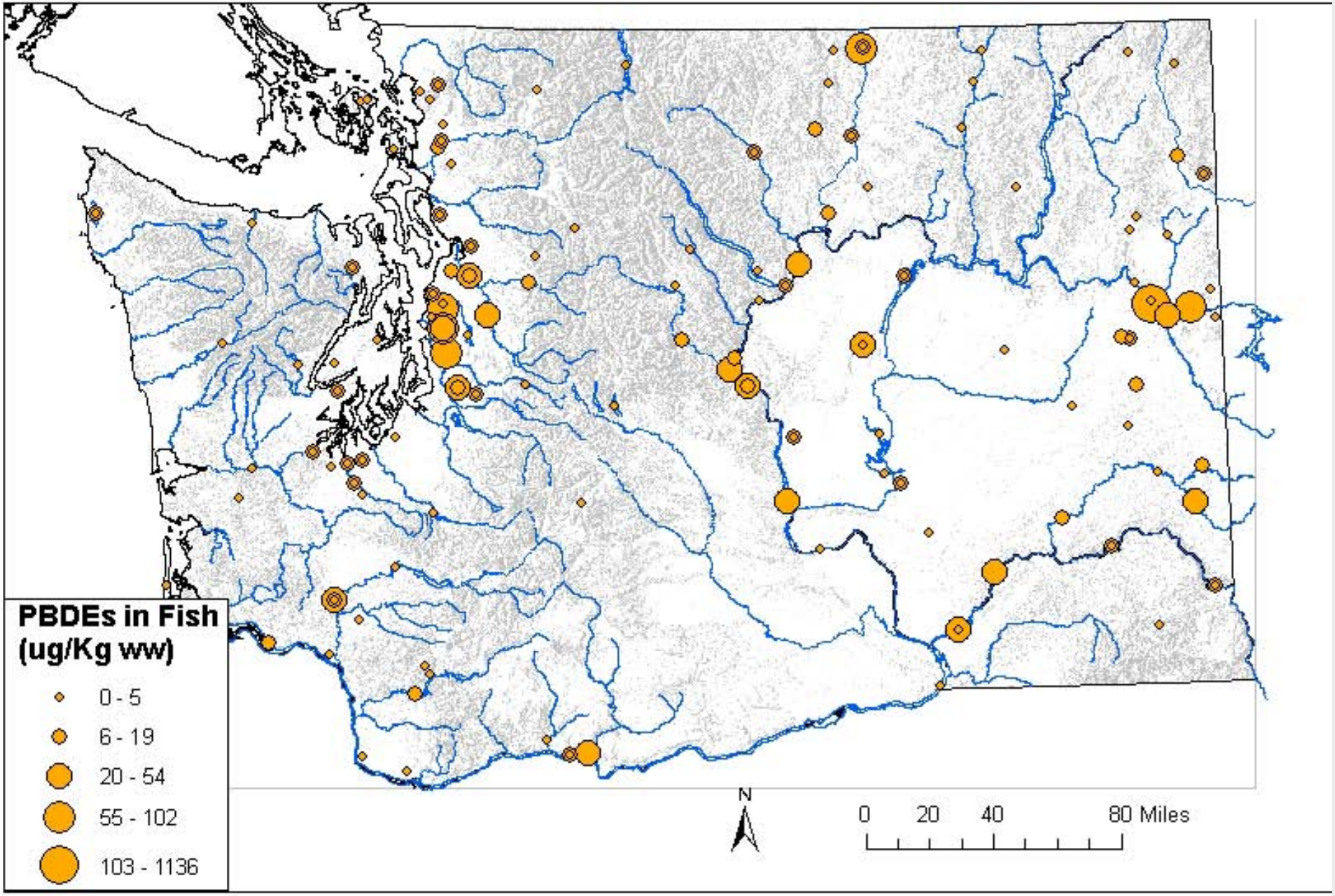

Mercury in Fish
(ug/Kg ww)
0 - 66
67 - 170
171 - 347
348 - 644
645 - 1600
N
0
20
40
80 Miles

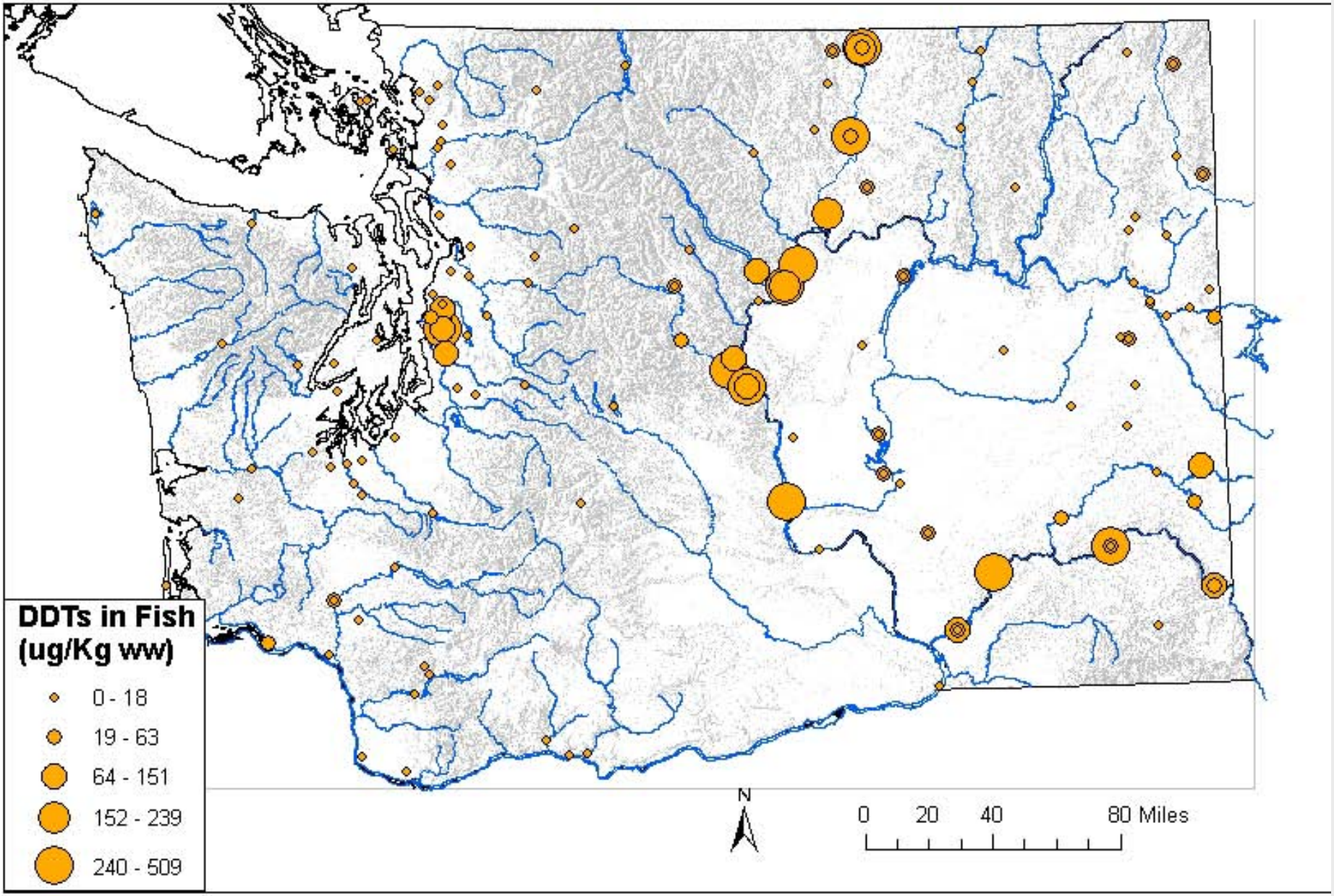


Lake Whatcom Fishing Stories


PCBs in Fish
(ug/Kg ww)
0 - 21
22 - 76
77 - 233
234 - 542
543 - 1,339
N
0
20
40
80 Miles


TCDD TEQ in Fish
(ng/Kg ww)
0.00 - 0.08
0.09 - 0.26
0.27 - 0.56
0.57 - 1.12
1.13 - 11.90
N
0
20
40
80 Miles


PBDEs in Fish
(ug/Kg ww)
0 - 5
6 - 19
20 - 54
55 - 102
103 - 1136
N
0
20
40
80 Miles


DDTs in Fish
(ug/Kg ww)
0 - 18
19 - 63
64 - 151
152 - 239
240 - 509
N
0 20 40 80 Miles

Summary of Exploratory Monitoring

- 260 samples, 130 sites
- 76% sites, 69% samples exceed WQS
- PCBs, dioxins, DDTs & other CPs exceed WQS
- Species important
- Site scoring helps see statewide “picture”
- Informs other efforts: LT monitoring, DOH

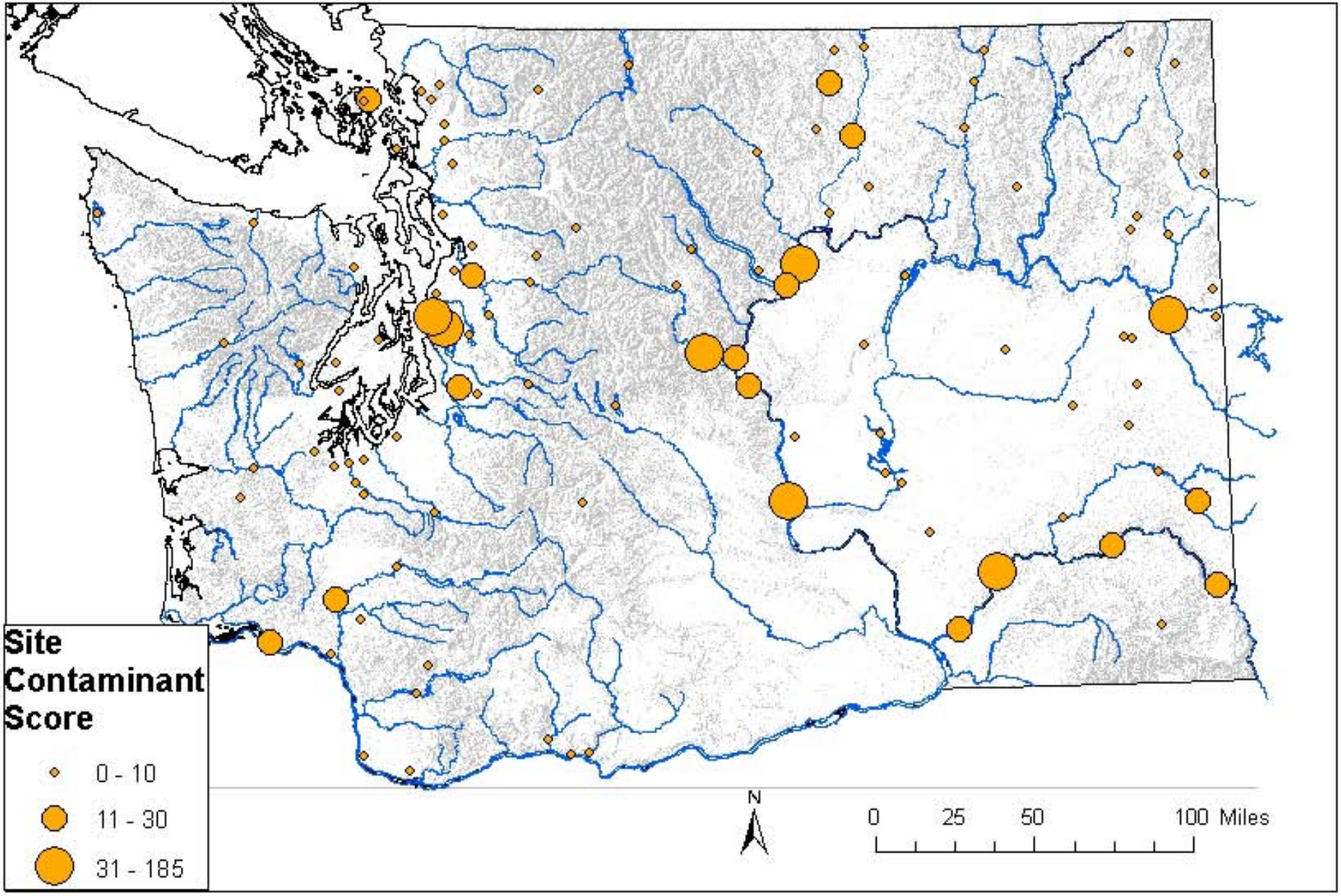
Which sites are most or least contaminated?

Some samples may be high in PCBs, yet low in DDTs. Other samples may be high in dioxin, yet low in mercury.

So, how to condense results from different analytes, species, and sites to gain a statewide perspective?

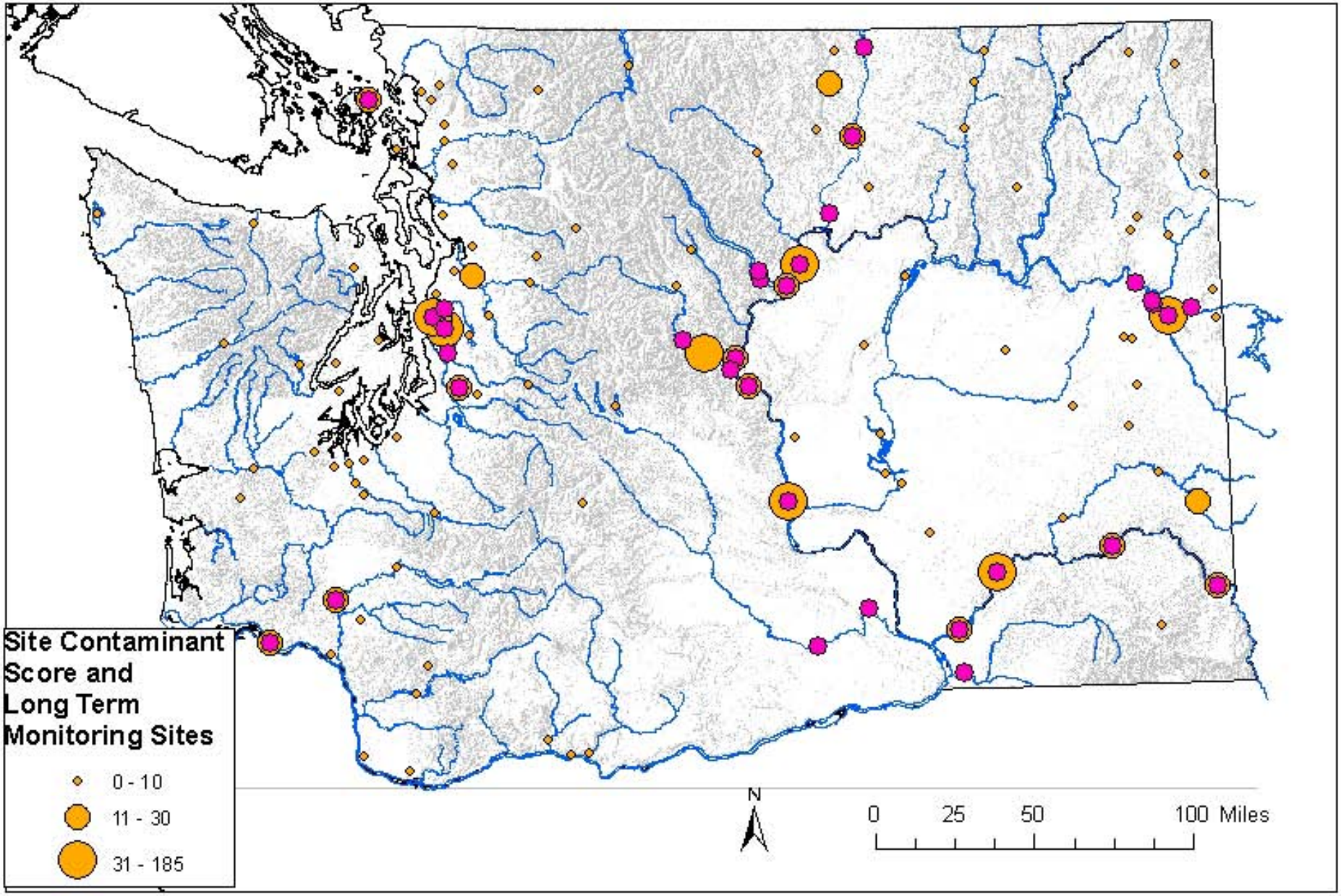
“Contaminant Score” developed for each sample and site – which can then be ranked.

Example Calculation of Contaminant Scores for Samples and Site for the Columbia River above Rock Island Dam.					
		Sample Result Value		Benchmark Exceedence Factor	
Contaminant	Benchmark Value [1]	NPM	WAL	NPM	WAL
Total PCB Aroclors (ppb)	5.3	52.0	46.0	9.8	8.7
2,3,7,8-TCDD TEQ (ppt) [2]	0.065	0.442	0.318	6.8	4.9
Total DDT (ppb)	32	415	343	13.0	10.7
Total PBDE (ppb) [3]	31	10.8	21.9	0.3	0.7
Mercury (ppb)	770	515	644	0.7	0.8
Sample Contaminant Score:				30.6	25.8
Site Contaminant Score: [4]				28.2	


Site Contaminant Score
0 - 10
11 - 30
31 - 185
N
0
25
50
100 Miles

Long Term Monitoring Component

- Goal: track changes in fish contaminant levels
- Target sites with TMDLs, FCAs, high levels
- Approx 5-year monitoring frequency
- Work with Regions, DOH, others
- 2009 – Snake River
- 2010 – Lake Chelan, Wenatchee River


Site Contaminant Score and Long Term Monitoring Sites
0 - 10
11 - 30
31 - 185
N
0
25
50
100 Miles

More Information At:

- Ecology Toxics Monitoring website:
- http://www.ecy.wa.gov/programs/eap/toxics/index.html

- Ecology WSTMP website:
- http://www.ecy.wa.gov/programs/eap/toxics/wstmp.htm

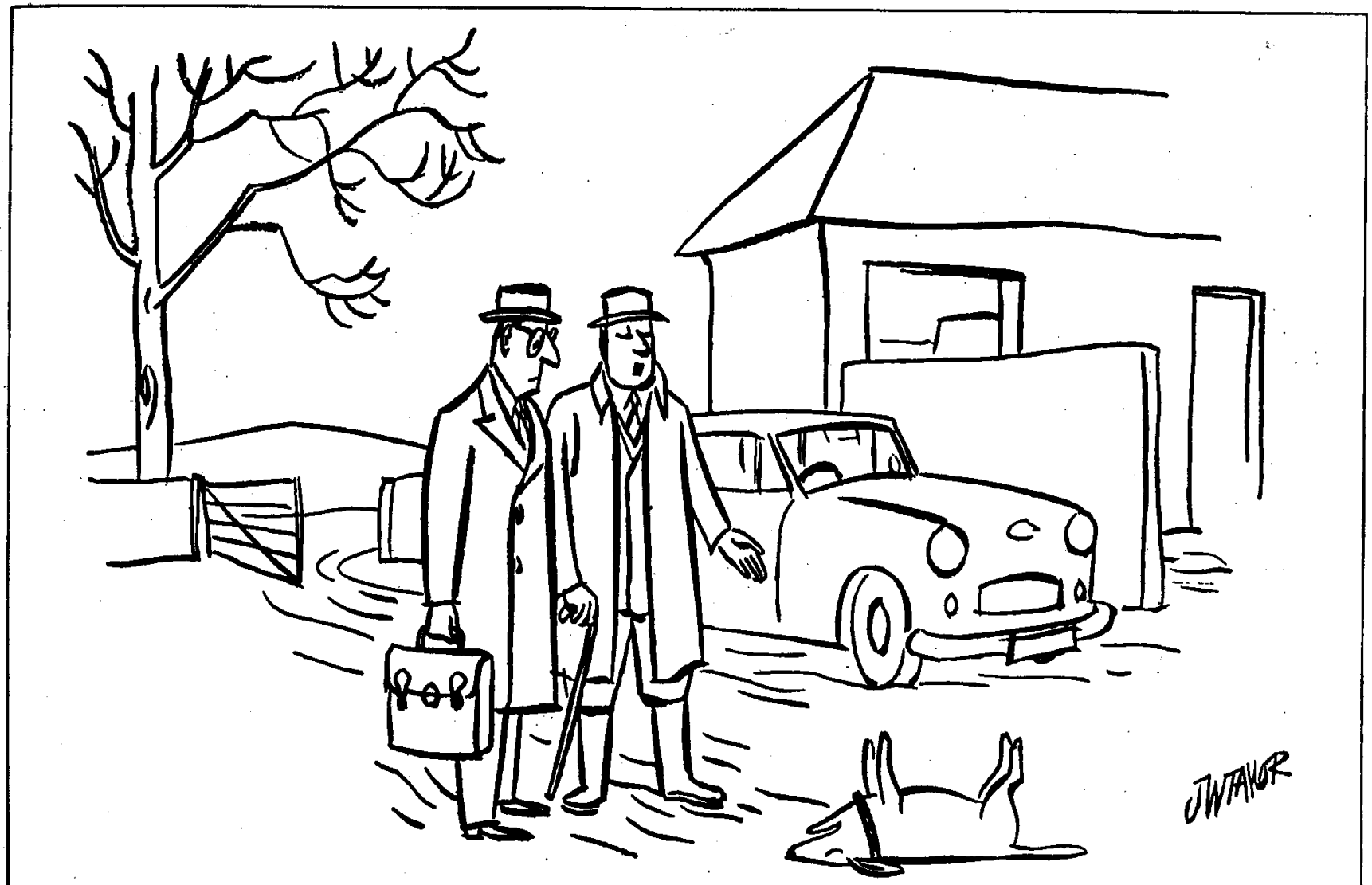
- Department of Health Fish Facts for Healthy Nutrition website:
- http://www.doh.wa.gov/ehp/oehas/fish/

Research Gaps and Needs - PNW

- Inventory contaminant sources and fluxes
- Index to data (who's got what where)
- More syntheses of existing data sets
- Develop/test of new sampling technologies

Policy Gaps/Needs

- Emphasize collaboration/partnerships
- Forums needed for regional issues
- Communication of upcoming work
- Improve regulatory tools (e.g. WQS)



"This is the dog that bit the cat that killed the rat that ate the malt that came from the grain that Jack sprayed."

PUNCH, March 6, 1963

What about eating fish?

- Many agencies collect/evaluate data
- Roles, mandates, criteria, evaluations vary
- Confusion: agencies and public
- Ecology: ID and correct problems, inform others
- DOH & local health districts: Risk Assessment, Management, Communication

eat more fish