

**2012 REGIONAL AMBIENT FISH TISSUE  
MONITORING PROGRAM;  
SUMMARY OF THE IOWA ANALYSES**

**Prepared by:**

**Watershed Monitoring and Assessment Section  
Iowa Geological and Water Survey Bureau  
Environmental Services Division  
Iowa Department of Natural Resources**

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## **Introduction:**

To supplement other environmental monitoring programs and to protect the health of people consuming fish from waters within this state, the state of Iowa conducts fish tissue monitoring. Since 1980, the Iowa Department of Natural Resources (IDNR), the United States Environmental Protection Agency Region VII (U.S. EPA), and the State Hygienic Laboratory (SHL) have cooperatively conducted annual statewide collections and analyses of fish for toxic contaminants. Beginning in 1983, this monitoring effort became known as the Regional Ambient Fish Tissue Monitoring Program (RAFT). Currently, the RAFT program is the only statewide fish contaminant-monitoring program in Iowa. Historically, the data generated from the RAFT program have enabled IDNR to document temporal changes in contaminant levels and to identify Iowa lakes and rivers where high levels of contaminants in fish potentially threaten the health of fish-consuming Iowans (see IDNR 2006). The Iowa RAFT monitoring program incorporates five different types of monitoring sites: 1) status, 2) follow-up, 3) trend, 4) turtle, and 5) random.

## **Status monitoring:**

The majority of RAFT sites sampled each year determine whether the waterbodies meet the "fish consumption" portion of the fishable goal of the federal Clean Water Act. In other words, these sites are used to screen for contamination problems and to determine the water quality "status" of the waterbodies. Analyses for a variety of pesticides, other toxic organic compounds, and metals are conducted on samples of omnivorous bottom-dwelling fish and carnivorous predator fish. Most status sites on rivers and lakes have either never been sampled or have not been sampled within the last five years (rivers) or 10 years (lakes). Staff of the IDNR divisions of Environmental Services and Conservation and Recreation select the status sites. Status monitoring occurs on most types of Iowa waterbodies (interior rivers, border rivers, and manmade and natural lakes) in both rural and urban areas. Lakes and river reaches known to support considerable recreational fishing receive highest priority, but IDNR attempts to sample all lakes and river reaches designated in the *Iowa Water Quality Standards* for recreational fishing. Approximately one-third to one-half of Iowa RAFT status sites are on lakes; the remaining sites are either on interior rivers or on the border rivers (Mississippi, Missouri or Big Sioux rivers).

## **Follow-up Monitoring:**

If the level of a contaminant in a fish tissue sample exceeds IDNR/IDPH advisory trigger levels and/or IDNR levels of concern (Appendix A; IDPH 2007), the RAFT program conducts follow-up monitoring to better define the levels of contaminants. For example, if status monitoring shows that contaminant levels in fish from a waterbody exceed IDNR/IDPH advisory trigger levels, additional samples will be collected as part of follow-up monitoring for the next year's RAFT program. If follow-up monitoring confirms that levels of contamination exceed State guidelines for protection of human health, a fish consumption advisory is issued. For more information on consumption advisories see the IDNR RAFT website: [http://www.iowadnr.gov/portals/idnr/uploads/fish/fish\\_consumption\\_advisories.pdf](http://www.iowadnr.gov/portals/idnr/uploads/fish/fish_consumption_advisories.pdf). If needed, IDNR Fisheries Bureau will conduct follow-up monitoring separately from the RAFT program to verify high levels of contaminants or to better delineate lengths of river consumption advisories. These follow-up samples are collected before the annual RAFT sampling and are analyzed at SHL.

**Trend monitoring:**

In 1994 U.S. EPA Region VII in cooperation with the Region VII states (Iowa, Kansas, Missouri, and Nebraska), identified sites that would be monitored at regular intervals to determine trends in levels of contamination. One composite sample of three to five common carp from each site is submitted for whole-fish analysis. Whole-fish samples are more likely to contain detectable levels of most contaminants than are fillet samples (edible portions) or tissue plugs. Examination of the trend monitoring results may help identify temporal changes in contaminant concentrations and may expose new contaminants entering the food chain. From 1996-2005, half of the trend sites were sampled on odd years and the other half were sampled in even years. In 2006, due to a change in RAFT program design (U.S. EPA 2006), all 10 trend sites were sampled and will be sampled every other year in the future. The following ten sites are Iowa's part of the RAFT trend monitoring program:

Table 1. IA RAFT trend site locations and sampling history.

site #	RAFT trend site name	county	# of samples	first sample date	last sample date
172	Des Moines River at Des Moines	Polk	9	8/17/1995	7/12/2012
173	Des Moines River NNW of Keosauqua	Van Buren	9	8/24/1994	7/19/2012
169	Iowa River E of Wapello	Louisa	9	9/14/1995	9/17/2010
177	Little Sioux River S of Washta	Ida	10	8/9/1994	9/24/2012
175	Maquoketa River NE of Maquoketa	Jackson	10	7/18/1995	8/3/2012
174	Mississippi River at Lansing	Allamakee	10	8/16/1995	10/15/2012
170	Mississippi River at Linwood	Scott	8	8/4/1994	8/20/2012
143	Mississippi River downstream of Dubuque	Dubuque	10	9/15/1994	9/11/2012
171	Skunk River NE of Wever	Lee	8	9/5/1997	9/17/2010
176	Wapsipinicon River SSE of Ground Mound	Scott	8	9/15/1994	8/25/2010

**Turtle Monitoring:**

In 2009, IDNR fisheries biologists first collected snapping turtles from nine Iowa lakes as part of RAFT monitoring to better define contaminant levels in Iowa turtle populations. This monitoring used the left front shoulder muscle tissue from two or three turtles for the sample that was submitted for analysis following the same protocol used for fish. The turtle monitoring continued in 2010 at four Iowa lakes, was suspended in 2011 and resumed in 2012.

**Random Monitoring:**

In 2006, based on recommendations in U.S. EPA's RAFT workplan (U.S. EPA 2006), Iowa began sampling random sites across the state as part of an effort to determine the current level of contaminants in fish tissue on a statewide basis. The 2006 sampling sites were selected from a previous random sampling project and data were collected only from large interior rivers. In 2007, the sample sites were selected from a random list of smaller public lakes and ponds. Given that U.S. EPA Region VII has recently changed the emphasis of the RAFT program again, the future of random sampling for Iowa fish contaminants is uncertain.

## **2012 Results:**

The 2012 RAFT program in Iowa involved the collection of 126 samples from 35 waterbodies. The high number of samples reflects the switch from fillet predator samples to tissue plug predator samples where the samples are individually analyzed and not composited. In July - October 2012, IDNR fisheries biologists collected, processed and prepared the RAFT samples for shipping. These activities were conducted according to procedures described in the workplan for the 2012 RAFT in Iowa (IDNR 2011). Once frozen, samples were transported or shipped to the Ankeny office of the SHL. The frozen tissue samples were stored at the SHL until shipment to the U.S. EPA Region VII laboratory in Kansas City, Kansas. All samples were shipped to the U.S. EPA Region VII laboratory for analysis by November 2012. Samples were analyzed for a variety of contaminants, including pesticides, other toxic organic compounds, and toxic metals (Appendix A). IDNR received results of all sample analyses in late August 2013.

Status monitoring in 2012 included the collection of 47 fish samples from nine sites with 38 of those samples collected from predatory fish and nine samples collected from bottom feeding fish.

The follow-up monitoring in 2012 involved the collection of 68 predatory fish mercury (Hg) samples from 15 sites.

Due to the drought conditions in 2012, biologists were only able to collect whole-fish common carp samples at seven (out of 10) trend sites.

There were three snapping turtle status samples collected at three sites and one follow-up Hg snapping turtle sample collected from one site.

The results for all of the 2012 RAFT monitoring in Iowa for the primary contaminants of concern (mercury, PCBs, dieldrin, chlordane and sum chlordane isomers) are summarized in Tables 2-6 and in Figures 1-4. In addition, appendices D through F contain all the sampling data generated by the Iowa portion of the 2012 RAFT program.

With the exception of mercury at approximately 11 sites, the vast majority of contaminant levels in the 2012 IA RAFT samples were low or not detected (Tables 2, 3 and 6). These results are currently being addressed by IDNR Fisheries bureau with the assistance of the IDNR Watershed Monitoring and Assessment section and the Iowa Department of Public Health.

2012 RAFT report

Table 2. 2012 IA RAFT mercury (Hg) status site sampling results from predatory fish. All samples were tissue plugs and Hg results are in mg/kg (or ppm).

site #	RAFT site name	county	date	species	# fish	Hg ave	Hg st dev	Hg max	Hg min
61	Cedar River at Midway	Floyd	9/10/2012	SMB	5	0.464	0.089	0.572	0.344
122	Clear Lake, north shore, near Clear Lake	Cerro Gordo	9/24/2012	WAE	5	0.075	0.020	0.102	0.056
289	Cold Springs Lake	Cass	9/12/2012	LMB	5	0.475	0.100	0.616	0.359
190	Five Island Lake at Emmetsburg	Palo Alto	10/1/2012	WAE	5	0.037	0.022	0.068	0.019
210	Mississippi River at Beaver Slough, Clinton	Clinton	9/14/2012	BLG	5	0.204	0.042	0.247	0.151
131	Mississippi River downstream of Muscatine	Muscatine	8/23/2012	WHB	4	0.244	0.136	0.419	0.087
82	North Raccoon River downstream of Sac City	Sac	10/1/2012	WAE	4	0.304	0.045	0.346	0.254
135	Winnebago River E of Mason City	Cerro Gordo	8/28/2012	WAE	5	0.218	0.082	0.325	0.154

Table 3. 2012 IA RAFT mercury (Hg) follow-up site sampling results from predatory fish. All samples were tissue plugs and Hg results are in mg/kg (or ppm).

site #	RAFT site name	county	date	species	# fish	Hg ave	Hg st dev	Hg max	Hg min
164	Beaver Lake	Dallas	9/19/2012	LMB	5	0.220	0.020	0.253	0.202
54	Des Moines River at U.S. 65/69, Des Moines	Polk	7/11/2012	FCF	5	0.183	0.075	0.286	0.104
139	East Nishnabotna River near Red Oak	Montgomery	7/31/2012	FRD	5	0.216	0.089	0.337	0.140
241	Grade Lake	Clarke	8/10/2012	LMB	5	0.616	0.228	0.921	0.374
3	Iowa River at Marshalltown	Marshall	9/26/2012	WAE	3	0.308	0.071	0.351	0.226
86	Lake Iowa N of Millersburg	Iowa	9/14/2012	LMB	5	0.303	0.107	0.424	0.185
134	Lake Pahoja near Larchwood	Lyon	9/26/2012	LMB	5	0.203	0.052	0.246	0.125
279	Maquoketa River, DS old Lake Delhi Dam	Delaware	8/14/2012	SMB	5	0.183	0.090	0.285	0.069
99	Red Haw Lake ESE of Chariton	Lucas	8/28/2012	LMB	5	0.409	0.098	0.518	0.305
68	Shell Rock River W of Clarksville	Butler	8/2/2012	WAE	3	0.285	0.078	0.373	0.223
125	Turkey River S of Garber	Clayton	8/14/2012	SMB	5	0.467	0.276	0.950	0.267
104	Upper Iowa River at Decorah	Winneshiek	8/27/2012	SMB	3	0.179	0.036	0.209	0.139
203	Volga River near Volga Recreation Area	Fayette	8/28/2012	SMB	5	0.214	0.051	0.274	0.158
117	West Fork Cedar River S of Allison	Butler	9/20/2012	SMB	4	0.182	0.077	0.296	0.131
162	Yellow Smoke Lake	Crawford	9/24/2012	LMB	5	0.218	0.074	0.331	0.150

Table 4. 2012 IA RAFT status site contaminants of concern sampling results from bottom-feeding fish. All samples were fillet composites and results are in mg/kg (or ppm).

site #	RAFT site name	county	date	species	# fish	technical chlordane	sum chlordane isomers <sup>1</sup>	sum PCBs <sup>2</sup>	Hg <sup>3</sup>
61	Cedar River at Midway	Floyd	9/10/2012	CCF	5	<0.03	<0.01	<0.09	0.172
122	Clear Lake, north shore, near Clear Lake	Cerro Gordo	9/7/2012	CCF	5	<0.03	<0.01	<0.09	0.0306
289	Cold Springs Lake	Cass	8/3/2012	CCF	5	<0.03	<0.01	<0.09	0.0507
190	Five Island Lake at Emmetsburg	Palo Alto	7/27/2012	CCF	5	<0.03	<0.01	<0.09	0.0219
210	Mississippi River at Beaver Slough, Clinton	Clinton	9/14/2012	CCF	4	<0.03	<0.01	<0.09	0.0626
131	Mississippi River downstream of Muscatine	Muscatine	8/23/2012	CAP	5	<0.03	<0.01	<0.09	0.0465
347	Missouri River at Blencoe	Monona	9/10/2012	PAH	4	<0.03	0.0116	<0.09	0.0906
82	North Raccoon River downstream of Sac City	Sac	10/1/2012	CCF	3	<0.03	0.0124	<0.09	0.147
135	Winnebago River E of Mason City	Cerro Gordo	8/28/2012	CAP	5	<0.03	<0.01	<0.09	0.122
<sup>1</sup> sum chlordane isomers = cis- chlordane + trans- chlordane + oxychlordane + cis- nonachlor + trans- nonachlor									
<sup>2</sup> sum PCBs = Aroclor 1248 + Aroclor 1254 + Aroclor 1260									
<sup>3</sup> Hg = mercury									

Table 5. 2012 IA RAFT trend site contaminants of concern sampling results from Common Carp. All samples were whole fish composites and results are in mg/kg (or ppm).

site #	RAFT site name	county	date	species	# fish	technical chlordane	dieldrin	sum PCBs <sup>1</sup>	Hg <sup>2</sup>
172	Des Moines River at Des Moines	Polk	7/12/2012	CAP	NA	0.031	<0.003	<0.09	0.132
173	Des Moines River NNW of Keosauqua	Van Buren	7/19/2012	CAP	3	0.11	0.027	0.24	0.111
177	Little Sioux River S of Washta	Cherokee	9/24/2012	CAP	5	<0.03	0.008	<0.09	0.0615
175	Maquoketa River NE of Maquoketa	Jackson	8/3/2012	CAP	3	0.042	0.0094	0.162	0.0526
174	Mississippi River at Lansing	Allamakee	10/15/2012	CAP	4	<0.03	<0.003	0.129	0.0414
170	Mississippi River at Linwood	Scott	8/20/2012	CAP	5	0.033	<0.0035	0.187	0.0733
143	Mississippi River downstream of Dubuque	Dubuque	9/11/2012	CAP	5	<0.03	<0.003	0.142	0.0693
<sup>1</sup> sum PCBs = Aroclor 1248 + Aroclor 1254 + Aroclor 1260									
<sup>2</sup> Hg = mercury									

Table 6. 2012 IA RAFT snapping turtle contaminants of concern sampling results. All samples were left front shoulder muscle tissue composites and results are in mg/kg (or ppm).

site #	RAFT site name	county	date	species	# turtles	technical chlordane	sum chlordane isomers <sup>1</sup>	sum PCBs <sup>2</sup>	Hg <sup>3</sup>
346	Big Hollow Lake	Des Moines	7/5/2012	snap	3				0.329
74	Lake of the Hills W of Davenport	Scott	8/29/2012	snap	3				0.0681
270	Pollmiller Park Lake	Lee	7/16/2012	snap	2				0.403
348	Wilson Lake	Lee	9/26/2012	snap	1	<0.03	<0.010	<0.09	0.303
<sup>1</sup> sum chlordane isomers = cis- chlordane + trans- chlordane + oxychlordane + cis- nonachlor + trans- nonachlor									
<sup>2</sup> sum PCBs = Aroclor 1248 + Aroclor 1254 + Aroclor 1260									
<sup>3</sup> Hg = mercury									



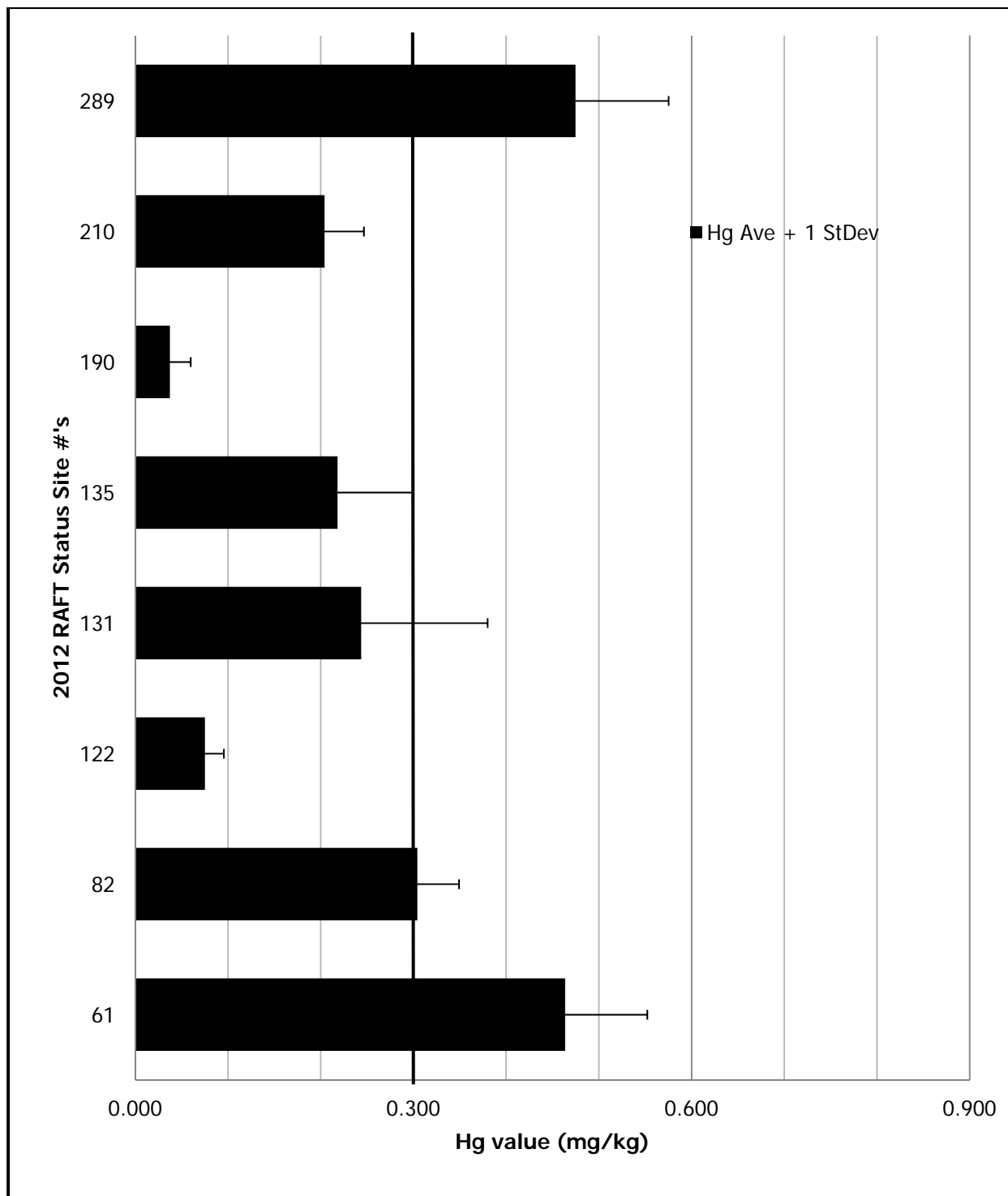


Figure 1. 2012 IA RAFT mercury status sample results for predatory fish. All samples were tissue plugs and results are in mg/kg (or ppm). All of the values above 0.3 mg/kg have been, or will be, addressed by IDNR through the issuance or continuation of consumption advisories or with follow-up monitoring. See Appendix B for the full list of 2012 RAFT sites.

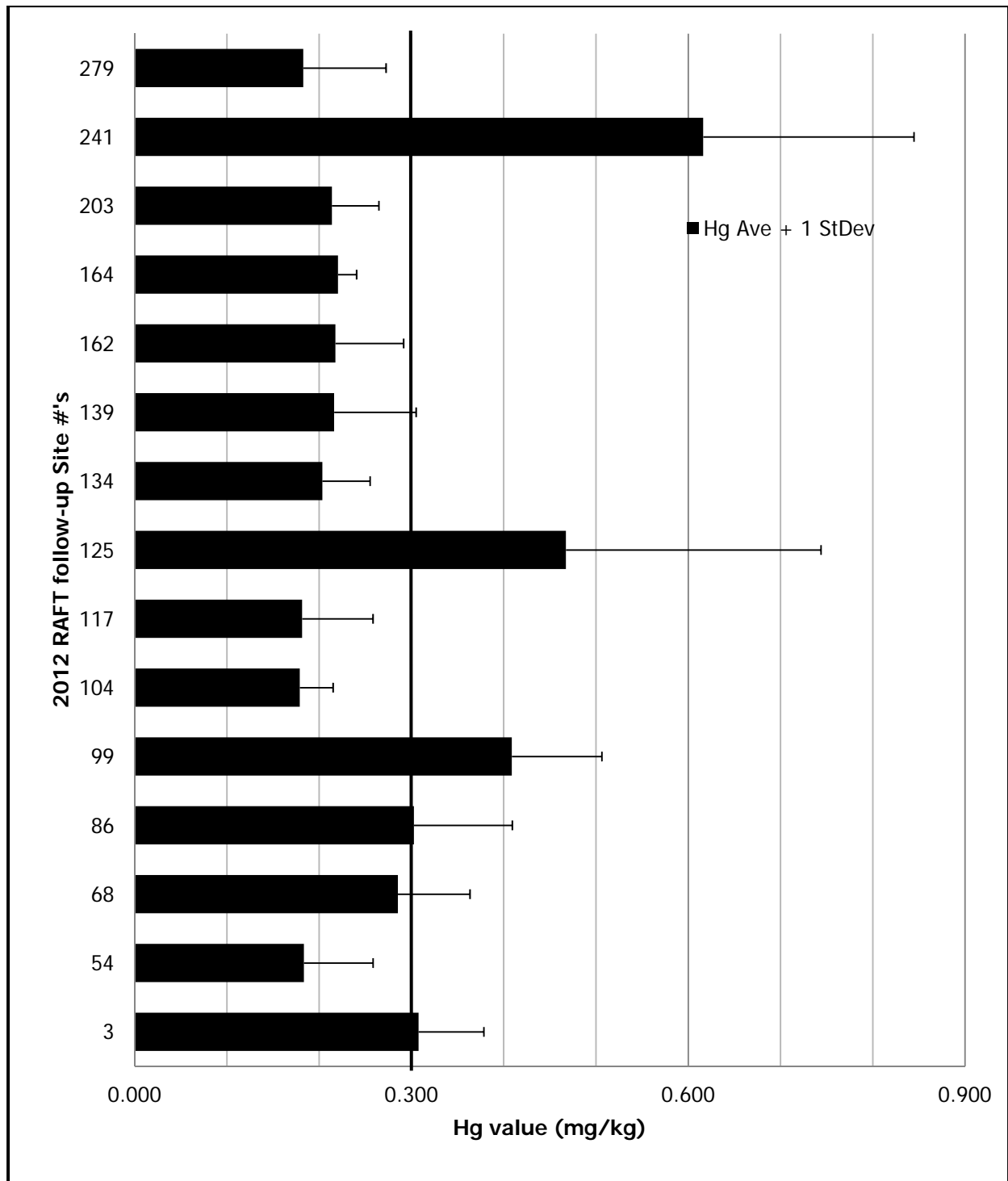


Figure 2. 2012 IA RAFT mercury follow-up sample results for predatory fish. All samples were tissue plugs and results are in mg/kg (or ppm). All of the values above 0.3 mg/kg have been, or will be, addressed by IDNR through the issuance or continuation of consumption advisories or with follow-up monitoring. See Appendix B for the full list of 2012 RAFT sites.

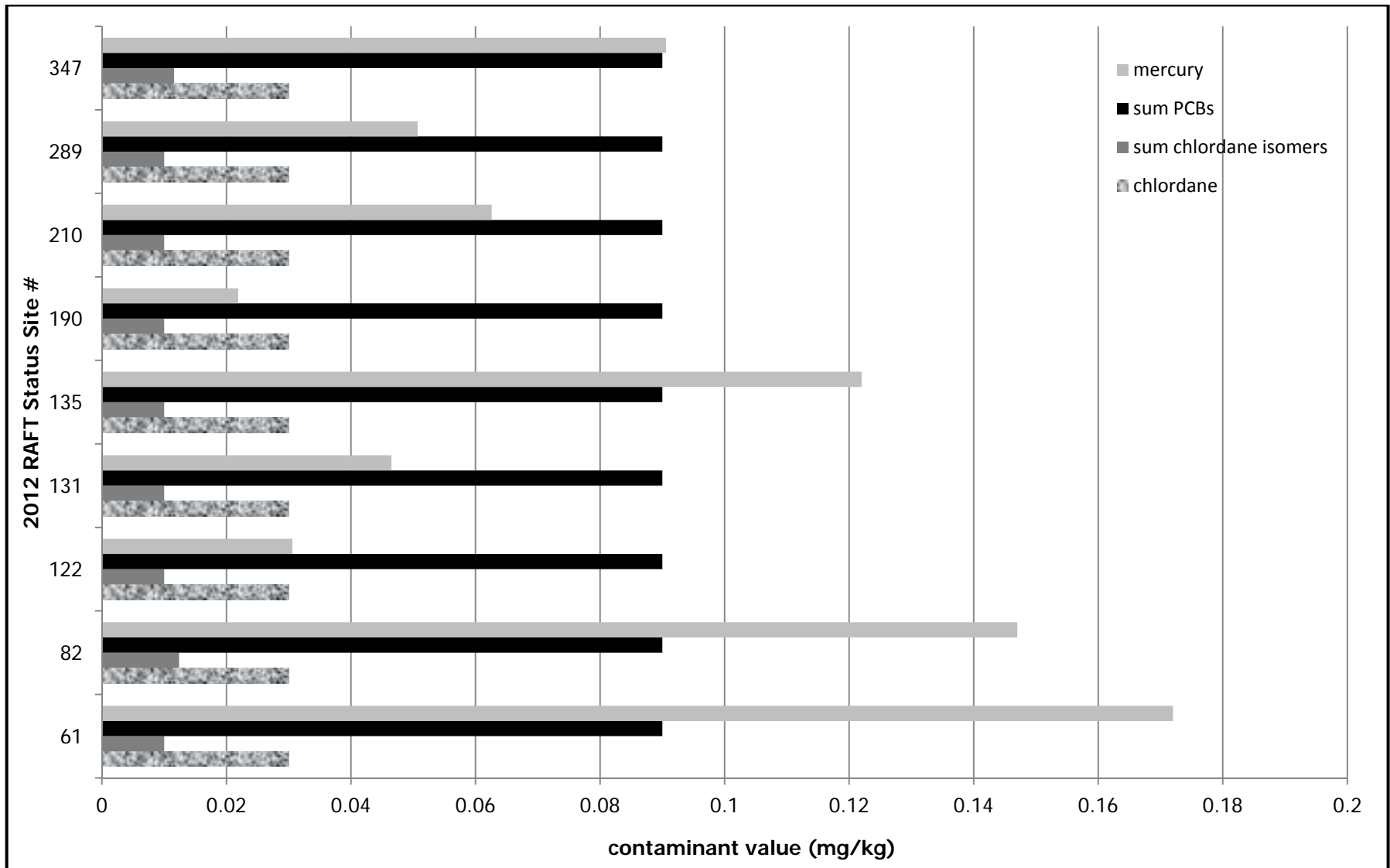


Figure 3. 2012 IA RAFT status sample results for chlordane, sum chlordane isomers, mercury and total PCBs (in mg/kg or ppm). All samples were composited fillets from bottom feeding fish (primarily common carp and channel catfish). See Appendix B for the full list of the 2012 RAFT sites.

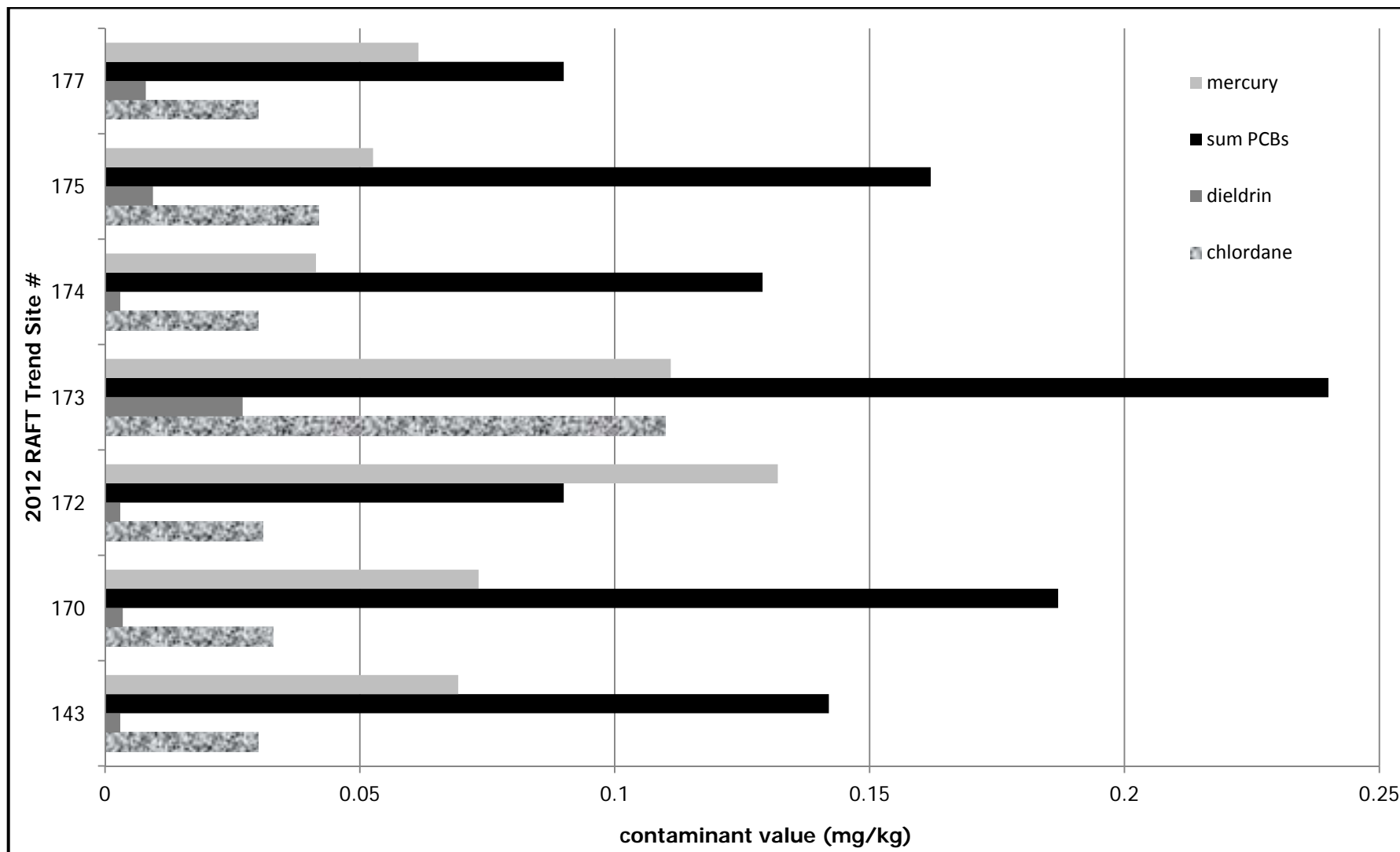


Figure 4. 2012 IA RAFT trend sample results for chlordane, dieldrin, mercury and total PCBs (in mg/kg or ppm) . All samples were composited from three-five whole-fish Common Carp and results are in mg/kg. See Appendix B for the full list of the 2012 RAFT sites.

**References:**

IDNR. 2006. Fish tissue monitoring in Iowa. Water Fact Sheet 2006-5. Geological and Water Survey, Iowa Department of Natural Resources. 4 pgs (<ftp://ftp.igsb.uiowa.edu/igspubs/pdf/WFS-2006-05.pdf>).

IDNR. 2011. Sampling Procedures for the Region VII Ambient Fish Tissue Monitoring Program in Iowa. Geological and Water Survey Bureau, Environmental Services Division, Iowa Department of Natural Resources. 16 pp.

IDPH. 2007. Fish consumption advisory protocol in Iowa. Iowa Department of Public Health. 8 pgs.

U.S. EPA. 2006. EPA Region 7 Regional Ambient Fish Tissue Monitoring Program (RAFTMP) program rationale, design and implementation plans for 2006 - 2010. Environmental Services Division, U.S. Environmental Protection Agency Region 7 and the Region 7 Fish Tissue Monitoring Workgroup. 24 pgs.

Summary of contaminants and respective criteria for fish tissue samples collected for the Regional Ambient Fish Tissue (RAFT) monitoring program in Iowa.

#	contaminant	detection level (ppm <sup>3</sup> )	IDNR/IDPH advisory level (ppm)	IDNR/IDPH advisory meal allowance
1	chlordanes, technical	0.03	0 to 0.6	unrestricted
			>0.6 to <5.0	one meal per week
			5.0 and over	do not eat
2	mercury	0.0181	0 to 0.3	unrestricted
			>0.3 to <1.0	one meal per week
			1.0 and over	do not eat
3	PCB, Aroclor 1248	0.04	sum = 0 to 0.2	unrestricted
4	PCB, Aroclor 1254	0.03	sum >0.2 to <2.0	one meal per week
5	PCB, Aroclor 1260	0.02	sum 2.0 and over	do not eat
6	chlordanes, cis <sup>-1</sup>	0.002		
7	chlordanes, trans <sup>-1</sup>	0.002		
8	nonachlor, cis <sup>-1</sup>	0.002		
9	nonachlor, trans <sup>-1</sup>	0.002		
10	oxychlordanes <sup>1</sup>	0.002		
11	DDD, 4,4'-	0.004		
12	DDE, 4,4'-	0.005		
13	DDT, 4,4'-	0.005		
14	BHC (lindane)	0.002		
15	cadmium	0.02		
16	dieldrin	0.003		
17	heptachlor	0.003		
18	heptachlor epoxide	0.003		
19	hexachlorobenzene	0.001		
20	lead	0.11		
21	mirex <sup>2</sup>	0.003		
22	pentachloroanisole	0.001		
23	pentachlorobenzene <sup>2</sup>	0.001		
24	selenium	0.5		
25	1,2,4,5-tetrachlorobenzene <sup>2</sup>	0.004		
26	trifluralin	0.003		
<sup>1</sup> status samples only				
<sup>2</sup> trend samples only				
<sup>3</sup> ppm = parts per million and is equivalent to milligrams/kilogram (mg/kg)				

Complete listing of the 2012 IA RAFT sampling sites.

site #	RAFT site name	county	waterbody type
3	Iowa River at Marshalltown	Marshall	river/stream
54	Des Moines River at U.S. 65/69, Des Moines	Polk	river/stream
61	Cedar River at Midway	Floyd	river/stream
68	Shell Rock River W of Clarksville	Butler	river/stream
74	Lake of the Hills W of Davenport	Scott	lake
82	North Raccoon River downstream of Sac City	Sac	river/stream
86	Lake Iowa N of Millersburg	Iowa	lake
99	Red Haw Lake ESE of Chariton	Lucas	lake
104	Upper Iowa River at Decorah	Winneshiek	river/stream
117	West Fork Cedar River S of Allison	Butler	river/stream
122	Clear Lake, north shore, near Clear Lake	Cerro Gordo	lake
125	Turkey River S of Garber	Clayton	river/stream
131	Mississippi River downstream of Muscatine	Muscatine	river/stream
134	Lake Pahoja near Larchwood	Lyon	lake
135	Winnebago River E of Mason City	Cerro Gordo	river/stream
139	East Nishnabotna River near Red Oak	Montgomery	river/stream
143	Mississippi River downstream of Dubuque	Dubuque	river/stream
162	Yellow Smoke Lake	Crawford	lake
164	Beaver Lake	Dallas	lake
170	Mississippi River at Linwood	Scott	river/stream
172	Des Moines River at Des Moines	Polk	river/stream
173	Des Moines River NNW of Keosauqua	Van Buren	river/stream
174	Mississippi River at Lansing	Allamakee	river/stream
175	Maquoketa River NE of Maquoketa	Jackson	river/stream
177	Little Sioux River S of Washta	Cherokee	river/stream
190	Five Island Lake at Emmetsburg	Palo Alto	lake
203	Volga River near Volga Recreation Area	Fayette	river/stream
210	Mississippi River at Beaver Slough, Clinton (mouth of Mill Creek)	Clinton	river/stream
241	Grade Lake	Clarke	lake
270	Pollmiller Park Lake	Lee	lake
279	Maquoketa River, downriver of former site of Lake Delhi Dam	Delaware	river/stream
289	Cold Springs Lake	Cass	lake
348	Wilson Lake	Lee	lake
346	Big Hollow Lake	Des Moines	lake
347	Missouri River at Blencoe	Monona	river/stream

## Appendix C

Fish and turtle species table that includes: species codes, common and scientific names, and RAFT codes.

species code	common name	scientific name	RAFT code
BGB	Bigmouth Buffalo	<i>Ictiobus cyprinellus</i>	3
BKB	Black Buffalo	<i>Ictiobus niger</i>	105
BLB	Black Bullhead	<i>Ameiurus melas</i>	4
BLC	Black Crappie	<i>Pomoxis nigromaculatus</i>	5
BLG	Bluegill	<i>Lepomis macrochirus</i>	8
BRT	Brown Trout	<i>Salmo trutta</i>	11
CCF	Channel Catfish	<i>Ictalurus punctatus</i>	16
CAP	Common Carp	<i>Cyprinus carpio</i>	12
FCF	Flathead Catfish	<i>Pylodictis olivaris</i>	19
FRD	Freshwater Drum	<i>Aplodinotus grunniens</i>	20
GOR	Golden Redhorse	<i>Moxostoma erythrurum</i>	390
LMB	Largemouth Bass	<i>Micropterus salmoides</i>	31
NHS	Northern Hog Sucker	<i>Hypentelium nigricans</i>	94
NOP	Northern Pike	<i>Esox lucius</i>	36
PAH	Paddlefish	<i>Polyodon spathula</i>	106
ULL	Quillback Carpsucker	<i>Carpiodes cyprinus</i>	74
RBT	Rainbow Trout	<i>Oncorhynchus mykiss</i>	39
RVC	River Carpsucker	<i>Carpiodes carpio</i>	42
SAR	Sauger	<i>Sander canadensis</i>	46
SHR	Shorthead Redhorse	<i>Moxostoma macrolepidotum</i>	192
SHG	Shortnose Gar	<i>Lepisosteus platostomus</i>	107
SMB	Smallmouth Bass	<i>Micropterus dolomieu</i>	47
SAB	Smallmouth Buffalo	<i>Ictiobus bubalus</i>	48
SNAP	Snapping Turtle	<i>Chelydra serpentina</i>	
SOFT	Softshell Turtle	<i>Apalone spp.</i>	
WAE	Walleye	<i>Sander vitreus</i>	55
WHB	White Bass	<i>Morone chrysops</i>	57
WHC	White Crappie	<i>Pomoxis annularis</i>	59
WHS	White Sucker	<i>Catostomus commersonii</i>	61
YLB	Yellow Bass	<i>Morone mississippiensis</i>	93
YEB	Yellow Bullhead	<i>Ameiurus natalis</i>	62
YEP	Yellow Perch	<i>Perca flavescens</i>	63



## Appendix D

Complete listing of the 2012 IA RAFT predator fish sampling results. See Appendix B for a list of 2012 RAFT site numbers and Appendix C for a list of fish names and abbreviations.

samp#	site #	species	biopart	sample type	length (cm)	weight (g)	mercury (mg/kg)
1402	3	WAE	plug	followup	37.7	454	0.346
1403	3	WAE	plug	followup	46.5	817	0.226
1404	3	WAE	plug	followup	39	413	0.351
1352	54	FCF	plug	followup	56.6	1875	J0.286
1353	54	FCF	plug	followup	49.2	1225	J0.104
1354	54	FCF	plug	followup	54.3	1580	J0.148
1355	54	FCF	plug	followup	49.7	1340	J0.143
1356	54	FCF	plug	followup	45.9	905	0.236
1338	61	SMB	plug	status	37.1	755	0.415
1339	61	SMB	plug	status	40.1	934	0.518
1340	61	SMB	plug	status	33.8	489	0.469
1341	61	SMB	plug	status	35.1	598	0.344
1342	61	SMB	plug	status	43.4	1208	0.572
1395	68	WAE	plug	followup	40.1	550	0.223
1396	68	WAE	plug	followup	38.9	484	0.373
1397	68	WAE	plug	followup	41.1	663	0.26
1347	82	WAE	plug	status	39.1	518	0.279
1348	82	WAE	plug	status	36.1	365	0.254
1349	82	WAE	plug	status	39.9	488	0.338
1350	82	WAE	plug	status	37.8	436	0.346
1405	86	LMB	plug	followup	32.8	540	0.424
1406	86	LMB	plug	followup	32.3	522	0.259
1407	86	LMB	plug	followup	34.8	581	0.407
1408	86	LMB	plug	followup	31.2	485	0.185
1409	86	LMB	plug	followup	34.5	572	0.238
1362	99	LMB	plug	followup	33	438	0.322
1363	99	LMB	plug	followup	33.5	511	0.305
1364	99	LMB	plug	followup	32.2	432	0.497
1365	99	LMB	plug	followup	34.2	519	0.518
1366	99	LMB	plug	followup	31.4	378	0.402
1382	104	SMB	plug	followup	28.2	256	0.189
1383	104	SMB	plug	followup	23.4	150	0.139
1384	104	SMB	plug	followup	31.5	454	0.209
1398	117	SMB	plug	followup	29.3	308	0.148
1399	117	SMB	plug	followup	28.9	334	0.151
1400	117	SMB	plug	followup	28.5	322	0.131
1401	117	SMB	plug	followup	29.3	342	0.296
1318	122	WAE	plug	status	37.7	440	0.0897
1319	122	WAE	plug	status	37	420	0.0565
1320	122	WAE	plug	status	36.5	420	0.102
1321	122	WAE	plug	status	39.3	575	0.0559
1322	122	WAE	plug	status	41.7	710	0.0711
1377	125	SMB	plug	followup	41.9	876	0.419
1378	125	SMB	plug	followup	33.5	416	0.95
1379	125	SMB	plug	followup	32	391	0.267
1380	125	SMB	plug	followup	31.2	395	0.312
1381	125	SMB	plug	followup	34.3	538	0.389

Complete listing of the 2012 IA RAFT predator fish sampling results.

samp#	site #	species	biopart	sample type	length (cm)	weight (g)	mercury (mg/kg)
1343	131	WHB	plug	status	43.1	1024	0.419
1344	131	WHB	plug	status	37.3	638	0.225
1345	131	WHB	plug	status	32.6	438	0.244
1346	131	WHB	plug	status	31.5	430	0.0867
1367	134	LMB	plug	followup	39.2	907.2	0.246
1368	134	LMB	plug	followup	40.9	1041.0	0.242
1369	134	LMB	plug	followup	38.5	891.3	0.177
1370	134	LMB	plug	followup	39.4	864.1	0.125
1371	134	LMB	plug	followup	38.1	886.8	0.227
1323	135	WAE	plug	status	47.7	1160	0.169
1324	135	WAE	plug	status	43	830	0.288
1325	135	WAE	plug	status	48.5	1120	0.155
1326	135	WAE	plug	status	40	565	0.325
1327	135	WAE	plug	status	37.8	455	0.154
1372	139	FRD	plug	followup	55.6	463	0.171
1373	139	FRD	plug	followup	54.4	522	0.149
1374	139	FRD	plug	followup	58	578	0.14
1375	139	FRD	plug	followup	64.8	759	0.337
1376	139	FRD	plug	followup	62	735	0.284
1415	162	LMB	plug	followup	33.5	540	0.15
1416	162	LMB	plug	followup	34.5	568	0.331
1417	162	LMB	plug	followup	34.5	617	0.249
1418	162	LMB	plug	followup	31.2	436	0.164
1419	162	LMB	plug	followup	33.5	536	0.194
1357	164	LMB	plug	followup	38.8	800	0.202
1358	164	LMB	plug	followup	41.9	1180	0.214
1359	164	LMB	plug	followup	42.5	1020	0.208
1360	164	LMB	plug	followup	36.8	660	0.225
1361	164	LMB	plug	followup	36.1	610	0.253
1328	190	WAE	plug	status	37.6	544.3	0.068
1329	190	WAE	plug	status	40.4	508.0	0.0542
1330	190	WAE	plug	status	36.6	417.3	0.0253
1331	190	WAE	plug	status	36.3	449.1	0.0201
1332	190	WAE	plug	status	34.8	381.0	0.019
1385	203	SMB	plug	followup	26.9	238	0.219
1386	203	SMB	plug	followup	26.2	221	0.158
1387	203	SMB	plug	followup	30	393	0.167
1388	203	SMB	plug	followup	32	449	0.274
1389	203	SMB	plug	followup	32.8	502	0.251
1313	210	BLG	plug	status	31.5	414	0.247
1314	210	BLG	plug	status	35.9	575	0.175
1315	210	BLG	plug	status	33.4	571	0.245
1316	210	BLG	plug	status	35.8	637	0.203
1317	210	BLG	plug	status	32.4	512	0.151

Complete listing of the 2012 IA RAFT predator fish sampling results.

samp#	site #	species	biopart	sample type	length (cm)	weight (g)	mercury (mg/kg)
1410	241	LMB	plug	followup	36.8	512.6	0.921
1411	241	LMB	plug	followup	36.8	449.1	0.774
1412	241	LMB	plug	followup	33.5	399.2	0.569
1413	241	LMB	plug	followup	35.3	499	0.443
1414	241	LMB	plug	followup	33.0	462.7	0.374
1390	279	SMB	plug	followup	29.7	330	0.218
1391	279	SMB	plug	followup	29.5	330	0.0685
1392	279	SMB	plug	followup	28.5	284	0.111
1393	279	SMB	plug	followup	33.2	400	0.285
1394	279	SMB	plug	followup	28.2	288	0.231
1333	289	LMB	plug	status	60.4	807	0.359
1334	289	LMB	plug	status	60	739	0.446
1335	289	LMB	plug	status	63.6	856	0.421
1336	289	LMB	plug	status	69.2	1334	0.532
1337	289	LMB	plug	status	62.4	954	0.616

J = The identification of the analyte is acceptable; the reported value is an estimate.

## Appendix E

Complete listing of the 2012 IA RAFT status (non Hg) and turtle sampling results (in mg/kg unless otherwise indicated). See Appendix B for a list of 2012 RAFT site descriptions and Appendix C for a list of fish names and abbreviations.

samp #	site #	species	biopart	sample type	BHC (Lindane)	cadmium (total)	chlordan, cis-	chlordan, technical	chlordan, trans-	DDD	DDE	DDT	dieldrin
1308	61	CCF	fillet	status	<0.002	UJ0.02	<0.002	<0.03	<0.002	<0.004	0.013	<0.005	<0.003
1311	82	CCF	fillet	status	<0.002	UJ0.02	<0.002	<0.03	<0.002	<0.004	0.022	<0.005	<0.003
1304	122	CCF	fillet	status	<0.002	UJ0.02	<0.002	<0.03	<0.002	<0.004	0.0072	<0.005	<0.003
1309	131	CAP	fillet	status	<0.002	UJ0.02	<0.002	<0.03	<0.002	<0.004	<0.005	<0.005	<0.003
1305	135	CAP	fillet	status	<0.002	J0.02	<0.002	<0.03	<0.002	<0.004	0.0056	<0.005	<0.003
1306	190	CCF	fillet	status	<0.002	UJ0.02	<0.002	<0.03	<0.002	<0.004	<0.005	<0.005	<0.003
1303	210	CCF	fillet	status	<0.002	UJ0.02	<0.002	<0.03	<0.002	<0.004	<0.005	<0.005	<0.003
1307	289	CCF	fillet	status	<0.002	UJ0.02	<0.002	<0.03	<0.002	<0.004	<0.005	<0.005	<0.003
1310	347	PAH	fillet	status	<0.002	UJ0.02	<0.002	<0.03	<0.002	<0.004	0.011	<0.005	<0.003
1301	346	SNAP	shoulder	turtle									
1302	74	SNAP	shoulder	turtle									
1312	348	SNAP	shoulder	turtle	<0.002	UJ0.02	<0.002	<0.03	<0.002	<0.004	<0.005	<0.005	<0.003
1351	270	SNAP	shoulder	turtle									
samp #	site #	species	biopart	sample type	heptachlor	heptachlor epoxide	hexachloro -benzene	lead	mean length (cm)	mean weight (g)	mercury	nonachlor, cis-	nonachlor, trans-
1308	61	CCF	fillet	status	<0.003	<0.003	<0.001	UJ0.11	40.6	621	0.172	<0.002	<0.002
1311	82	CCF	fillet	status	<0.003	<0.003	<0.001	UJ0.11	44.0	708	0.147	<0.002	0.0044
1304	122	CCF	fillet	status	<0.003	<0.003	<0.001	UJ0.11	51.3	1212	0.0306	<0.002	<0.002
1309	131	CAP	fillet	status	<0.003	<0.003	<0.001	UJ0.11	48.1	1554	0.0465	<0.002	<0.002
1305	135	CAP	fillet	status	<0.003	<0.003	<0.001	UJ0.11	51.3	1851	0.122	<0.002	<0.002
1306	190	CCF	fillet	status	<0.003	<0.003	<0.001	UJ0.11	43.0	649	0.0219	<0.002	<0.002
1303	210	CCF	fillet	status	<0.003	<0.003	<0.001	UJ0.11	45.1	784	0.0626	<0.002	<0.002
1307	289	CCF	fillet	status	<0.003	<0.003	<0.001	UJ0.11	71.5	892	0.0507	<0.002	<0.002
1310	347	PAH	fillet	status	<0.003	<0.003	<0.001	J0.14	89.0	6228	0.0906	<0.002	0.0036
1301	346	SNAP	shoulder	turtle					30.7	6633	0.329		
1302	74	SNAP	shoulder	turtle					29.5	6421	0.0681		
1312	348	SNAP	shoulder	turtle	<0.003	<0.003	<0.001	UJ0.11	24.2	2753	0.303	<0.002	<0.002
1351	270	SNAP	shoulder	turtle					25.4	5088	0.403		

Complete listing of the 2012 IA RAFT status (non Hg) and turtle sampling results.

samp #	site #	species	biopart	sample type	number species	number specimens	oxy-chlordane	PCB, Aroclor 1248	PCB, Aroclor 1254	PCB, Aroclor 1260	pentachloro-anisole (PCA)	selenium	trifluralin
1308	61	CCF	fillet	status	1	5	<0.002	<0.04	<0.03	<0.02	<0.001	1.42	<0.003
1311	82	CCF	fillet	status	1	3	<0.002	<0.04	<0.03	<0.02	<0.001	1.37	<0.003
1304	122	CCF	fillet	status	1	5	<0.002	<0.04	<0.03	<0.02	<0.001	1.08	<0.003
1309	131	CAP	fillet	status	1	5	<0.002	<0.04	<0.03	<0.02	<0.001	J0.79	<0.003
1305	135	CAP	fillet	status	1	5	<0.002	<0.04	<0.03	<0.02	<0.001	1.09	<0.003
1306	190	CCF	fillet	status	1	5	<0.002	<0.04	<0.03	<0.02	<0.001	J0.45	<0.003
1303	210	CCF	fillet	status	1	4	<0.002	<0.04	<0.03	<0.02	0.0011	1.18	<0.003
1307	289	CCF	fillet	status	1	5	<0.002	<0.04	<0.03	<0.02	<0.001	UJ0.33	<0.003
1310	347	PAH	fillet	status	1	4	<0.002	<0.04	<0.03	<0.02	<0.001	1.08	<0.003
1301	346	SNAP	shoulder	turtle	1	3							
1302	74	SNAP	shoulder	turtle	1	3							
1312	348	SNAP	shoulder	turtle	1	1	<0.002	<0.04	<0.03	<0.02	<0.001	J0.46	<0.003
1351	270	SNAP	shoulder	turtle	1	2							
< = The analyte was not detected at or above the reporting limit (U or K).													
J = The identification of the analyte is acceptable; the reported value is an estimate.													
UJ = The analyte was not detected at or above the reporting limit. The reported value is an estimate.													

## Appendix F

Complete listing of the 2012 IA RAFT trend site sampling results (in mg/kg unless otherwise indicated). See Appendix B for a list of 2012 RAFT site descriptions and Appendix C for a list of fish names and abbreviations.

samp #	site #	species	biopart	sample type	1,2,4,5-tetra-chlorobenzene	BHC (Lindane)	cadmium (total)	chlordane, technical	DDD	DDE	DDT	dieldrin	heptachlor
1296	143	CAP	whole	trend	<0.004	<0.002	UJ0.02	<0.03	<0.004	0.011	<0.005	<0.003	<0.003
1300	170	CAP	whole	trend	<0.004	<0.002	J0.02	0.033	<0.0042	0.0087	<0.005	<0.0035	<0.003
1298	172	CAP	whole	trend	<0.004	<0.002	UJ0.02	0.031	0.009	0.087	<0.005	<0.003	<0.003
1294	173	CAP	whole	trend	<0.004	<0.002	0.08	0.11	<0.0091	0.017	<0.005	0.027	<0.003
1295	174	CAP	whole	trend	<0.004	<0.002	J0.02	<0.03	<0.004	0.0044	<0.005	<0.003	<0.003
1297	175	CAP	whole	trend	<0.004	<0.002	J0.04	0.042	<0.0051	0.011	<0.005	0.0094	<0.003
1299	177	CAP	whole	trend	<0.004	<0.002	0.07	<0.03	0.0054	0.016	<0.005	0.008	<0.003
samp #	site #	species	biopart	sample type	heptachlor epoxide	hexachloro-benzene	lead	mean length (cm)	mean weight (g)	mercury	mirex	number species	number specimens
1296	143	CAP	whole	trend	<0.003	<0.001	UJ0.11	47.7	1599.2	0.0693	<0.003	1	5
1300	170	CAP	whole	trend	<0.003	<0.001	UJ0.11	48.1	1474	0.0733	<0.003	1	5
1298	172	CAP	whole	trend	<0.003	<0.001	UJ0.11	51.9	1764	0.132	<0.003	1	
1294	173	CAP	whole	trend	<0.007	0.001	UJ0.11	53	2138	0.111	<0.003	1	3
1295	174	CAP	whole	trend	<0.003	<0.001	UJ0.11	48.3	1860	0.0414	<0.003	1	4
1297	175	CAP	whole	trend	<0.003	0.0059	J0.24	47.5	1730	0.0526	<0.003	1	3
1299	177	CAP	whole	trend	<0.003	<0.001	UJ0.11	45.8	1277	0.0615	<0.003	1	5
samp #	site #	species	biopart	sample type	PCB, Aroclor 1248	PCB, Aroclor 1254	PCB, Aroclor 1260	pentachloro-anisole (PCA)	pentachloro-benzene	selenium	trifluralin		
1296	143	CAP	whole	trend	<0.04	0.069	0.033	0.0011	<0.001	UJ0.32	<0.003		
1300	170	CAP	whole	trend	<0.04	0.1	0.047	<0.001	<0.001	UJ0.33	<0.003		
1298	172	CAP	whole	trend	<0.04	<0.03	<0.02	<0.001	<0.001	J0.83	<0.003		
1294	173	CAP	whole	trend	<0.04	0.12	0.08	0.002	<0.001	UJ0.33	<0.003		
1295	174	CAP	whole	trend	<0.04	0.067	0.022	0.0011	<0.001	UJ0.33	<0.003		
1297	175	CAP	whole	trend	<0.04	0.085	0.037	0.0014	<0.001	J0.78	<0.003		
1299	177	CAP	whole	trend	<0.04	<0.03	<0.02	<0.001	<0.001	1.04	<0.003		
< = The analyte was not detected at or above the reporting limit (U or K).													
J = The identification of the analyte is acceptable; the reported value is an estimate.													
UJ = The analyte was not detected at or above the reporting limit. The reported value is an estimate.													