

Upper Mississippi River Fish Consumption Advisories:

State Approaches to Issuing and Using Fish Consumption Advisories on the Upper Mississippi River



August 2005

Upper Mississippi River Basin Association



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The Upper Mississippi River Basin Association (UMRBA) is a regional interstate organization formed in 1981 by the Governors of Illinois, Iowa, Minnesota, Missouri, and Wisconsin to help coordinate the states' river-related programs.

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on the Upper Mississippi River**

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Executive Summary

Why are there differences among states in whether they list the Upper Mississippi River (UMR) as impaired based on fish consumption advisories (FCA)? Preliminary examination by the Upper Mississippi River Basin Association (UMRBA) Water Quality Task Force suggests the following:

- Differences in the states' fish tissue monitoring programs,
- Differences in the states' FCA processes,
- Differences in how states use FCAs and fish tissue monitoring data in assessing water quality condition under Section 305(b) of the Clean Water Act (CWA), and
- Differences in how states use FCAs and fish tissue monitoring data in determining water quality impairment under Section 303(d) of the CWA.

Contamination of fish tissue occurs when fish take in bioaccumulative toxins of historical origin (e.g., PCBs, DDT) and from current practices (e.g., mercury, dioxin, lead) from the water and from the food they eat. These toxins can accumulate in fish tissue over time and reach concentrations that could pose a risk to human health from consuming the fish. The UMR states monitor different fish species and use different approaches for assessing the risk to human health, providing advisories recommending limited consumption of these fish, and determining if a river segment should be listed as impaired under the Clean Water Act. As a result, there are several Mississippi River segments where bordering states have issued different FCAs, and have categorized the impairment of the river segment differently. This situation can lead to public confusion about the risks of consuming fish caught in the UMR and has economic and regulatory implications for point source dischargers utilizing the UMR, as well as implications for implementation of corrective actions to reduce water quality impairment.

In October 2004, the UMRBA Water Quality Task Force, with funding from U.S. Environmental Protection Agency (EPA) Regions 5 and 7, launched a project to address the issue of why shared UMR segments are listed differently by border states because of fish consumption impairment. The purpose of this project was to identify the reasons for interstate differences and, if possible and appropriate, develop recommendations to eliminate or reduce differences among states by improving the consistency, comparability, and compatibility of the FCA process for the UMR. UMRBA convened a group of professionals from conservation, health, natural resources, and pollution control agencies in Illinois, Iowa, Minnesota, Missouri, and Wisconsin. These representatives, along with U.S. EPA Regions 5 and 7, formed an FCA Work Group to:

- Determine and document why differences exist among states,
 - Identify and discuss options and alternatives to reduce or eliminate these differences, and
 - Recommend specific tasks that could be implemented to reduce or eliminate the differences among UMR states in the FCA process.
-

Assessing the condition of water bodies for fish consumption is different than a traditional water quality assessment because it involves the overlapping regulatory responsibilities of multiple agencies. The traditional water quality assessment is usually conducted by the state agency responsible for achieving the goals of the Clean Water Act. The FCA process involves not only pollution control agencies, but also health, conservation, and natural resources agencies. The FCA process starts with the collection and analysis of fish tissue for contaminants. This information is then used to evaluate whether contaminants in the fish tissue pose a risk to human health, and if so, to issue an advisory on how much and how frequently locally caught fish species should be eaten. Finally, the FCA information is considered when the biennial assessment of state-wide water quality is conducted. If fish contaminants exceed a certain level, or a fish consumption advisory is issued for a water body, the river segment may be added to the CWA Section 303(d) list of impaired water bodies.

Consensus recommendations of the Water Quality Task Force include:

1. There should be consistent fish consumption advisories on the Upper Mississippi River among border states.

Although currently there are differences among the states' fish consumption advisories (FCA) on the Upper Mississippi River (UMR), the desired condition is to have consistent, comparable, and compatible FCAs for the UMR. This recommendation is the most significant outcome of the project. It acknowledges that there are significant differences in the FCA methodologies and even philosophies among the states. It also indicates the states will have to make changes in their fish tissue sampling and analysis programs, health risk determination for FCAs, and how FCAs are issued if this recommendation is to be implemented.

2. A minimum suite of contaminants, fish species, size classes, sampling locations, sampling periods, sampling frequencies, and sample preparation procedures for fish consumption advisories should be established for the Upper Mississippi River and implemented by all five states.

Not all fish species are prevalent along the entire UMR, so there are reasons why every state does not monitor the same fish species. However, a select number of important commercial and sport fish that are distributed along the entire UMR should be sampled during the same season, at the same frequency (e.g., every 5 years), and for the same size classes. In addition, fish tissue should be prepared in the same way and analyzed for a common set of contaminants. This would permit a consistent assessment of the condition of the fish consumption use for these species throughout the entire UMR. It would also permit states to cost-effectively and efficiently share resources and increase the fish data available for each state to use in its FCA process.

3. All Upper Mississippi River states should participate in the U.S. EPA Fish Contaminant Forum to be held in Baltimore, Maryland from September 18-22, 2005.

The U.S. EPA Fish Contaminant Forum brings all the states together to share the approaches and rationale each state uses in fish contaminant monitoring, in assessing risks to human health, and in issuing FCAs. The UMR states assess risk to human health posed by fish tissue contaminants by using the Food and Drug Administration (FDA) action levels, the Great Lakes Protocol, or other risk-based approaches. Implementation of these approaches can result in different estimates of risk to human health and lead to conflicting FCAs and inconsistent listing of shared river segments. The states' varying approaches to risk assessment is the primary factor explaining why there are differences in state-issued FCAs and CWA Section 303(d) listings for the UMR. These approaches will be extensively discussed and debated at the Fish Contaminant Forum. Thus, the Forum is an excellent opportunity for the UMR states to gather with colleagues, exchange information, and discuss the merits of each approach.

4. If necessary, following the 2005 U.S. EPA Fish Contaminant Forum, a meeting of Upper Mississippi River states should be convened to specifically address protocols for consistent fish consumption guidance and issuance.

Because multiple agencies are involved in the FCA process, it might not be possible for all those involved in the process to attend the U.S. EPA Fish Contaminant Forum. It is recommended that if the UMR states desire additional discussion of the technical aspects of the FCA approaches, the appropriate professionals from each UMR state should meet following the Forum to review the information presented at the Forum, discuss the merits of each approach, and consider options for developing a consensus approach to be used by states for fish consumption guidance and issuance on the UMR.

5. The Clean Water Act Section 305(b) assessment and Section 303(d) listing process should be revisited after obtaining consistency in data and fish consumption advisories.

In four of the five UMR states (Illinois, Iowa, Minnesota, and Wisconsin), waters can be listed as impaired based on whether FCAs have been issued for those waters. In contrast, Missouri, fish tissue contaminants are used as the basis for impairment, rather than the issuance of a FCA *per se*. In addition, Missouri's methodology for deriving its Section 303(d) list must be adopted into regulation, making any modifications to that methodology more difficult to incorporate. Because there is already a great deal of consistency among the states in how they utilize FCAs in their assessment and listing processes, further efforts addressing the assessment and listing process should be tabled until the states have achieved consistency in how FCAs are developed.

It is primarily differences in the fish species and contaminants monitored and the basis for issuing FCAs that result in different Section 303(d) listings for shared UMR

segments. Recommendations 2 through 4 above should increase the comparability, consistency, and compatibility of FCAs for the UMR. Following attainment of these recommendations, the assessment and listing process can be revisited to determine if additional work is needed to obtain consistent Section 303(d) listings for shared portions of the UMR.

The UMR is more than a nationally significant commercial navigation system. It is an integral part of the regional economy, culture, and environment. Commercial and subsistence fishers depend on the river's fishery and many regional and local community economies are supported by recreational use and river-related tourism. Recreational fishing also is part of the quality of life of the region. It is important that guidance on fish consumption and listing of impaired river segments be consistent, comparable, and compatible for this shared resource. The UMRBA will facilitate the implementation of the Water Quality Task Force recommendations over the next several years to move toward consistent messages on fish consumption and impairment in the UMR.

Preface

In January 2004, the UMRBA published a report entitled *Upper Mississippi River Water Quality: The States' Approaches to Clean Water Act Monitoring, Assessment, and Impairment Decisions*. That report concluded, "enhanced consistency and coordination of water quality management on the UMR is both necessary and possible" and identified FCAs as one of the areas with potential for making substantial progress in the short term. This report is the first step toward making that progress.

UMRBA is a 501(c)(3) nonprofit organization established in 1981 by the Governors of the five states that border the upper river to facilitate dialogue and cooperative action among the states and to work with federal agencies on interjurisdictional river programs and policies. In 1998, UMRBA formed a Water Quality Task Force composed of representatives from the environmental protection agencies in each of the basin's five states: Illinois EPA, Iowa Department of Natural Resources (DNR), Minnesota Pollution Control Agency, Missouri DNR, and Wisconsin DNR. In addition, both Regions 5 and 7 of the U.S. EPA participate.

This report is the result of the combined efforts of the UMRBA Water Quality Task Force and representatives from the five states' public health, natural resource, and conservation agencies, which also have responsibility for some aspect of FCAs. The U.S. EPA participated in the development of this report and provided funding for the project; the UMRBA staff provided overall coordination and support; and the consulting firms of FTN Associates and Wenck Associates provided technical assistance, research, and facilitation. A list of participants is included on the next page.

The UMR FCA project began in March 2005 with the publication of a background paper describing the states' existing approaches to sampling fish tissue, developing and issuing FCAs, and using those advisories in assessing water quality and listing impaired waters. Information from that background paper is incorporated into this report. On March 30-31, 2005 a workshop was held in Davenport, Iowa to review the background material and discuss potential options for enhancing the consistency of FCAs on the UMR. The options identified and discussed at the workshop formed the basis for subsequent discussion at a May 23-24, 2005 consultation meeting in St. Paul, Minnesota. At that meeting, representatives from state agencies and U.S. EPA developed the conclusions and recommendations contained in this report.

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Chapter 1

Introduction

As part of the third largest river system in the world, the Upper Mississippi River (UMR) is defined as that portion of the Mississippi River above the Ohio River (Figure 1). This report focuses on the interstate portion of the UMR, i.e., the Mississippi River between the St. Croix and Ohio Rivers. The UMR forms a boundary for five states (Illinois, Iowa, Minnesota, Missouri, and Wisconsin) and has been recognized by Congress as “a nationally significant ecosystem and a nationally significant commercial navigation system” (Section 1103, 1986 Water Resources Development Act, P.L. 99-662).

The fish resources in the Upper Mississippi River have been exposed to a number of bioaccumulative toxins of historical origin, such as natural occurring mercury, banned pesticides such as DDT and Lindane, as well as industrial chemicals such as polychlorinated biphenyls (PCBs). In addition, fish are exposed to toxins from current practices such as atmospheric mercury from incinerators and coal-fired power plants and dioxin by-products of paper production and various combustion processes. Since these toxins persist in the environment, fish take them in from the water and from the food they eat, and these toxins accumulate in fish tissue over time. In some fish species the toxins accumulate to levels that could be harmful to human health if enough of the fish are eaten over time.

The UMR boundary states address this threat to the health of their citizens by monitoring levels of toxic contaminants in fish tissue and issuing advisories regarding the consumption of fish species that are found to contain contaminants at levels that could pose a chronic health risk to humans. If fish tissue contaminant concentrations exceed a specific risk level, a fish consumption advisory (FCA) is issued for the river segment. However, because the states use different methodologies for developing FCAs, there are differences in consumption advice from neighboring states for the UMR. This can give rise to public concern and confusion in determining if fish caught from the UMR are safe to eat.

A goal of the Clean Water Act (CWA) is for all U.S. waters to have water quality that “provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water.” This goal is to be achieved through water quality standards that states develop and that consist of designated uses for water bodies and water quality criteria established to protect these uses. The U.S. Environmental Protection Agency (EPA) has stated that this goal of the CWA means that not only can fish survive in U.S. waters, but also that humans can safely eat fish caught in these waters (U.S. EPA 2000b, 2003). Therefore, fish consumption advisories and fish tissue monitoring data are to be considered as part of the states’ periodic assessments of the condition of their waters required by the CWA [Section 305(b) reports] and in listing impaired water bodies under the CWA [Section 303(d) list].

All of the UMR basin states assess fish consumption as a designated use of the UMR in their Section 305(b) and Section 303(d) processes. A number of segments of the UMR are listed as impaired for the fish consumption use under Section 303(d) of the CWA. Even though the Mississippi River is a shared resource for five states, different states list different segments of shared portions of the river for different contaminants. Differences in the Section 303(d) listings of shared portions of the UMR have economic and regulatory implications for discharges into listed river segments, as well as implications for corrective actions required to be implemented for the listed segments.

Why are there differences among states in how they list UMR segments under CWA Section 303(d) because of contaminated fish tissue? Preliminary examination by the Upper Mississippi River Basin Association (UMRBA) Water Quality Task Force suggested the following reasons for these differences:

1. Differences in the states' fish tissue monitoring programs,
2. Differences in the states' consumption advisory processes,
3. Differences in how states use fish consumption advisories and fish tissue monitoring data in assessing water quality condition under Section 305(b) of the CWA, and
4. Differences in how states use FCAs and fish tissue monitoring data in determining water body impairment under Section 303(d) of the CWA.

The UMRBA convened a group of professionals from conservation, health, natural resources, and pollution control agencies in Illinois, Iowa, Minnesota, Missouri, and Wisconsin. These state representatives, together with U.S. EPA Regions 5 and 7, were asked to:

1. Document the processes used by states to issue FCAs to determine water quality impairment of the UMR based on FCAs.
2. Determine why there are differences among the states in the fish consumption advice they issue on the UMR and in their determinations of impairment for the UMR;
3. Identify and discuss options and alternatives to reduce or eliminate any differences; and
4. Recommend specific tasks that could be implemented to reduce or eliminate the differences among UMR basin states in the FCA process.

This report documents the findings and recommendations of this group. Chapters 2 through 4 of this report address different elements of the FCA process: monitoring of contaminant levels in fish (Chapter 2), determining contaminant levels that pose human health risks (Chapter 3), and determining if contaminant levels in fish warrant issuing a FCA (Chapter 4). Chapter 5 lists existing FCAs for the UMR. Chapter 6 addresses how states use FCAs when assessing the condition of state waters and identifies existing Section 303(d) fish consumption use impairments for the UMR. Chapter 7 presents the options and alternatives considered for reducing or eliminating differences in FCAs for the UMR. Chapter 8 presents the recommendations that resulted from consideration of the options and alternatives.

Figure 1
Upper Mississippi River Basin



Chapter 2

Fish Tissue Sampling and Analysis

All of the UMR basin states have fish contaminant monitoring programs that include the Mississippi River. These programs involve multiple state agencies and, in some cases, federal agencies. The majority of Mississippi River fish tissue sample collection and analysis by the states is related to two regional approaches: the Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory (Great Lakes Protocol), and EPA Region 7's Regional Ambient Fish Tissue (RAFT) monitoring program. Illinois, Minnesota, and Wisconsin utilize the Great Lakes Protocol. Iowa and Missouri are involved in the RAFT monitoring program. Although both the Great Lakes Protocol and RAFT program involve fish tissue sampling, the two have different origins and purposes. The Great Lakes Protocol was developed to provide a consistent basis for fish consumption advisories among the Great Lakes states. The RAFT programs were developed for monitoring contaminants in the environment, partly, but not exclusively, for assessing risk to human health.

REGIONAL APPROACHES

Great Lakes Protocol

The Great Lakes Protocol arose from the efforts of the Great Lakes states in the early 1980's to share data and coordinate issuance of FCAs on a lakes-wide basis. In 1993, the Great Lakes Sport Fish Advisory Task Force, made up of representatives from health and environmental or natural resource agencies from all of the states bordering the Great Lakes, developed and published a uniform protocol for coordinated development of FCAs for the Great Lakes (Anderson et al. 1993). This Great Lakes Protocol specifically addressed human health risks from PCBs. However, the methodology is applicable to other contaminants and the Great Lakes states of the UMR basin utilize it for contaminants other than PCBs.

The Great Lakes Protocol includes protocols for collection and analysis of fish tissue samples. Under the Great Lakes Protocol, collection of scaled, skin-on fillets is specified for the majority of fish species. Fillets should include "all flesh from the back of the head to the tail and from the top of the back down to and including the belly flap area of the fish. ...[A]ll fins, the tail, head, viscera, and major bones (backbone and ribs)" should be removed. There are a number of fish species with slightly different protocols. For example, bullheads, channel and flathead catfish, and burbot fillets should be skinned. For sturgeon, a skin-off cross-section (steak) is specified. It is preferred that individual fillets be analyzed. If composite fillet samples are used for analysis, they should be of similar size, so that the length of the smallest fish in the composite is at least 90% as long as the largest fish in the composite. Composite samples with fish that differ in size more than 75% will be excluded from the Great Lakes shared data set. The Great Lakes Protocol does not specify an analysis method for PCBs in fish tissue, but does set a goal for a minimum detection limit for PCB analysis of 0.05 mg/kg (Anderson et al. 1993).

Regional Ambient Fish Tissue (RAFT) Monitoring Program

As part of the U.S. EPA Region 7 RAFT monitoring program, states work with U.S. EPA Region 7 to collect and analyze annual fish tissue samples to characterize fish contamination levels in state fisheries resources. Three types of samples are collected in the RAFT monitoring program: status, follow-up, and trend samples. The purpose of status samples is to determine the levels of contaminants in sport fisheries. Status samples are collected each year from different water bodies or different locations in the same water bodies. Generally status sites are re-sampled every 5 to 10 years. Samples collected at status sites are composites of skinless fillets from three to five fish of similar size (i.e., all must be at least 75% as long as the largest fish in the sample). Two sets of samples are collected – one sample of a bottom-feeding species (e.g., common carp, catfish, sucker), and one sample of a predator species (e.g., walleye, smallmouth bass, largemouth bass, white crappie, sauger).

Follow-up sampling sites are status sites where concentrations of contaminants in fish tissue exceeded state advisory guidelines. The purpose of re-sampling these sites the following year is to confirm and categorize the levels of contaminants. Follow-up samples are also composites of skinless fillets from three to five fish of similar size.

Trend sampling sites are permanent sampling sites that are sampled every 1 to 2 years. Samples collected at trend sites consist of three to five whole fish. Common carp is the fish species usually collected for these samples.

All RAFT fish tissue samples are analyzed by the U.S. EPA Region 7 laboratory in Kansas City, Kansas, using the same analytical methods. U.S. EPA method 245.6 (mercury by AA semi-automated for all matrices) is used in analyzing fish tissue for mercury. For all other metals, the fish tissue samples are analyzed using a PE Optima 4300 ICAP (U.S. EPA Region 7 Method Number 3122.3b). For all other contaminants, the samples are subject to a solvent extraction and analyzed using gas chromatography. Table 1 lists the target analytes and their associated minimum detection levels.

Table 1
Chemical Analysis of RAFT Fish Tissue Samples
(applicable to Iowa and Missouri)

Chemical	Detection level (mg/kg wet weight)
Cadmium	0.06
Chlordane, technical	0.03
Chlordane, cis-	0.002
Chlordane, trans-	0.002
Nonachlor, cis-	0.002
Nonachlor, trans-	0.002
Oxychlordane	0.002
pp'-DDD	0.004
pp'-DDE	0.005
pp'-DDT,	0.005
Diazinon*	0.2
Dieldrin	0.003
Heptachlor	0.003
Heptachlor epoxide	0.003
Hexachlorobenzene	0.001
Hexachlor-ocyclohexane (BHC)-gamma	0.002
Lead	0.17
Mercury	0.0181
Mirex*	0.003
PCB-Aroclor 1248	0.04
PCB-Aroclor 1254	0.03
PCB-Aroclor 1260	0.02
Pentachloroanisole	0.001
Pentachlorobenzene*	0.0002
1,2,4,5-tetrachlorobenzene*	0.0004
Selenium	0.5
Trifluralin	0.003

*Trend samples only

STATE PROGRAMS

The following sections describe the fish contaminant monitoring programs for each UMR Basin state as they relate to the border sections of the UMR.

Illinois

Fish tissue samples are collected from the Mississippi River by the Illinois Department of Natural Resources (DNR) as part of the Illinois Fish Contaminant Monitoring Program. Several sites on the Mississippi River are typically sampled annually, although there are no permanent sampling sites, nor fixed schedule for sampling Mississippi River sites. Contaminant sampling sites for a particular year are selected jointly by the Illinois DNR and Illinois EPA, based on their professional judgment of the program information needs. Illinois agencies have collected fish

tissue samples from one to eight sampling sites on the Mississippi River during six of the last eight years.

Fish samples consist of composites of skin-on fillets from three to five fish of the same species and similar size, in accordance with the Great Lakes Protocol. Routine samples consist of samples of catfish, black bass, and two sizes of carp. Occasionally different or additional species are collected (e.g., sturgeon, paddlefish, white bass).

Fish samples are analyzed by Illinois EPA laboratories. One laboratory analyzes samples for organics (i.e., pesticides) and a separate laboratory analyzes portions of predator fish (i.e., bass) samples for mercury. The extraction method used for organic compounds is accelerated solvent extraction. Table 2 lists the chemicals tested for in the fish samples, and their associated minimum detection levels.

Table 2
Chemical Analysis of Illinois Fish Tissue Samples

Chemical	Detection level (mg/kg wet weight)
Aldrin	0.01
Chlordane, sum of isomers	0.02
Total DDT	0.01
Dieldrin	0.01
Endrin	0.01
Heptachlor	0.01
Heptachlor epoxide	0.01
Hexachlorobenzene	0.01
BHC-alpha (Lindane)	0.01
Mercury	0.02
Methoxychlor	0.05
Mirex	0.01
Total PCBs (aroclor)	0.1
Toxaphene	1.0

Iowa

Fish tissue samples are collected from the Mississippi River by the Iowa DNR as part of U.S. EPA Region 7's RAFT monitoring program (see REGIONAL PROGRAMS above). There are three RAFT trend sampling sites located on the Mississippi River. Two of these sites, downstream of Dubuque and downstream of Linwood, are sampled in even years (Figure 2). The third site, at Lansing, is sampled in odd years (Krier 2003). In addition, at least three status sites on the Mississippi River (located in upper, middle, and lower sections of the Iowa portion of the river) are usually sampled by Iowa DNR each year as part of RAFT. The status sampling sites are selected by Iowa DNR based on their professional judgment of information needs.

Minnesota

As part of the Minnesota Fish Contaminant Monitoring Program (MFCMP), Minnesota DNR collects fish tissue samples from Mississippi River Pools 1-9 once every five years. Specific sampling locations are selected jointly by the Minnesota Department of Natural Resources, Department of Health, and Pollution Control Agency. The last sampling event was in 2000 and the next sampling event is planned for 2007.

In accordance with the Great Lakes Protocol, samples consist of skin-on fillets from game fish and rough fish species collected during fish population assessments. These typically include common carp, walleye, catfish, and white bass. For larger fish (e.g., northern pike, walleye, bass, catfish, common carp, suckers) individual fillets are analyzed. For smaller fish (e.g., bluegill, crappie, perch), composites of three to five fillets are analyzed.

Fish samples are analyzed by the Minnesota Department of Agriculture. All samples are analyzed for mercury using U.S. EPA Method 7473 (thermal decomposition amalgamation and atomic absorption spectrophotometry). Usually 15 to 20% of samples are also analyzed for PCBs using AOAC Method 970.52h for extraction (fractionation in a Unitrex apparatus) and U.S. EPA Method 8080 for analysis. Detection levels for these analyses are shown in Table 3. Occasionally samples are analyzed for other contaminants such as organochlorine pesticides, dioxins, or heavy metals other than mercury.

Table 3
Chemical Analysis of Minnesota Fish Tissue Samples

Chemical	Detection level (mg/kg wet weight)
Mercury	0.01
Total PCBs	0.01

Missouri

Fish tissue samples are collected from the Mississippi River by U.S. EPA Region 7 as part of the RAFT Monitoring Program. There is one RAFT trend sampling site on the UMR at Hannibal (Figure 2). Fish tissue samples are collected at this site every two years. In 2003 and 2004, RAFT status samples were collected on the Mississippi River at Crystal City and Herculaneum (Figure 2). RAFT status site locations are selected by the Missouri DNR in coordination with the Missouri Department of Conservation. There are no plans for RAFT status sampling on the Mississippi River in Missouri again in the near future.

Fish tissue samples are also collected from the Mississippi River by the Missouri Department of Conservation as part of its fish toxics monitoring program and the state Resource Assessment Monitoring Program (RAMP). Fish tissue data collected under the RAMP are not used in the FCA processes because whole fish are analyzed, which is not appropriate for evaluating human

health risk. For the fish toxics monitoring program, the Department of Conservation selects approximately 50 sites to sample each year. In most years, several of these sites are on the Mississippi River. Mississippi River sites are re-sampled by the Department of Conservation within 2 to 5 years.

The Department of Conservation samples consist of composites of fillets from 2 to 25 individuals of the same species. Fish species collected by the Department of Conservation include shovelnose sturgeon, carp, flathead catfish, channel catfish, freshwater drum and buffalo. Sturgeon eggs are also collected and analyzed.

Samples collected by the Department of Conservation are analyzed by a private laboratory. Table 4 lists the chemicals tested for in the fish samples and their detection limits. Samples are analyzed for cadmium and lead using quantitative ICP-Mass Spectrometry. Samples are analyzed for mercury using thermal combustion gold amalgamation atomic absorption spectroscopy. Samples are analyzed for organochloride pesticides and PCBs using capillary gas chromatography.

Table 4
Chemical Analysis of Missouri Department of Conservation
Fish Tissue Samples

Chemical	Detection Level (mg/kg wet weight)
Aldrin	0.00027
Arochlor 1248	0.05
Arochlor 1254	0.05
Arochlor 1260	0.05
Cadmium	0.007
Chlordane, cis-	0.00004
Chlordane, trans-	0.00023
Nonachlor, cis-	0.0001
Nonachlor, trans-	0.00003
p, p'-DDD	0.00067
p, p'-DDE	0.00086
p, p'-DDT	0.0014
Dieldrin	0.00015
Endrin	0.0001
Heptachlor	0.00019
Heptachlor epoxide	0.00001
Hexachlorobenzene	0.00026
BHC-alpha	0.00008
BHC-beta	0.00019
Lead	0.009
Mercury	0.002
Methoxychlor	0.00035
Total PCB	0.02

Figure 2
Upper Mississippi River
Fish Tissue Sampling Sites

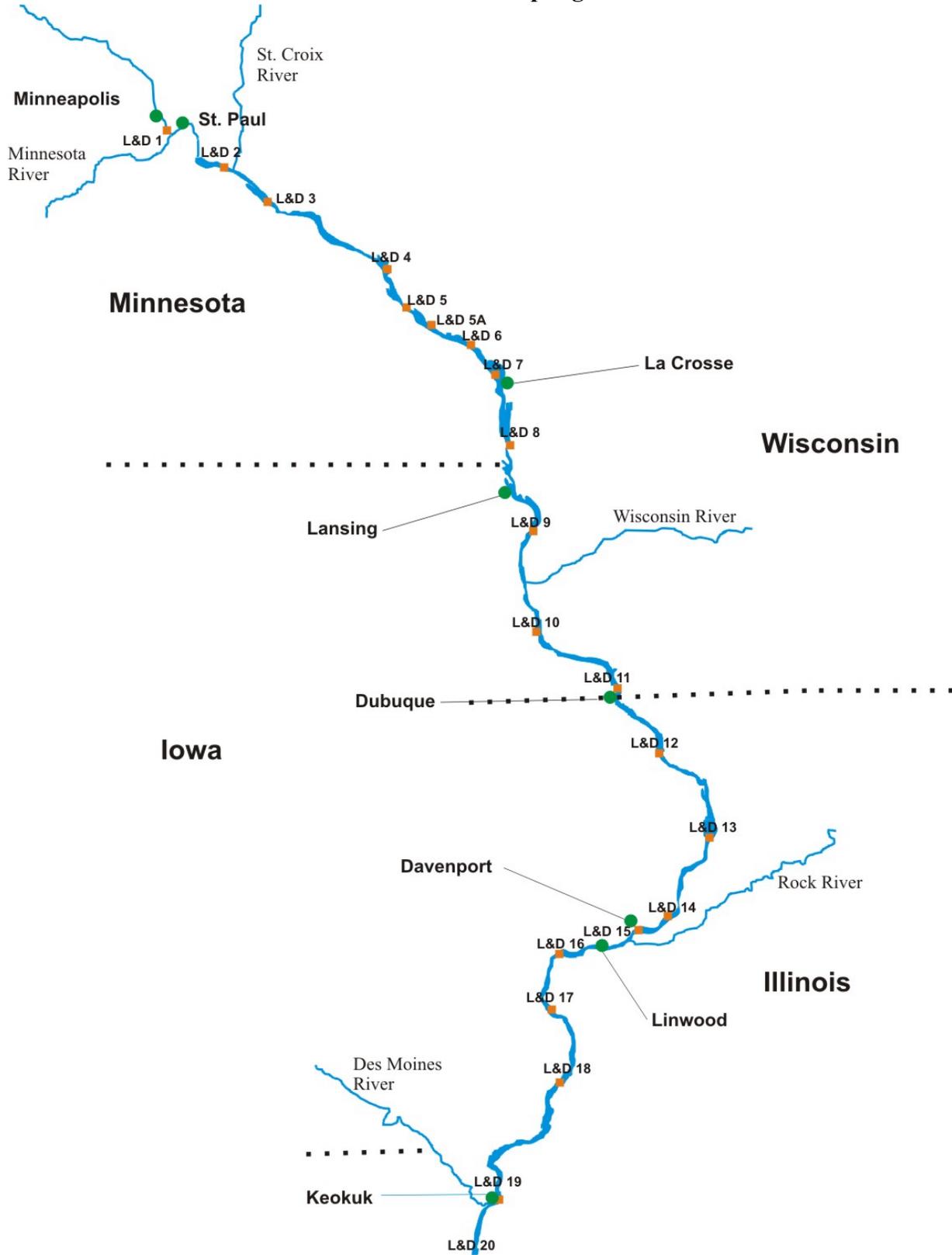


Figure 2
Continued



Wisconsin

Fish tissue samples are collected from the Mississippi River by Wisconsin DNR as part of the state fish contaminant monitoring program. Wisconsin DNR has not established permanent sampling sites on the Mississippi River. In the past, sampling of the Mississippi River has been variable in terms of time and location. Future fish sampling on the Mississippi River will occur biennially at sites selected by the DNR in Pools 2 through 11.

Fish samples consist of approximately ten scaled, skin-on fillets for each species. Fillets are not usually composited. Priority species for sampling on the Mississippi River are those that are currently on the site-specific consumption advisory list; buffalo, carp, channel catfish, flathead catfish, walleye, and white bass.

All fish samples are analyzed for PCBs and mercury. A selected subset of the samples is analyzed for banned pesticides and dioxin and furan congeners. The Wisconsin State Lab of Hygiene handles the analysis for total PCBs, mercury, and banned pesticides. U.S. EPA Method 1631 (cold atomic absorption spectrophotometry) is used to analyze for mercury in the fish samples. Capillary column gas chromatography is currently used to measure PCBs and pesticides in fish samples, although older data is based on packed column chromatography. Contract labs analyze samples for dioxin and furan congeners using U.S. EPA Method 1613B. Table 5 lists the chemicals for which fish tissue samples are analyzed, along with detection levels.

Comparison

Comparison of the monitoring programs for the UMR states yields the following observations:

1. Sampling locations and schedules for collecting fish tissue samples from the Mississippi River vary from state to state.
2. Skinless fillets are collected for the U.S. EPA Region 7 RAFT monitoring program and most of Missouri Department of Conservation's program. The rest of the states' monitoring programs collect skin-on fillets for analysis of fish tissue contaminants.
3. Wisconsin is the only state that does not analyze composite fillet samples.
4. All of the states collect at least some of the same fish species as neighboring states.
5. States analyze fish tissue for a variety of different chemicals (see Table 6). Mercury and PCBs are the only contaminants that all five states analyze.
6. Four of the states analyze fish tissue for some form of chlordane, DDT species or total DDT, dieldrin, heptachlor epoxide and hexachlorobenzene.
7. The detection limits for these analyses vary considerably between programs, although Iowa and Missouri RAFT programs have the same detection limits.
8. The analytical methods used by the various state programs differ, except the Iowa and Missouri RAFT programs, which use the same lab. This accounts for the differences in detection limits observed in Table 6.

Table 5
Chemical Analysis of Wisconsin Fish Tissue Samples

Chemical	Detection Level (mg/kg wet weight)
Aldrin	0.05*
Chlordane, cis-	0.020
Chlordane, trans-	0.020
Nonachlor, cis-	0.020
Nonachlor, trans	0.020
o, p-DDD	0.040
p, p-DDD	0.040
o, p-DDE	0.030
p, p-DDE	0.030
o, p-DDT	0.040
p, p-DDT	0.040
Dieldrin	0.020
Dioxin & furan congeners	Varies
Endrin	0.02*
Heptachlor epoxide	0.05*
Hexachlorobenzene	0.01*
BHC-alpha	0.01*
BHC-gamma	0.01*
Mercury	0.004
Methoxychlor	0.05*
Oxychlordane	0.05*
Total PCBs	0.040
Toxaphene	1.0*

*Report Limit

While there are some differences in sample collection and analysis methods, there does seem to be the potential for states to use, or at least consider, fish tissue contaminant data from other states. All fish tissue are analyzed by registered laboratories that use acceptable Quality Assurance/Quality Control (QA/QC) protocols, and, while contaminant detection levels differ from state to state, the detection levels are all below minimum contaminant guidelines used by all of the states (see Chapter 3). The use of skin-on vs. skinless fillets is a potential source of data bias as skin-on fillets tend to have higher concentrations of some contaminants, such as PCBs.

Table 6
Comparison of Detection Limits Associated with
State Fish Tissue Analysis Programs

Chemical	Illinois (mg/kg)	Iowa (mg/kg)	Minnesota (mg/kg)	Missouri RAFT (mg/kg)	Missouri Dept. of Conservation (mg/kg)	Wisconsin (mg/kg)
Aldrin	0.01				0.00027	0.05*
Cadmium		0.06		0.06	0.007	
Chlordane, technical		0.03		0.03		
Chlordane, sum of isomers	0.02					
Chlordane, cis-		0.002		0.002	0.00004	0.02
Chlordane, trans-		0.002		0.002	0.00023	0.02
Nonachlor, cis-		0.002		0.002	0.0001	0.02
Nonachlor, trans-		0.002		0.002	0.00003	0.02
Oxychlordane		0.002		0.002		0.05
pp'-DDD		0.004		0.004	0.00067	0.04
pp'-DDE		0.005		0.005	0.00086	0.03
pp'-DDT		0.005		0.005	0.0014	0.04
Total DDT	0.01					
Diazinon		0.04		0.04		
Dieldrin	0.01	0.003		0.003	0.00015	0.02
Endrin	0.01				0.0001	0.02*
Heptachlor	0.01	0.003		0.003	0.00019	
Heptachlor epoxide	0.01	0.003		0.003	0.00001	0.05*
Hexachlorobenzene	0.01	0.001		0.001	0.00026	0.01*
BHC-alpha	0.01				0.00008	0.01*
BHC-beta					0.00019	
BHC-gamma		0.002		0.002		0.01*
Lead		0.17		0.17	0.009	
Mercury	0.02	0.0181	0.01	0.0181	0.002	0.004
Methoxychlor	0.05				0.00035	0.05*
Mirex	0.01					
Oxychlordane						0.05*
PCB-Aroclor 1248		0.04		0.04	0.05	
PCB-Aroclor 1254		0.03		0.03	0.05	
PCB-Aroclor 1260		0.02		0.02	0.05	
Total PCBs	0.1		0.01		0.02	0.04
Pentachloroanisole		0.001		0.001		
Pentachlorobenzene		0.0002		0.0002		
1,2,4,5-tetrachlorobenzene		0.0004		0.0004		
Selenium		0.5		0.5		
Toxaphene	1.0					1.0*
Trifluralin		0.003		0.003		

* Report Limit

Chapter 3

Determination of Fish Consumption Advisory Guidelines

This chapter discusses the origins of the numeric guidelines used by the UMR states to evaluate the health risk to humans from fish consumption and develop fish consumption advice. The agency-specific responsibility for developing these guidelines varies among states. However, all guidelines are based on toxicological research of the Food and Drug Administration (FDA) and/or U.S. EPA. Illinois, Minnesota, and Wisconsin utilize the Great Lakes Protocol in developing their guidelines. Iowa utilizes FDA contaminant action levels, while Missouri uses a combination of FDA action levels and U.S. EPA risk assessment methods.

GREAT LAKES PROTOCOL

The Great Lakes Protocol arose from the efforts of the Great Lakes states in the early 1980s to share data and coordinate issuance of FCAs on a lakes-wide basis. In 1993, the Great Lakes Sport Fish Advisory Task Force, made up of representatives from health and environmental or natural resource agencies from all of the states bordering the Great Lakes, developed and published a uniform protocol for coordinated development of FCAs for the Great Lakes (Anderson et al. 1993). This Great Lakes Protocol specifically addressed human health risks from PCBs. However, the methodology is applicable to other contaminants and the Great Lakes states of the UMR basin also utilize it for chlordane.

The Great Lakes Protocol utilizes five advisory categories (see Table 7). Under the Great Lakes Protocol, FCA guidelines for PCBs are calculated to restrict consumption of PCBs to a level less than the health protection value ($0.05 \mu\text{g}/\text{kg}/\text{day}$) for a 70 kg adult (equivalent to $3.5 \mu\text{g}/\text{day}$). For PCBs, the health protection value was selected by the Great Lakes Sport Fish Advisory Task Force from existing toxicological values and studies based on a weight-of-evidence approach. Fish tissue concentration guidelines for PCBs are calculated for each of the five advisory categories using the following equation:

$$0.05 \mu\text{g}/\text{kg}/\text{day} \times 70 \text{ kg} \times \text{fish consumption rate (g/day)} \times 0.5$$

where, $0.05 \mu\text{g}/\text{kg}/\text{day}$ is the health protection value for PCBs, 70 kg is the assumed weight of adults consuming fish, the fish consumption rate is based on the advisory category (see Table 7), and 0.5 is the estimated reduction in contaminant resulting from cleaning the fish (Anderson et al. 1993). Regression analysis of the relationship between fish size and measured tissue contaminant concentrations is used to assign fish size ranges to the advisory categories based on the target contaminant consumption rates if the percent of the variance in tissue contaminant concentration accounted for by fish size (i.e., R^2) is considered significant. In most cases, regression is not used.

Table 7
Fish Consumption Rates for Advisory Categories
of Great Lakes Protocol

Advisory category	Consumption (g fish/day)	PCB concentration in fish (fish consumption rate * 3.5 µg/day)
Unrestricted consumption	140	0.05 ppm
1 meal/week	32	0.22 ppm
1 meal/month	7.4	0.95 ppm
6 meals/year	3.7	1.89 ppm
No consumption	0	>1.89 ppm

While the current Great Lakes Protocol addresses only PCBs, it suggests that, for other chemicals, reference doses (RfDs) calculated by U.S. EPA be used as the human protection value when setting FCA guidelines.

FDA ACTION LEVELS

The Food and Drug Administration (FDA) develops action levels for use in classifying foods bought and sold in interstate commerce as “adulterated” or “unadulterated,” for the purpose of determining if legal action may be required to remove a foodstuff from the marketplace. Foods are classified as “unadulterated” when they contain contaminants only from sources that cannot be avoided when following good agricultural and/or manufacturing practices (Nowell and Resek 1994, U.S. EPA 2000a). Therefore, FDA action levels are guidelines for assessing if foodstuffs are contaminated beyond a reasonable level.

The FDA action levels are based on recommendations from U.S. EPA resulting from U.S. EPA analysis of FDA monitoring data, indicating the extent to which residues of particular contaminants cannot be avoided when following good agricultural and/or manufacturing practices (FDA 1990). In developing Action Levels, FDA considers economic costs of banning foodstuffs, along with potential health risks to the general population based on national average consumption rates (Nowell and Resek 1994). Table 9 provides a summary of the current FDA Action Levels.

STATE PROGRAMS

The following sections describe how each of the UMR states develop the numeric guidelines they use to evaluate human health risk from consumption of contaminated fish and to issue fish consumption advice.

Illinois

The Illinois EPA is responsible for developing the FCA guidelines for Illinois. Illinois utilizes the Great Lakes Uniform Protocol for FCAs (Anderson et al. 1993). The numeric guidelines used to set PCB related FCAs (Table 8) are those derived for the Great Lakes Uniform Protocol (Anderson et al. 1993). The guidelines for chlordane are calculated using the RfD for chlordane reported in the Great Lakes Protocol, 0.06 mg/kg/day. There are two sets of guidelines for evaluation of mercury concentrations in fish:

1. To protect children (applicable to women of child bearing age, women who are nursing, and children under 15 years old), the mercury guideline is the same as the PCB guidelines, and
2. To protect adults (applicable to males over 15 years old and women beyond child bearing years), the mercury guideline is the same as the chlordane guidelines (Table 8).

Table 8
Illinois Fish Consumption Advisory Guidelines*

Chemicals	Consumption Frequency				
	Unrestricted	1 meal/week	1 meal/month	6 meals/year	Do Not Eat
PCB (mg/kg)	0 – 0.05	0.06 – 0.22	0.23 – 0.95	0.96 – 1.89	>1.9
Chlordane (mg/kg)	0 – 0.15	0.16 – 0.65	0.66 – 2.82	2.83 – 5.62	>5.62
Mercury for children (mg/kg)	0 – 0.05	0.06 – 0.22	0.23 – 0.95	0.96 – 1.89	>1.9
Mercury for adults (mg/kg)	0 – 0.15	0.16 – 0.65	0.66 – 2.82	2.83 – 5.62	>5.62

* T. Hornshaw, IL EPA, personal communication 1-28-05

Iowa

The Iowa Department of Natural Resources works with the Iowa Department of Health to develop the FCA guidelines for Iowa. In Iowa, numeric guidelines for FCAs consist of two values for the chemicals that are monitored in the RAFT program: an action level and a level of concern (Table 9). Iowa action levels are set to the FDA fish tissue contaminant action levels (FDA 2001). Where possible, levels of concern are set to half the FDA action level. For those chemicals that do not have an FDA action level, the level of concern is set to two times the maximum concentration measured in Iowa RAFT program samples during the period from 1986 through 1992. Levels of these contaminants are typically very low in Iowa and the levels of concern have been set to highlight the occurrence of concentrations that are significantly greater than what has occurred in the past.

Table 9
Iowa Fish Consumption Advisory Action Levels*

Chemical	FDA Action Level (mg/kg wet weight)	Iowa Level of Concern (mg/kg wet weight)
BHC (lindane)	None	0.1
Cadmium	None	0.3
Chlordane, technical	0.3	0.15
Chlordane, cis-	Sum = 0.3	Sum = 0.15
Chlordane, trans-		
Nonachlor, cis-		
Nonachlor, trans-		
Oxychlordane	Sum = 5.0	Sum = 2.5
DDD, p, p'		
DDE, p, p'-		
DDT, p, p'-	0.3	0.15
Dieldrin		
Heptachlor	Sum = 0.3	Sum = 0.15
Heptachlor epoxide		
Hexachlorobenzene	None	0.01
Lead	None	1.0
Mercury	1.0	0.23
PCB-Aroclor 1248	Sum = 2.0	Sum = 1.0
PCB-Aroclor 1254		
PCB-Aroclor 1260		
Pentacloroanisole	None	0.1
Trifluralin	None	0.2

*Krier 2003

Minnesota

The Minnesota Department of Health is responsible for developing the FCA guidelines for Minnesota. Minnesota utilizes the Great Lakes Uniform Protocol for FCAs. The numeric guidelines used to set PCB-related FCAs (Table 10) are those derived for the Great Lakes Uniform Protocol (Anderson et al. 1993). Mercury guidelines for children (i.e., women who are, or who plan to become pregnant; women who are nursing; and children under 15) are based on the U.S. EPA recommended maximum mercury consumption rate of 0.1 µg/kg/day. Mercury guidelines for men and non-childbearing women are based on a recommended maximum mercury consumption rate of 0.3 µg/kg/day.

Table 10
Minnesota Fish Consumption Advisory Guidelines*

Chemicals	Consumption Frequency				
	Unrestricted	1 meal/week	1 meal/month	6 meals/year	Do Not Eat
PCB (mg/kg)	0 – 0.05	>0.05 – 0.2	>0.2 – 1.0	>1.0 – 1.9	>1.9
Mercury for children (mg/kg)	0 – 0.05	>0.05 – 0.2	>0.2 – 1.0	NA	>1.0
Mercury for adults (mg/kg)	0 – 0.16	>0.16 – 0.65	>0.65 – 2.8	NA	>2.8

*MPCA 2004

Missouri

The Missouri Department of Health and Senior Services is responsible for developing Missouri's FCA guidelines, which consist of trigger levels for chemicals of concern (Table 11). According to the Missouri Department of Health and Senior Services principles for fish health advisories (Crellin 1989), trigger levels "should be calculated using the most current risk assessment methodology of" the U.S. EPA, and a "1 in 100,000 (10^{-5}) maximum excess cancer risk..." FDA action levels can be used when they are similar to the trigger levels calculated using the U.S. EPA risk assessment methodology (Crellin 1989). The trigger level for chlordane was calculated using U.S. EPA Risk Assessment Methodology (U.S. EPA 2000a) with a cancer potency factor of 1.3 per mg/kg-day, assuming an intake rate of 4.3 g fish/day. The lead trigger level is set to the World Health Organization lead action level. The remainder of the trigger levels are set to the FDA fish tissue action levels (FDA 2001), with the exception of the mercury action level, which is equivalent to the EPA action level. The mercury trigger level shown in Table 11 is protective of children 12 years and under and unborn children. There is currently no mercury trigger level for adults (i.e., males over 12 years and women beyond childbearing). Based on current toxicological research, the Missouri Department of Health and Senior Services has decided that the levels of mercury that occur in Missouri fish do not pose a health threat for adults.

Table 11
Missouri Fish Consumption Advisory Trigger Levels*

Chemical	Trigger Level (mg/kg)
Chlordane (sum of isomers)	0.1
DDT	5.0
DDE	5.0
DDD	5.0
Dieldrin	0.3
Endrin	0.3
Lead	0.3
Mercury	0.3
Total PCBs	2.0

* T. Blanc, Missouri Department of Health and Senior Services, personal communication 1-27-05.

Wisconsin

The Wisconsin Department of Health and Family Services is responsible for developing FCA guidelines for Wisconsin. Wisconsin utilizes the Great Lakes Uniform Protocol for FCAs (Anderson et al. 1993). The consumption advisory guidelines for Wisconsin are listed in Table 12. The numeric criteria used to set PCB-related FCAs are those derived for the Great Lakes Uniform Protocol (Anderson et al. 1993). Mercury guidelines for children (i.e., women who are, or who plan to become pregnant; women who are nursing; and children under 15) are based on the U.S. EPA recommended maximum mercury consumption rate of 0.1 µg/kg/day. Mercury guidelines for men and non-childbearing women are based on a recommended maximum mercury consumption rate of 0.3 µg/kg/day. The guidelines for chlordane are based on the RfD for chlordane reported in the Great Lakes Protocol, 0.06 µg/kg/day. Dioxin guidelines are based on U.S. EPA human health TEFs for dioxin and furan congeners exposed as 2, 3, 7, 8-TCDD (WDNR 2004).

Table 12
Wisconsin Fish Consumption Advisory Guidelines*

Chemicals	Consumption Frequency				
	Unrestricted	1 meal/week or 52 meals/year	1 meal/month or 12 meals/year	6 meals/year	Do Not Eat
PCB (mg/kg)	0 – 0.05	>0.05 – 0.2	>0.2 – 1.0	>1.0 – 1.9	>1.9
Hg for children (mg/kg)	0 – 0.05	>0.05 – 0.22	>0.22 – 1.0	NA	>1.0
Hg for adults (mg/kg)	0 – 0.16	>0.16	NA	NA	NA
Dioxin (mg/kg)	NA	NA	NA	NA	>0.00001
Chlordane (mg/kg)	NA	0.16 – 0.65	0.66 – 2.82	2.83 – 5.62	>5.62

*WDNR 2004

Comparison

Table 13 presents a comparison of the numeric guidelines utilized by the UMR states to set FCAs. Comparison of how the states determine these guidelines yields the following observations:

1. Illinois, Minnesota, Wisconsin, (and Missouri for chlordane only), develop consumption advisory guidelines using risk-based methods.
2. Iowa and Missouri use primarily FDA fish tissue action levels as consumption advisory thresholds.
3. Illinois, Minnesota, and Wisconsin develop a range of values as consumption advisory guidelines for a range of consumption frequencies (unrestricted, 1 meal/week, 1 meal/month, 6 meals/year, no consumption).
4. Iowa and Missouri set a single value as a guideline for when to issue an FCA for various contaminants.
5. All of the states evaluate fish tissue concentrations of PCBs and mercury for FCAs.
6. Minnesota is the only state that does not evaluate fish tissue concentrations of chlordane for FCAs.
7. The PCB guidelines for FCAs are similar. The guidelines for Illinois, Minnesota, and Wisconsin are essentially the same because these states use the Great Lakes Protocol for PCBs. The fish tissue action levels for Iowa and Missouri are identical (2.0 mg/kg), and are essentially the same as the “no consumption” guideline from the Great Lakes Protocol (>1.9 mg/kg).
8. Minnesota, Wisconsin, and Illinois have essentially identical mercury guidelines for the protection of children, except for the “no consumption” guideline, which is higher for Illinois.
9. The mercury action level for protection of children in Iowa is the same as the “no consumption” guideline for Minnesota and Wisconsin.
10. The mercury trigger level for protection of children in Missouri is similar to the 1 meal/month guideline for Illinois, Minnesota, and Wisconsin.
11. Missouri is the only state that does not have a mercury guideline for protection of adults.
12. Iowa’s mercury action level for protection of adults is the same as for the protection of children.
13. Illinois, Minnesota, and Wisconsin’s mercury guidelines for protection of adults are identical for unrestricted consumption, but differ for the rest of the consumption frequencies these states use.
14. The Illinois and Wisconsin guidelines for chlordane are identical. The Iowa chlordane action level is similar to the Illinois and Wisconsin guidelines for the 1 meal/month consumption frequency. The Missouri chlordane trigger level is similar to the Illinois and Wisconsin guidelines for 1 meal/week.

Table 13
Comparison of Fish Consumption Advisory Guidelines
for Upper Mississippi River Basin States

Chemical	Target Population	Illinois (mg/kg)	Iowa (mg/kg)	Minnesota (mg/kg)	Missouri (mg/kg)	Wisconsin (mg/kg)
PCBs	All	0.06->1.9	2.0	>0.05->1.9	2.0	>0.05->1.9
Mercury	Children	0.06->1.9	1.0	>0.05->1.0	0.3	>0.05->1.0
Mercury	Adults	0.16->5.62	1.0	0.16->2.8		0.16
Chlordane	All	0.16->5.62	0.3		0.1	0.16->5.62
BHC (Lindane)	All		0.1			
Cadmium	All		0.3*			
DDD, p, p'-	All		Sum = 5.0		5.0	
DDE, p, p'-	All				5.0	
DDT, p, p'-	All				5.0	
Dieldrin	All		0.3		0.3	
Dioxin	All					0.00001
Endrin	All				0.3	
Heptachlor	All				0.3	
Hexachlorobenzene	All		0.01*			
Lead	All		1		0.3	
Pentachloroanisole	All		0.1*			
Trifluralin	All		0.2*			

* Levels of concern rather than advisory guidelines

Chapter 4

Issuance of Fish Consumption Advisories

This chapter summarizes how each of the states in the UMR Basin use their FCA guidelines to assess concentrations of contaminants in fish tissue to determine the need for, and develop, FCAs.

ILLINOIS

In Illinois, the need for FCAs is determined by the Illinois Fish Contaminant Monitoring Program, which consists of staff from the Illinois Departments of Agriculture, Natural Resources, Nuclear Safety, and Public Health, as well as the Illinois EPA. FCAs are announced by the Illinois Department of Public Health. Water bodies other than the Great Lakes (e.g., the Mississippi River) are considered for FCAs when at least one fish tissue sample (i.e., catfish, black bass, large carp, or small carp) from a water body exceeds the unlimited consumption guidelines for PCBs, mercury, or chlordane (Table 7) over two consecutive sampling periods. The sampling periods are typically two-year periods, but sampling frequencies can be somewhat irregular. Only fish tissue data from Illinois are evaluated. Determination of the advice regarding consumption frequency of fish of particular sizes is based on the fish tissue concentration data collected for the water body and best professional judgment. An existing FCA can be removed or reduced in severity (i.e., more frequent consumption), if fish tissue samples for the species designated in the FCA from the water body have concentrations below the guidelines for the existing FCA for two consecutive sampling periods.

IOWA

FCAs in Iowa are issued by the Iowa Department of Natural Resources (DNR) Fisheries Bureau. Water bodies are considered for FCAs when bottom-feeder or predator species fish samples exceed the FDA action levels (Table 8) over two consecutive sampling periods (e.g., status sample with follow-up sample the next year, or two trend samples collected every 1 to 2 years). Only fish tissue data from Iowa are evaluated. Determination of advice regarding fish sizes of concern is based on the fish tissue concentration data and best professional judgment of Iowa DNR and the Health Department personnel. In the past, the DNR has issued only “no consumption” advisories, not issuing advice to limit consumption frequency. However, in the fall of 2004, DNR began issuing advice for sensitive populations (i.e., women who are, or may become pregnant; nursing mothers, and children) to limit consumption of specific fish to one meal/week. An existing FCA can be removed if fish tissue samples from the species designated in the FCA from the water body have concentrations below the FDA action levels over two consecutive sampling periods.

MINNESOTA

FCAs in Minnesota are issued by the Minnesota Department of Health. Water bodies are usually considered for FCAs when the mean of fish tissue concentrations for a particular species measured in a water body over approximately five years exceeds the FCA guidelines for unlimited consumption (Table 9). To determine the fish sizes to include in an advisory, Minnesota Department of Health looks at the mean contaminant concentrations for different size classes of the species under consideration. Fish tissue PCB data up to 10 years old can be used to determine fish consumption advice. All historical fish tissue mercury data can be used for determining fish consumption advice, because a state-wide trend analysis of mercury concentrations in fish tissue indicated that the rate of decline in fish tissue mercury was not large enough to justify using only the last 10 years of data. In calculating the means used in determining fish consumption advice, measurements of fish tissue contaminants reported as less than detection are set to half the detection level (MPCA 2004). An existing FCA can be removed, or reduced in severity, if the mean of the fish tissue concentrations for the listed fish species measured in a listed water body over approximately five years is less than the guidelines for the existing FCA (Table 9). Fish tissue data collected from the Mississippi River by both Minnesota and Wisconsin are used to determine fish consumption advice. Minnesota Department of Health staff work with Wisconsin DNR staff when setting fish consumption advice for shared waters, including the Mississippi River.

MISSOURI

FCAs in Missouri are issued by the Missouri Department of Health and Senior Services. Missouri issues three levels of advisories: a level one advisory indicates fish are safe for unlimited consumption, a level two advisory indicates fish consumption should be limited to a specified monthly or weekly amount (limited consumption), and a level three advisory indicates that specified fish species should not be consumed (no consumption). Only data collected by Missouri agencies are evaluated.

Water bodies are considered to be under a level one advisory when less than 10% of the composite sample results for all the species sampled in the water body in one year are above the fish consumption action level (Table 11). A limited consumption advisory is issued for a species in a water body when the results from at least one composite sample of that species for the year from the water body are at or above the trigger level, and when 10% to 49% of the samples from all appropriate species from the same sampling site are at or above the fish consumption trigger level. The consumption amount associated with this advisory is usually the average consumption amount used in calculating the trigger level. A no consumption advisory is issued for a fish species in a water body when the results from at least one composite sample of that species from the water body are at or above the fish consumption trigger level and 50% or more of the samples from all appropriate species from the same sampling site are at or above the fish consumption trigger level. A no consumption advisory may also be issued if composite samples of three or more species collected in a water body are at or above the fish consumption trigger level. There should be at least three composite samples of appropriate species at a sampling site

with analysis results above the fish consumption trigger level before a no consumption advisory is issued. These three samples can be from one year or two consecutive years. The boundaries of an advisory are based on professional judgment of the likely extent of contamination and probable range of the affected species and commonly known landmarks (Crellin 1989).

A limited consumption advisory can be removed from a water body if one year of data shows that no more than 10% of fish tissue samples have concentrations greater than the fish consumption action levels. An advisory of no consumption can be removed from a water body if:

- Two consecutive years of data show that no more than 10% of fish tissue samples have concentration greater than the fish consumption action levels; or
- There is one year of fish tissue samples where only 10% to 49% of the samples for a fish species with a consumption advisory exceed the fish consumption action levels, followed by one year of fish tissue samples where no more than 10% of the samples exceed the fish consumption action levels (Crellin 1989).

WISCONSIN

FCAs in Wisconsin are issued by the Wisconsin Department of Natural Resources (DNR) and Department of Health and Family Services. Mean and maximum fish tissue concentrations of the Wisconsin chemicals of concern (Table 12) are calculated for each species for each water body sampled, using data from the most recent five to ten years. Water bodies are considered for a site-specific mercury-based FCA if the mean or maximum fish tissue concentration of mercury exceeds the criteria associated with the state-wide advisory. For site-specific PCB-based fish consumption advice, average concentrations, frequency in meal categories, and the relationship of tissue concentration to fish length are examined to determine the appropriate consumption advice. The analysis includes descriptive statistics, frequency distributions within advisory categories, and relationship of length to tissue chemical concentration. In addition to site-specific analyses, mercury contamination was evaluated on a state-wide basis. This evaluation consisted of placing fish species in meal frequency categories based on comparison of the distributions of mercury concentrations for each fish species to the guidelines for each meal frequency category, angler harvest rates, bag and size limitations, and other factors that affect consumption rates (WDNR 2003a).

Fish tissue data collected from the Mississippi River by both Minnesota and Wisconsin are used to determine Mississippi River fish consumption advice. Wisconsin DNR staff work with Minnesota Department of Health staff when setting fish consumption advice for shared waters, such as the Mississippi River.

Decisions to reduce the severity of a site-specific FCA are usually based on data from at least two years, collected within a five year period, showing concentrations within less restrictive advisory category guidelines. Best professional judgment, knowledge of the water body and fisheries, and other factors are involved in determining if the data represent a real reduction in tissue concentrations.

COMPARISON

Differences in the way the UMR states use their fish consumption guidelines to evaluate fisheries are summarized below:

1. The states use different data periods of record when determining if an FCA should be issued, removed, or reduced. In Missouri, one to two years of data is required. In Illinois and Iowa data from two sampling periods (usually 2-3 years) is required. In Minnesota and Wisconsin, data collected over at least a 5 year period are considered.
2. Data evaluation methods used to issue FCAs vary among states. Illinois and Iowa consider the number of guideline exceedances, while Missouri considers the percentage of trigger level exceedances. In contrast, Minnesota and Wisconsin compare average and/or maximum fish tissue concentrations guidelines.
3. Data evaluation methods used to reduce or remove FCAs also vary among states. Illinois, Iowa, and Wisconsin require a minimum number of samples be less than the guidelines. Missouri requires a minimum percentage of samples be less than the trigger level. Minnesota requires that the 5-year average be less than the guidelines.
4. Wisconsin and Minnesota are the only UMR states that use each other's data in issuing FCAs for the UMR. Illinois, Iowa, and Missouri use only their own data to issue FCAs for the UMR.

Chapter 5

Mississippi River Reaches with Existing Fish Consumption Advisories

The following tables (Tables 14 through 17) summarize the most recent FCAs available for the UMR from Illinois, Minnesota, Missouri, and Wisconsin. Iowa does not currently have any FCAs for the Mississippi River. Iowa FCA public information materials do mention the joint U.S. EPA and FDA recommendation that women who are nursing or pregnant or planning to become pregnant, and children under 13 limit their consumption of larger predator fish from all freshwater water bodies to one meal/week to limit their exposure to mercury. However, this does not constitute a FCA.

[In the following tables, a target population designation of “children” includes women who are or plan to become pregnant; nursing mothers; and children under 15. A target population designation of “adults” includes females over 15 who are beyond childbearing or who do not plan to become pregnant and males over 15.]

Table 14
Current Illinois Fish Consumption Advisories for
the Mississippi River as of February 2005¹

Species	Water Body	Contaminant	Fish Length	Consumption Rate	Target Population
Channel catfish	Pools 12-26 and down to Cairo	PCBs	< 18”	One meal/week	All
Channel catfish	Pools 12-26 and down to Cairo	PCBs	> 18”	One meal/month	All
Sturgeon	L&D 22 to Cairo	PCBs	All	One meal/month	All
Carp	All but Pool 15	PCBs	All	One meal/week	All
Carp	Pool 15	PCBs	All	One meal/month	All
All predators ²	Pools 12-26 and down to Cairo	Mercury ³	All	One meal/week	Children

1. <http://www.idph.state.il.us/envhealth/fishadv/mississippiriver.html>
<http://www.idph.state.il.us/envhealth/fishadv/specialmercury.html>

2. includes largemouth bass, smallmouth bass, spotted bass, striped bass, white bass, hybrid striped bass, walleye, sauger, saugeye, flathead catfish, muskellunge, and northern pike.

3. Reflects the state-wide mercury consumption advisory – there is no mercury advisory specifically for the Mississippi River.

Table 15
Current Minnesota Fish Consumption Advisories for
the Mississippi River as of February 2005¹

Species	Water Body	Contaminant	Fish Length	Consumption Rate	Target Population
Black crappie	Pools 5, 5A, 6, 9 to Iowa	Mercury	All	One meal/week	Children
Black crappie	Pools 7, 8	Mercury	All	One meal/week	All
Bigmouth buffalo	Pools 2, 3, 7, 8	Mercury	> 20"	One meal/week	Children
Bigmouth buffalo	Pool 9 to Iowa	Mercury	> 20"	One meal/month	Children
Bigmouth buffalo	Pool 9 to Iowa	Mercury	> 20"	One meal/week	Adults
Bluegill sunfish	Pool 4, 5, 5A, 6, 9 to Iowa	Mercury	All	One meal/week	Children
Buffalo	Pool 4	PCBs	15" – 25"	One meal/month	All
Buffalo	Pools 5, 5A, 6	PCBs	15" – 30"	One meal/month	All
Carp	Pools 2, 3, 4, 5, 5A, 6	PCBs & mercury	>15"	One meal/month	Children
Carp	Pools 2, 3, 4	PCBs	15" – 30"	One meal/month	Adults
Carp	Pools 5, 5A, 6	PCBs	15" – 30"	One meal/week	Adults
Carp	Pools 7, 8, 9 to Iowa	Mercury	< 20"	One meal/week	Children
Carp	Pools 7, 8	Mercury	< 15"	One meal/week	Adults
Carp	Pools 7, 8	PCBs	15" – 20"	One meal/week	Adults
Carp	Pool 9 to Iowa	Mercury	15" – 20"	One meal/week	Adults
Carp	Pools 7, 8, 9 to Iowa	PCBs	> 20"	One meal/month	All
Channel catfish	Pools 2, 3	Mercury	< 20"	One meal/week	Children
Channel catfish	Pools 2, 3	PCBs	15" – 20"	One meal/week	Adults
Channel catfish	Pools 2, 3	Mercury	> 20"	One meal/month	Children
Channel catfish	Pools 2, 3	PCBs	20" – 25"	One meal/month	Adults
Channel catfish	Pool 4	Mercury	< 15"	One meal/week	Children
Channel catfish	Pool 4, 5, 5A, 6	PCBs	< 15"	One meal/week	Adults
Channel catfish	Pool 4	PCBs	15" – 20"	One meal/month	All
Channel catfish	Pool 4	PCBs	20" – 25"	One meal/two months	All
Channel catfish	Pools 5, 5A, 6, 7, 8	PCBs	< 15"	One meal/week	Children
Channel catfish	Pools 5, 5A, 6	PCBs	> 15"	One meal/month	All
Channel catfish	Pools 7, 8	Mercury	15" – 30"	One meal/week	Children
Channel catfish	Pools 7, 8	PCBs	< 20"	One meal/week	Adults
Channel catfish	Pools 7, 8	PCBs	20" – 30"	One meal/month	Adults
Channel catfish	Pools 5, 5A, 6	Mercury	> 30"	One meal/month	Children
Channel catfish	Pool 9 to Iowa	Mercury	15" – 25"	One meal/week	All
Crappie	Pools 2, 3, 4, 7, 8	Mercury	All	One meal/week	Children
Flathead catfish	Pools 2, 3, 5, 5A, 6, 7, 8	Mercury	15" – 20"	One meal/week	Children
Flathead catfish	Pools 2, 3, 4, 5, 5A, 6	Mercury & PCBs	> 20"	One meal/month	Children
Flathead catfish	Pools 2, 3	PCBs	15" – 20"	One meal/week	Adults
Flathead catfish	Pools 2, 3	PCBs	20" – 25"	One meal/month	Adults

Table 15 (Continued)

Species	Water Body	Contaminant	Fish Length	Consumption Rate	Target Population
Flathead catfish	Pool 4	PCBs	20" – 30"	One meal/month	Adults
Flathead catfish	Pools 5, 5A, 6	Mercury	15" – 25"	One meal/week	Adults
Flathead catfish	Pools 5, 5A, 6	Mercury	> 25"	One meal/month	Adults
Freshwater drum	Pools 2, 3, 5, 5A, 6	Mercury	All	One meal/week	Children
Freshwater drum	Pools 2, 3	Mercury	< 15"	One meal/week	Adults
Freshwater drum	Pools 2, 3	PCBs	15" – 20"	One meal/week	Adults
Freshwater drum	Pool 4	Mercury	< 15"	One meal/week	Children
Freshwater drum	Pool 4	Mercury	> 15"	One meal/month	Children
Freshwater drum	Pool 4	Mercury	All	One meal/week	Adults
Freshwater drum	Pools 5, 5A, 6	PCBs	< 15"	One meal/week	Adults
Freshwater drum	Pools 5, 5A, 6, 7, 8	Mercury	> 15"	One meal/week	Adults
Freshwater drum	Pools 7, 8	Mercury	< 20"	One meal/week	Children
Freshwater drum	Pools 7, 8	Mercury	> 20"	One meal/month	Children
Freshwater drum	Pool 9 to Iowa	Mercury	All	One meal/week	All
Largemouth bass	Pools 2, 3	Mercury	< 15"	One meal/week	Children
Largemouth bass	Pools 2, 3	Mercury	> 15"	One meal/month	Children
Largemouth bass	Pools 2, 3, 5, 5A, 6	Mercury	> 15"	One meal/week	Adults
Largemouth bass	Pool 4	Mercury	All	One meal/month	Children
Largemouth bass	Pool 4	Mercury	All	One meal/week	Adults
Largemouth bass	Pools 5, 5A, 6, 9 to Iowa	Mercury	All	One meal/week	Children
Largemouth bass	Pools 7, 8	Mercury	All	One meal/week	All
Northern pike	Pools 2, 3	Mercury	15" – 25"	One meal/week	Children
Northern pike	Pools 2, 3	Mercury	> 25"	One meal/month	Children
Northern pike	Pools 2, 3	PCBs	> 15"	One meal/week	Adults
Northern pike	Pools 2, 3	Mercury	> 20"	One meal/week	Adults
Northern pike	Pool 4	Mercury	> 15"	One meal/month	Children
Northern pike	Pool 4	Mercury	> 25"	One meal/week	Adults
Northern pike	Pools 5, 5A, 6	Mercury	15" – 30"	One meal/week	Children
Northern pike	Pools 5, 5A, 6	Mercury	> 30"	One meal/month	children
Northern pike	Pools 5, 5A, 6, 7, 8, 9 to Iowa	Mercury	> 30"	One meal/week	Adults
Northern pike	Pools 7, 8	Mercury	15" – 25"	One meal/week	Children
Northern pike	Pools 7, 8	Mercury	> 25"	One meal/month	Children
Northern pike	Pool 9 to Iowa	Mercury	> 15"	One meal/week	Children
Sauger	Pools 2, 3	Mercury	< 20"	One meal/week	Children
Sauger	Pools 2, 3	PCBs	< 20"	One meal/week	Adults
Sauger	Pools 2, 3	Mercury	> 20"	One meal/month	Children
Sauger	Pools 2, 3	Mercury	> 20"	One meal/week	Adults
Sauger	Pool 4	Mercury	All	One meal/month	Children
Sauger	Pool 4	PCBs	< 20"	One meal/week	Adults
Sauger	Pools 5, 5A, 6	Mercury	All	One meal/week	Children
Sauger	Pools 5, 5A, 6	Mercury	> 15"	One meal/week	Adults

Table 15 (Continued)

Species	Water Body	Contaminant	Fish Length	Consumption Rate	Target Population
Sauger	Pools 7, 8, 9 to Iowa	Mercury	< 15"	One meal/week	Children
Sauger	Pools 7, 8	Mercury	> 15"	One meal/month	Children
Sauger	Pools 7, 8	Mercury	> 15"	One meal/week	Adults
Smallmouth bass	Pools 2, 3, 4, 5, 5A, 6, 9 to Iowa	Mercury	<15"	One meal/week	Children
Smallmouth bass	Pools 2, 3, 4, 5, 5A, 6	Mercury	> 15"	One meal/month	Children
Smallmouth bass	Pools 2, 3	PCBs	< 15"	One meal/week	Adults
Smallmouth bass	Pools 2, 3	Mercury	> 15"	One meal/week	Adults
Smallmouth bass	Pool 4, 5, 5A, 6, 7, 8	Mercury	All	One meal/week	Adults
Smallmouth bass	Pools 7, 8	Mercury	All	One meal/month	Children
Smallmouth buffalo	Pools 2, 3	Mercury	< 15"	One meal/week	Children
Smallmouth buffalo	Pools 2, 3	PCBs	>15"	One meal/month	Children
Smallmouth buffalo	Pools 7, 8	PCBs	15" – 20"	One meal/month	All
Snapping turtle	Pools 2, 3	Mercury	All	One meal/week	Adults
Snapping turtle	Pools 2, 3, 4	Mercury	All	One meal/week	Children
Walleye	Pools 2, 3	Mercury	< 15"	One meal/week	Children
Walleye	Pools 2, 3	Mercury	> 15"	One meal/month	Children
Walleye	Pools 2, 3	Mercury	All	One meal/week	Adults
Walleye	Pool 4, 5, 5A, 6, 7, 8	Mercury	< 25"	One meal/week	Children
Walleye	Pool 4, 5, 5A, 6	Mercury	> 25"	One meal/month	Children
Walleye	Pool 4	PCBs	15" – 25"	One meal/week	Adults
Walleye	Pool 4	Mercury	> 25"	One meal/week	Adults
Walleye	Pools 5, 5A, 6	PCBs	> 25"	One meal/month	Adults
Walleye	Pools 7, 8	PCBs	< 15"	One meal/week	Adults
Walleye	Pools 7, 8	Mercury	> 15"	One meal/week	Adults
Walleye	Pool 9 to Iowa	Mercury	< 20"	One meal/week	Children
Walleye	Pool 9 to Iowa	Mercury	> 20"	One meal/month	Children
Walleye	Pool 9 to Iowa	Mercury	> 20"	One meal/week	Adults
White bass	Pools 2, 3	PCBs & Mercury	All	One meal/month	children
White bass	Pools 2, 3, 4	PCBs	< 20"	One meal/month	Adults
White bass	Pools 5, 5A, 6	Mercury	All	One meal/month	Children
White bass	Pools 5, 5A, 6	PCBs	All	One meal/month	Adults
White bass	Pools 7, 8	Mercury	< 15"	One meal/week	All
White bass	Pool 9 to Iowa	Mercury	< 15"	One meal/week	Children
White bass	Pools 7, 8	Mercury	> 15"	One meal/month	All
White sucker	Pool 4	Mercury	> 15"	One meal/month	Children
White sucker	Pool 4	Mercury	> 15"	One meal/week	Adults

1. <http://www.health.mn.us/divs/eh/fish/eating/riverspicpop.pdf>,
<http://www.health.state.mn.us/divs/eh/fish/eating/rivergenpop.pdf>

Table 16
Current Missouri Fish Consumption Advisories for
the Mississippi River as of February 2005¹

Species	Water Body	Contaminant	Size	Consumption Rate	Target Population
Largemouth bass	Pools 20-26 and down to Cairo	Mercury ²	> 12"	No consumption	Children
Sturgeon and sturgeon eggs	Pools 20-26 and down to Cairo	PCBs, chlordane	All	No consumption	All

1. <http://www.dhss.mo.gov/NewAndPublicNotices/04FishAdvisory.pdf>

2. Reflects the state-wide mercury FCA – there is no mercury advisory specifically for the Mississippi River.

Table 17
Current Wisconsin Fish Consumption Advisories for
the Mississippi River as of February 2005¹

Species	Water Body	Contaminant	Size	Consumption Rate	Target Population
Bluegill	Pools 2-12	Mercury ²	All	One meal/week	Children
Sunfish	Pools 2-12	Mercury ²	All	One meal/week	Children
Black crappie	Pools 2-12	Mercury ²	All	One meal/week	Children
White crappie	Pools 2-12	Mercury ²	All	One meal/week	Children
Yellow perch	Pools 2-12	Mercury ²	All	One meal/week	Children
Bullheads	Pools 2-12	Mercury ²	All	One meal/week	Children
Walleye	Pools 2-12	Mercury ²	All	One meal/month	Children
Walleye	Pools 2-12	Mercury ²	All	One meal/week	Adults
Walleye	Pools 2, 3, 4, 5, 5A, 6	PCBs	> 25"	One meal/month	All
Northern pike	Pools 2-12	Mercury ²	All	One meal/month	Children
Northern pike	Pools 2-12	Mercury ²	All	One meal/week	Adults
Smallmouth bass	Pools 2-12	Mercury ²	All	One meal/month	Children
Smallmouth bass	Pools 2-12	Mercury ²	All	One meal/week	Adults
Largemouth bass	Pools 2-12	Mercury ²	All	One meal/month	Children
Largemouth bass	Pools 2-12	Mercury ²	All	One meal/week	Adults
Channel catfish	Pools 2-12	Mercury ²	All	One meal/month	Children
Channel catfish	Pools 2-12	Mercury ²	All	One meal/week	Adults
Channel catfish	Pools 5, 5A, 6	PCBs	> 15"	One meal/month	All
Channel catfish	Pools 7, 8	PCBs	> 20"	One meal/month	All
Flathead catfish	Pools 2-12	Mercury ²	All	One meal/month	Children
Flathead catfish	Pools 2-12	Mercury ²	All	One meal/week	Adults
White sucker	Pools 2-12	Mercury ²	All	One meal/month	Children
Drum	Pools 2-12	Mercury ²	All	One meal/month	Children
Burbot	Pools 2-12	Mercury ²	All	One meal/month	Children
Sauger	Pools 2-12	Mercury ²	All	One meal/month	Children
Sturgeon	Pools 2-12	Mercury ²	All	One meal/month	Children
Carp	Pools 2-12	Mercury ²	All	One meal/month	Children
Carp	Pools 2, 3, 4	PCBs	> 15"	One meal/month	All
Carp	Pools 7, 8, 9	PCBs	> 20"	One meal/month	All
Carp	Pools 10, 11, 12	PCBs	> 22"	One meal/month	All

Table 17 (Continued)

Species	Water Body	Contaminant	Size	Consumption Rate	Target Population
White bass	Pools 2-12	Mercury ²	All	One meal/month	Children
White bass	Pools 2, 3, 4, 5, 5A, 6	PCBs	All	One meal/month	All
White bass	Pools 7, 8	PCBs	> 15"	One meal/month	All
Rock bass	Pools 2-12	Mercury ²	All	One meal/month	Children
Muskies	Pools 2-12	Mercury ²	All	No consumption	Children
Buffalo	Pools 2, 3	PCBs	> 15"	One meal/month	All
Buffalo	Pool 4, 5, 5A, 6	PCBs	All	One meal/month	All
Catfish	Pools 2, 3	PCBs	> 20"	One meal/month	All
Catfish	Pool 4	PCBs	15" – 20"	One meal/month	All
Catfish	Pool 4	PCBs	> 20"	One meal/ two months	All
All other species	Pools 2-12	Mercury ²	All	One meal/month	Children

¹ <http://dnr.wi.gov/org/water/fhp/fish/pages/consumption/pcbtables04.pdf>

<http://dnr.wi.gov/org/water/fhp/fish/pages/consumption/hookintohealthyfish04.pdf>

² Reflects the state-wide mercury FCA-there is no mercury advisory specifically for the Mississippi River.

A comparison of the existing FCAs issued for the UMR yields the following observations:

1. All states but Iowa have mercury FCAs on the Mississippi River. However, Minnesota is the only state that has water body-specific mercury FCAs. Illinois, Missouri, and Wisconsin have issued state-wide mercury FCAs, which cover the Mississippi River.
2. Iowa is the only state on the Upper Mississippi River that does not currently have FCAs on the river. However, Iowa offers the public the U.S. EPA and FDA recommendations for reducing risk from mercury in fish.
3. Missouri, Minnesota, and Wisconsin are the only states that have issued “no consumption” advice for fish species in the Mississippi River.
4. Illinois, Minnesota, and Wisconsin have issued primarily “limited consumption” advisories for the Mississippi River. Missouri has issued only “no consumption” advisories for the Mississippi River.
5. Minnesota and Wisconsin FCAs for the Mississippi River are very similar. However, there are some differences in the fish species, the contaminants of concern, and the fish size classes with advisories. One instance of this is that Wisconsin has a consumption advisory for muskie on the UMR, while Minnesota does not.
6. A number of Wisconsin’s mercury FCAs that include portions of the Mississippi River bordering Iowa recommend less frequent consumption for protection of children than the U.S. EPA and FDA guidance (i.e., only one meal/month rather than one meal/week), which Iowa offers.
7. Illinois, Minnesota, and Wisconsin define children 15 and under as a sensitive population, while Iowa and Missouri use 12 years as the cut-off age for the sensitive population.

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8. The Missouri state-wide mercury FCA is a “no consumption” advisory for children, while the Illinois state-wide mercury FCA is a “limited consumption” advisory for children.
 9. The Missouri FCA for PCBs in sturgeon extends from Pool 20 south, while the Illinois FCA for PCBs in sturgeon extends from Lock and Dam 22 south. In addition, Missouri advises “no consumption” of both sturgeon and sturgeon eggs, while Illinois advises just limiting consumption of sturgeon only.
 10. Missouri has issued FCAs for chlordane in sturgeon in the Mississippi River. Illinois has not.
 11. Illinois has issued FCAs for PCBs in channel catfish and common carp on the Mississippi River. However, Missouri has not issued consumption advisories for these species.

Chapter 6

Determination of Impairment Based on Fish Consumption Advisories

Under Section 305(b) of the Clean Water Act, states are required to submit biennial water quality assessment reports to the U.S. EPA. These reports are intended to provide an overall perspective on water quality conditions in each state. More specifically, Section 305(b) directs the states to describe the quality of their surface waters, analyze the extent to which various designated uses such as aquatic life support and recreation are protected, estimate the costs and benefits associated with protecting those uses, and describe the impact of point and non-point source pollutants (UMRBA 2004). In practice, states assess the quality of their waters for all designated uses for which data are available. All of the UMR states addressed fish consumption as a designated use in their most recent Section 305(b) reports.

In addition to presenting a snapshot of current water quality conditions and providing insight into the progress the states are making in protecting their surface waters, states use their Section 305(b) assessment of use support as a substantial basis in the determination of impairment for their Section 303(d) lists of impaired waters. Section 303(d) of the Clean Water Act requires states to develop lists of impaired waters, assign a priority ranking to those waterbodies, and develop total maximum daily loads (TMDLs) for them. Impaired waters are those waterbodies that do not meet the water quality standards (designated use, numeric criteria and/or narrative criteria, and antidegradation policy) set for them by states.

While there is an obvious relationship between Section 305(b) assessments and Section 303(d) listings, the results of the two decision-making processes are not necessarily identical. For instance, waterbodies that are listed under Section 303(d) as “impaired” are not always synonymous with those that have been assessed under Section 305(b) as “not supporting” or “partially supporting” their designated uses. In part, the difference is inherent in the purposes of these two evaluations. The Section 305(b) assessment is intended to provide a description of the overall quality of a state’s waters. In contrast, the Section 303(d) list triggers a regulatory process involving development of a TMDL. Thus a state may treat data differently for these separate evaluations [i.e., Section 305(b) vs. Section 303(d)], often applying more stringent data quality and quantity requirements for Section 303(d) listings.

While both Section 305(b) assessments and Section 303(d) lists must be submitted to U.S. EPA, only the Section 303(d) list is subject to U.S. EPA approval. U.S. EPA has 30 days in which to either approve or disapprove the list submitted by the state. If U.S. EPA disapproves the list, U.S. EPA has 30 days to establish a new list (UMRBA 2004).

U.S. EPA is seeking to better integrate the development and submission of Section 305(b) water quality reports and Section 303(d) lists of impaired waters. In November 2001, U.S. EPA issued

guidance for integrating the two reports. While the integrated report guidance was optional for the 2002 reporting cycle, none of the five UMR states fully employed the guidance for its 2002 submittal. Two UMR states did submit integrated reports in 2004, and two other states are in the process of integrating their Section 305(b) and Section 303(d) reports.

U.S. EPA has issued guidance on the use of FCAs when determining if water bodies should be placed on the Section 303(d) list (U.S. EPA 2000b, 2003). This guidance states that FCAs demonstrate impairment of a water body, based on non-support of the fish consumption designated use in a water body, when the FCA is based on fish tissue data collected from that water body and the guidance used to issue the FCA is equal to or less protective than the state water quality standards (U.S. EPA 2000b, 2003). This is the case regardless of whether the guidance used to issue the FCA is developed from risk-based factors (as in the Great Lakes Protocol), or are based on FDA action levels (U.S. EPA 2000b).

The sections below summarize the role of FCAs in the UMR states' Section 305(b) and Section 303(d) processes. These summaries address how the states use the presence of FCAs for a water body to categorize the support of the water body's fish consumption designated use (Section 305(b) process), and in determining if a water body is impaired and should be included on the Section 303(d) list. There is some discussion in the regulatory community about whether a water body that supports all of its designated uses except fish consumption should necessarily be included on the Section 303(d) list, because in many cases fish consumption issues cannot be fully addressed through the TMDL program.

ILLINOIS

The Illinois EPA is responsible for assessing the condition of Illinois water resources under Section 305(b) of the Clean Water Act and determining impairment under Section 303(d) of the Clean Water Act. Only data collected in Illinois is used for assessing the condition of Illinois water resources, including support of the fish consumption designated use. Data used are primarily from Illinois EPA programs. However, data from other Illinois agencies and monitoring programs are used if their quality assurance program is approved by the Illinois EPA (ILEPA 2004b).

In the Illinois Section 305(b) condition assessment, the presence of water body-specific FCAs issued by the Illinois Fish Contamination Monitoring Program indicates less than full support (attainment) of the fish consumption designated use for that water body. A restricted consumption advisory (i.e., one meal/week, one meal/month, or 6 meals/year) indicates partial support, a no consumption advisory indicates non-support of the fish consumption use (ILEPA 2004a). The Illinois 2004 Section 305(b) report states that the Mississippi River is classified as "partially supporting" its fish consumption designated use.

Water bodies found to be partially or not attaining any designated use are classified as impaired, and included on the state's Section 303(d) list. The Illinois EPA does not consider the Section 303(d) lists of other states in determining impairment of border or transboundary waters.

In the Section 303(d) listing, watersheds are prioritized for development of TMDLs based, in part, on what designated uses are not fully supported. Watersheds with less than full support of the fish consumption designated use are classified as medium priority (ILEPA 2004b). The entire length of the Mississippi River bordering Illinois is included on Illinois' 2004 Section 303(d) list, with the partial support of the fish consumption designated use due to PCBs in fish tissue included as one of the listed impairments (ILEPA 2004b).

IOWA

The Iowa DNR is responsible for assessing the condition of Iowa water resources under Section 305(b) of the Clean Water Act and determining impairment under Section 303(d) of the Clean Water Act. The DNR does use water quality data collected by adjacent states in border and transboundary waters for assessing the condition of Iowa waters for its Section 305(b) report. Data from the five years previous to the assessment cut-off date (i.e., for the 2004 report this would be the period 1998-2002) are used to assess attainment of the fish consumption designated use. This use is considered threatened when levels of at least one contaminant measured in fish tissue are greater than half the FDA action level. Water bodies are categorized as not attaining their fish consumption beneficial use when levels of one or more toxics have exceeded the FDA action levels in two consecutive samples (usually from consecutive years) and a "no consumption" advisory is in effect (IADNR 2005).

In Iowa, the presence of a water body-specific FCA indicates the fish consumption designated use is not attained and the water body can be assigned to use support Category 5 and included on the Section 303(d) list (IADNR 2005). Iowa DNR reviews adjacent states' Section 303(d) listings and associated data and rationale related to boundary and transboundary water bodies. The DNR applies this data to its Section 303(d) listing methodology and considers modification of Iowa listings based on the review of the additional information (IADNR 2003, 2005). The Mississippi River fish consumption designated use is not listed as impaired on Iowa's 2004 Section 303(d) list (www.iowadnr.com/water/tmdlwqa/wqa/303d/2004/2004final303dlist.pdf).

MINNESOTA

The Minnesota Pollution Control Agency is responsible for assessing the condition of Minnesota's water resources under Section 305(b) of the Clean Water Act and determining impairment under Section 303(d) of the Clean Water Act. Data from any source that meets the Pollution Control Agency QA/QC requirements can be used to assess attainment of designated uses. Preference is given to data that are available through STORET (MPCA 2004). Water bodies can be assigned to use support Category 5 and included in the Minnesota Section 303(d) list when they have at least one FCA that recommends consumption of a fish species once per month, or less frequently, for any population segment i.e., children or adults (MPCA 2004). This means that a water body can be included on the Section 303(d) list if the arithmetic mean of mercury (over period of record) or PCBs (over latest 10 years) in tissue of any fish species in any size class (5" and up) is greater than 0.2 mg/kg (MPCA 2004).

The Pollution Control Agency coordinated with Wisconsin DNR on 2004 Section 303(d) listings of the border portions of the Mississippi River (WDNR 2004). The entire length of the Mississippi River bordering Minnesota is included on the state's 2004 Section 303(d) list. The fish consumption designated use is listed as impaired for this portion of the Mississippi River due to the presence of mercury and PCB-related FCAs.

MISSOURI

The Missouri DNR is responsible for assessing the condition of Missouri water resources under Section 305(b) of the Clean Water Act and determining impairment under Section 303(d) of the Clean Water Act. In Missouri, fish tissue concentrations rather than FCAs are used to develop the state Section 303(d) list of impaired waters. Under the revised, integrated Section 305(b) assessment and Section 303(d) listing process, water bodies are categorized as not attaining their fish consumption use and can be assigned to use support Category 5 and included on the Section 303(d) list for impairment of the fish consumption designated use when average fish tissue concentrations of measured contaminants for a water body exceed FCA action levels (Table 11). Currently only data up to seven years old can be used for assessment, and there must be at least three samples from the last seven years for the data set to be considered adequate for assessing attainment of the fish consumption designated use (MDNR 2004a). The DNR reviews Section 303(d) lists from adjacent states related to boundary water bodies (e.g., Mississippi River). If Section 303(d) listings for shared water bodies are different in another state, the DNR will request the data that are the basis of the listing in the other state and review it according to the DNR's methodology for development of the Section 303(d) list. The Missouri DNR will base its decision whether or not to revise its listing on the results of the evaluation of the other state's data (MDNR 2004a).

The final 2002 Section 303(d) list for Missouri lists the UMR as impaired due to chlordane and PCBs (MDNR 2004b). This listing was added by U.S. EPA Region 7 based on the presence of individual fish tissue measurements of PCBs and chlordane that exceeded the action levels and was not based on the Section 305(b) assessment. DNR staff anticipate that the chlordane and PCB-related fish consumption designated use impairments of the Mississippi River will be removed from its next listing of impaired waters, because average fish tissue concentrations for the Mississippi River are below the action levels. (Missouri DNR anticipates that its next Section 303(d) list may be a combined list for 2004 and 2006.)

WISCONSIN

The Wisconsin DNR is responsible for assessing the condition of Wisconsin water resources under Section 305(b) of the Clean Water Act and determining impairment under Section 303(d) of the Clean Water Act. Data collected by federal and Wisconsin state agencies, and their cooperators, that meet DNR data QA/QC criteria, are used to assess Wisconsin water resources (WDNR 2003a, 2004).

Wisconsin is currently categorizing all streams as not attaining their fish consumption designated use in the Section 305(b) report, due to the presence of a general mercury FCA for all state waters (WDNR 2003a, 2004). However, only waters with pan or game fish species with the following categories of site-specific FCAs are included on Wisconsin's Section 303(d) list:

- Mercury advisories restricting consumption to 1 meal/month or advising non-consumption (note that water bodies subject only to the state-wide mercury advisory do not meet this criterion); and
- PCB advisories restricting consumption to 1 meal/month, 1 meal/2 months, or advising non-consumption (WDNR 2003b).

The Wisconsin DNR coordinated its 2004 Section 303(d) listings of the Mississippi River with the Minnesota Pollution Control Agency (WDNR 2004). The entire length of the Mississippi River bordering Wisconsin is included on the state's approved 2004 Section 303(d) list. The fish consumption use is listed as impaired for this portion of the Mississippi River due to the presence of mercury and PCB-related FCAs.

COMPARISON

A comparison of how the UMR states use FCAs in determining attainment of the fish consumption designated use for the Section 305(b) report, yields the following observations:

- Wisconsin is the only state that bases a non-attainment finding on a general state-wide FCA.
- Illinois and Minnesota determine designated use attainment based on site-specific FCAs.
- Missouri uses fish tissue data, rather than FCAs, to determine attainment of the fish consumption designated use.
- Iowa considers both fish tissue data and FCAs to assess attainment of the fish consumption designated use.

A comparison of how the UMR Basin states use FCAs to determine impairment for Section 303(d) listing yields the following observations:

- Missouri is the only state that does not use FCAs to determine impairment.
- Iowa, Minnesota, and Wisconsin use site-specific FCAs to determine if water bodies should be included on the Section 303(d) list.
- Illinois determines what water bodies should be included on the Section 303(d) list based on support of designated uses, including fish consumption which is determined based on the presence or absence of site-specific FCAs.

Table 18 is a comparison of 2002 and 2004 Section 303(d) impaired water listings on the UMR resulting from FCAs or fish tissue data. Listings for the portions of the Mississippi River bordering Minnesota and Wisconsin are the same because these states share data and use similar

methods to determine FCAs and inclusion on their Section 303(d) lists. Part of the reason the listings for portions of the Mississippi River bordering Iowa and Wisconsin are different is because these states use different FCA guidance levels (see Chapter 3). Wisconsin identifies impairment of the fish consumption use at lower fish tissue pollutant concentrations than Iowa. The same is true for differences in listings for portions of the Mississippi River bordering Iowa and Illinois. The differences in listings for portions of the Mississippi River bordering Missouri and Illinois are at least partially due to differences in the Section 303(d) listing processes of these states. The fish tissue pollutant concentrations used by Illinois to identify impairment of the fish consumption use are lower than those used by Missouri. In addition, Missouri evaluates an average value, rather than individual measurements, as Illinois does. Both of these factors make a determination of impairment more likely in Illinois than in Missouri.

Table 18
2002 and 2004 Section 303(d) Impaired Waters Listings on the Upper Mississippi River
Resulting from Fish Consumption Impairment
(Relative Locations of Major River Cities are Shown in Circles)

MINNESOTA ¹			WISCONSIN	
2002	2004		2004	2002
(10 segments) Mercury-10 PCB-10	Mercury PCB	St. Croix River (48 mi)	PCB Mercury	PCB Mercury
(12 segments) Mercury-12 PCB-12	Mercury PCB	Chippewa River (49 mi)	PCB Mercury	
(5 segments) Mercury-5 PCB-5	Mercury PCB	Lock & Dam 6 Richmond Island (21 mi)	PCB Mercury	
(4 segments) Mercury-4 PCB-4	Mercury PCB	<i>La Crosse</i> Root River (63 mi)	PCB Mercury	
IOWA				
unlisted	unlisted	Wisconsin River (48 mi)	PCB Mercury	
unlisted	unlisted	Lock & Dam 11 <i>Dubuque</i> (61 mi)	PCB Mercury	
unlisted	unlisted		PCB Mercury	
unlisted	unlisted	Lock & Dam 13 (89 mi)		
unlisted	unlisted	<i>Quad Cities</i>		
unlisted	unlisted	Iowa River (73 mi) <i>Keokuk</i>	(3 segments) PCBs-3	PCBs
MISSOURI³			ILLINOIS²	
Chlordane PCBs	unlisted	Des Moines River (37 mi)	(4 segments) PCBs-4	PCBs
		<i>Quincy</i>	(5 segments) PCBs-5	PCBs
		Lock & Dam 21 <i>Hannibal</i> (88 mi)	(2 segments) PCBs-2	PCBs
			(7 segments) PCBs-7	PCBs

Table 18 (Continued)

2002	2004		2004	2002
		Cuivre River (41 mi)	(3 segments) PCBs-3	PCB
		Illinois River		PCBs
Chlordane PCBs	unlisted	Missouri River (78 mi) <i>St. Louis</i>	(5 segments) PCBs-5	PCBs
		Kaskaskia River (118 mi)		PCBs
		<i>Cape Girardeau</i>	(4 segments) PCBs-4	PCBs
		Ohio River		PCBs

¹ For its 2004 impaired water list, Minnesota consolidated 31 UMR sub-reaches (segments), which were used in its 2002 list, into 4 HUC-8 reaches. For 2002, this table aggregates the 31 segments by HUC-8 reach, with the number of segments and their pollutants identified within each reach.

² Illinois' 2004 impaired waters list includes listings for 33 HUC-10 segments on the UMR. All HUC-10 segments within a HUC-8 reach have identical listings and are thus not broken out separately in this table. The number of HUC-10 segments within each HUC-8 reach is listed in the table.

³ Missouri has not yet submitted its 2004 Section 303(d) list to the U.S. EPA. This table reflects preliminary information for 2004 provided by Missouri DNR water quality program staff. Missouri may ultimately submit a consolidated 2004/2006 Section 303(d) list.

Chapter 7

Options and Alternatives for Improving the UMR FCA Process

FISH CONSUMPTION ADVISORIES AND THE CLEAN WATER ACT

Assessing the condition of water bodies for fish consumption uses is different than a traditional water quality assessment because it involves multiple agencies. The traditional water quality assessment is usually conducted by the designated state agency responsible for achieving the goals of the Clean Water Act. The FCA process includes not only pollution control agencies, but also health, conservation, and natural resource agencies. The FCA process starts with the monitoring and analysis of fish tissue for contaminants. This information is then used to evaluate whether contaminants in the fish tissue pose a risk to human health, and if so, to issue an advisory on how much and how frequently locally-caught fish species should be eaten. Finally, the FCA information is considered when the biennial assessment of state-wide water quality is conducted [Section 305(b) report]. If fish contaminants exceed a certain level, or a FCA is issued for a water body, the decision can be made to add that water body to the Section 303(d) list of impaired water bodies. The UMR state agency responsibilities in the FCA process are shown in Table 19.

Table 19
State Agency Responsibilities for Fish Consumption Advisories

	Illinois	Iowa	Minnesota	Missouri	Wisconsin
Fish Sampling	DNR	DNR (water quality)	DNR	USEPA, DNR, and DOC	DNR
Fish Contaminant Analysis	IEPA	USEPA	DOA	USEPA and private laboratory	state laboratory
Advisory Guidance	IFCMP	DNR, Dept. of Health	MDH	DHSS	DHFS
Issue Advisory	DPH	DNR (fisheries)	MDH	DHSS	DNR, DHFS
Water Quality Assessment and Listing	IEPA	DNR (water quality)	PCA	DNR	DNR

DHFS=Department of Health and Family Services

DHSS=Department of Health and Senior Service

DOA=Department of Agriculture

DOC=Department of Conservation

DNR=Department of Natural Resources

DPH=Department of Public Health

IEPA=Illinois Environmental Protection Agency

IFCMP=Illinois Fish Contaminant Monitoring Program consisting of representatives from the DOA, DPH, DNR, Nuclear Safety and IEPA

MDH=Minnesota Department of Health

USEPA=United States Environmental Protection Agency

In the spring of 2005, the UMRBA Water Quality Task Force and other professionals from the states gathered to discuss options for improving the consistency, comparability, and compatibility of the FCA processes on the UMR. At a workshop held on March 30-31, the state representatives documented differences in their FCA processes and identified options and alternatives for ameliorating or eliminating these differences. The alternatives were summarized and provided to participants to vote on their top three alternatives for improving the FCA process in seven areas. The alternatives were then ranked in each of seven areas (Table 20). This chapter discusses these options and alternatives. At a consultation meeting held on May 23-24, state and U.S. EPA representatives discussed the top three alternatives in each category and developed the recommendations presented in Chapter 8.

OPTIONS AND ALTERNATIVES

Options and alternatives were identified for each of the three components of the FCA process: Monitoring and Analysis; Fish Consumption Guidance and Issuance; and Assessment and Listing (Table 20). Because there are multiple agencies involved with the FCA process, not all individuals were familiar with the specific analyses and procedures used by other agencies within their state or in other states. Therefore, additional alternatives were suggested to provide information that would clarify the analyses and procedures of each agency and to improve the process of sharing information among states.

Monitoring and Analysis

Comparing the states' FCAs and associated Clean Water Act reports is difficult because of different monitoring and analysis approaches. In particular, the fish species, size categories analyzed, processing specifications (i.e., skin-on or off fillets), contaminants analyzed, and sampling frequency differ. Some of these differences arise from the fact that Region 5 states follow the Great Lakes protocols while Region 7 states follow the RAFT protocols. The monitoring and analysis alternative that received the greatest number of votes was to establish and adopt a minimum set of contaminants, fish species and size categories, sampling locations and frequencies, and fish tissue preparation procedures for monitoring UMR fish tissue contamination. It was emphasized that this was to be a minimum set, with each state retaining the flexibility to monitor additional fish species and size categories consistent with their protocols for the rest of their state. This minimum set would provide comparable and consistent information to be used in an assessment of fish tissue contaminants throughout the entire UMR.

A corollary to this alternative was to establish an associated set of Data Quality Objectives for fish contaminants, to document the desired level of certainty in the data and the decisions that could be made using this information. A quality assurance round robin among UMR states for selected fish tissue contaminants could be conducted if all the states were to use consistent protocols.

Other alternatives included having all the states adopt either the Great Lakes Protocols or the RAFT protocols, having the U.S. EPA Regions develop one set of monitoring and analysis

guidance for all UMR states, or having a single state or organization conduct all the fish data collection and provide it to the other UMR states.

A minimum set of monitoring activities offers several advantages for the UMR states. First, it permits a uniform assessment of fish contaminants for this shared water body among all UMR states. It has the potential for increasing the efficiency and effectiveness of monitoring by letting states share resources in collecting and analyzing fish samples. Because all the states are using the same collection and analysis protocols, the potential sample size for fish contaminant analysis by each state can be increased because they can use fish tissue data collected by their border state(s).

Consistency and comparability in procedures and protocols are important for shared water bodies, such as the UMR. However, all of the states want to use the same procedures throughout their state. It would be difficult for a state to justify using different procedures on different waters, particularly since the purpose of FCAs is to protect human health. A minimum set of procedures could be implemented for the UMR along with the procedures used for other state water bodies.

Fish Consumption Advisory Guidance

Different approaches for estimating risk to human health from fish tissue contaminants also contribute to differences in FCAs for the UMR among states. The Great Lakes Protocol is followed by Illinois, Minnesota, and Wisconsin. The Great Lakes Protocol is a risk-based approach for estimating the potential risks to human health. Iowa and Missouri use primarily the FDA action levels as the basis for estimating the potential risks to human health, although Missouri also uses the U.S. EPA risk-based approach for some chemicals. Risk-based approaches and the FDA action levels use different Rfd assumptions, as well as other assumptions, so the estimated risk to human health is different for different fish contaminant concentrations. The use of different approaches for estimating risk to human health is the primary reason there are different Section 303(d) listings for fish contaminant levels on the UMR.

In general, risk to human health is associated with higher fish contaminant concentrations when using the FDA action level Rfds, assumptions, and methods than when using the Great Lakes Protocol. However, the specific FDA assumptions are not well documented so it is difficult to determine precisely why these differences occur. Although all states are committed to protecting human health, their preferences vary with regard to how health risks should be communicated to the public. In addition, states recognize the importance of fishing and outdoor experiences to local economies and quality of life. These considerations all contribute to how states view the relevance and applicability of differing risk assessment methods.

Table 20

Options and alternatives for improving fish consumption advisories in seven different categories

Category: Monitoring and Analysis		Votes*
1.	Establish a minimum set of contaminants; fish species; fish size categories; sampling locations, periods, and frequencies; and fish tissue preparation procedures which all states use for fish contaminant monitoring on the UMR.	8
2.	Establish a minimum set of data quality objectives (DQOs) for fish contaminants for the UMR.	6
3.	All UMR states adopt Great Lakes sampling protocols.	4
4.	One agency or organization conduct all fish contaminate sampling and analysis for the UMR using one protocol; cost shared among the states.	3
5.	U.S. EPA Regions 5 and 7 provide identical guidance on monitoring and analysis for FCAs.	1
6.	Combine Numbers 2, 4, and 5 above	1
7.	All UMR states adopt U.S. EPA Region 7 RAFT monitoring design and sampling protocols.	0
Category: FCA Guidance		
1.	Formulate and use similar Rfds, methods, and assumptions for determining fish contaminant levels that pose human health risks on the UMR.	6
2.	Formulate and use similar Rfds, methods, and assumptions for determining fish <i>mercury</i> contaminant levels that pose human health risks on the UMR.	5
3.	Adopt Great Lakes PCB numeric guidance for FCAs.	3
4.	U.S. EPA Regions 5 and 7 issue identical guidance on FCAs.	2
5.	Each state evaluate the Great Lakes PCB Protocol and consider adopting it for their state.	2
6.	Review and comment on the Great Lakes Mercury Protocol.	2
7.	One agency analyze and recommend FCA contaminant guidance for the UMR.	1
8.	Adopt the U.S. EPA FCA as the default method, with state modification, if needed.	1
Category: FCA Issuance		
1.	Share FCAs with UMR states prior to issuing advisory.	5
2.	One agency analyze data for all fish species and fish contaminant levels on the UMR and determine if and where FCAs should be issued.	4
3.	Standardize the minimum FCA levels to be used for the UMR in issuing advice on fish consumption (e.g., unlimited consumption, 1 meal/week, no consumption).	4
4.	Develop procedures for resolving interstate differences in FCAs for the same locations, species and contaminants.	3
5.	Conduct follow-up studies to determine the effectiveness of FCAs in reaching the target populations to improve the fish consumption advice through adaptive management.	2
6.	Adopt consumption advisories of border state(s) for fish species and/or contaminants not monitored.	1
7.	Develop uniform approaches for communicating with the public that account for socioeconomic, ethnic, and racial background.	1
8.	UMRBA serve as clearing house for UMR FCAs.	1
9.	Conduct a FCA risk communication workshop for UMR states.	1

Table 20 (Continued)

Category: Assessment		Votes*
1.	Formulate common definitions of full support, partial support, and non-support of the fish consumption designated use.	6
2.	Use consistent protocols among states for Section 305(b) assessments of the fish consumption designated use for the UMR.	5
3.	Formulate a consistent set of designated uses for all states to use for the UMR.	2
4.	One agency conduct the Section 305(b) assessment for the UMR and provide for other UMR states.	1
5.	Use final U.S. EPA Section 305(b) guidance without modification	1
6.	Strive for consistent outcomes among states.	1
Category: Listing		
1.	Develop consistent approaches for using FCAs in the Section 303(d) listing process among UMR states [e.g., identical threshold criteria, frequency of exceedance (2 consecutive years, 5 year mean)]	7
2.	Develop consistent, understandable messages for the public on interstate listings.	6
3.	One agency conduct the listing process for the UMR and provide for other UMR states.	2
Category: Background Information Needs		
1.	Distribute state Fish Monitoring and Analysis Plans from other states.	6
2.	Explain the Great Lakes FCA Protocol.	6
3.	Compare FDA and risk-based approaches for determining contaminant levels posing human health risks.	5
4.	Summarize fish contaminant levels, by species and location from north to south in the UMR.	4
5.	Provide rationale for multiple levels of guidance for fish consumption (e.g., 1 meal/week, 1 meal/2 weeks, 1 meal/month).	3
6.	Explain the FDA approach for establishing human health risk form PCB contaminant levels in fish.	2
7.	Explain the U.S. EPA Region 7 RAFT Protocols.	1
8.	Combine No. 2 and 3 above.	1
Category: Information Sharing		
1.	Share fish contaminant data and metadata among UMR states to increase sample size and fish species.	6
2.	Summarize salient points on FCAs from the U.S. EPA Fish Contaminant Forum Meeting in Baltimore in September that are relevant for the UMR states.	4
3.	Conduct similar FCA workshops on an annual basis.	4
4.	UMRBA serve as a clearinghouse for UMR fish contaminant information.	3
5.	Establish a password protected UMR state/U.S. EPA web site for exchanging information on FCAs.	2
6.	Conduct fish consumption advisory workshops on an as-needed basis.	2
7.	Establish and maintain an email network.	2

*A total of nine votes were possible for each option. Eight individual responses were received with a consensus response from the state of Iowa

It is unlikely that consistent FCA protocols will be used for the UMR until the differences between risk-based approaches for estimating potential health risks are compared and contrasted with the FDA action level approach and other barriers associated with changing from one approach to the other are further explored.

The alternatives proposed under this category, in general, were intended to move toward using the same RfDs, assumptions, and methods for estimating potential human health risks from UMR fish tissue contaminants.

Fish Consumption Advisory Issuance

The fish consumption advice issued for the UMR varies among states. Consumption advisories that apply to the UMR range from state-wide to water body specific, and from unrestricted consumption to 1 meal/week, 1 meal/month, 1 meal/2 month, and do not eat. In addition, these consumption categories can be applied to different fish species for different contaminants in different river segments for different population segments. Whether or not these differences are confusing to the public is not entirely clear. Some believe that variability among state FCAs or among FCAs for different UMR pools issued by the same state confuses public understanding. Others believe that many people fish the same bodies of water for the same species of fish and are less interested in FCAs throughout the state than they are for the specific Mississippi River pool in which they fish. Therefore, they can be given specific advice for specific fish within that specific pool without confusion.

The greatest potential for confusion arises for the portions of the UMR shared among border states such as Minnesota and Wisconsin, Iowa and Illinois, or Illinois and Missouri. If one state lists a fish species for a specific contaminant for a shared Mississippi River pool and the other state doesn't list that fish species, public confusion can arise. One state may be viewed as over-protecting human health, or the other state could be viewed as under-protecting human health.

The options and alternatives proposed for this category were intended to move toward consistent, clearly understood FCAs. These suggestions ranged from sharing advisories prior to issuing them so that differences might be eliminated, to focusing on sending a common message to the public, even if different technical approaches were used to arrive at the decision to issue an advisory. Finally, some states considered the use of several consumption levels excessive. They suggested that a limited number of advisory consumption levels be issued, such as unrestricted consumption, 1 meal/week, or do not eat. Other states thought that this was overly restrictive, particularly if some fish could be consumed once a month or once every two months. For many fishers, this corresponds to the frequency at which they go fishing and consume those fish.

States also use different methods for determining if fish contaminant data indicate an FCA should be issued. For example, Iowa and Illinois issue an FCA if two consecutive fish tissue samples from the same water body have contaminant concentrations exceeding the criterion concentration. Minnesota and Wisconsin issue FCAs if the mean of fish tissue concentrations for a particular species in a water body exceeds the criterion value over about a five-year period.

Missouri uses the percentage of the samples exceeding a criterion value to issue three levels of FCA – unrestricted consumption, limited consumption, and no consumption. Some of these differences could be addressed by developing procedures to resolve interstate differences in FCAs. Alternatively, they could be addressed by developing uniform approaches for communicating with the public when the underlying FCA procedures are different.

A missing element in the FCA process is feedback on how effective states are in communicating with the public. The purpose of FCAs is to protect public health. If the public isn't aware there is an advisory or does not understand the advisory, then alternative communication approaches need to be developed. Communication approaches should account for different socioeconomic, ethnic, and racial backgrounds that exist along the UMR. The Wisconsin Department of Health and the Missouri Department of Conservation have conducted follow-up surveys on their FCAs. Similar surveys should be considered by other states.

Assessment and Listing

Under U.S. EPA's guidance, a consolidated water quality assessment and impairment listing methodology is recommended for the Clean Water Act Section 305(b) and Section 303(d) requirements. The Section 305(b) assessment phase evaluates the condition of the states' waters to determine if water bodies are meeting water quality standards, including attainment of designated uses. All UMR states except Missouri use FCAs for assessing attainment of the fish consumption designated use. In Missouri, fish tissue contaminant concentrations are compared with fish consumption criterion to determine if this use is being attained. If the fish consumption designated use of a water body is not being attained, it may be included on the state Section 303(d) list of impaired water bodies. There are also differences among UMR states in the amount of fish data required and how the data are analyzed when determining support of the fish consumption designated use and impairment.

While finding consistency among the states' approaches to FCA impairment listings is important, it will first be necessary to resolve differences in how FCAs are issued in the first place. However, one of the complicating issues will be the geographic units used for issuing FCAs versus those used for impairment listings. The five UMR states have agreed to use 13 hydrological unit categories along the UMR for their Section 305(b) assessments and Section 303(d) lists. FCAs, however, are typically issued for river segments such as pools. Several states believe the public has a better understanding of which pool they fish rather than which watershed unit they fish. Wisconsin is the only state that identifies the entire Mississippi River along its border as impaired on the states' Section 303(d) list, based on a state-wide mercury FCA. The other states list specific river reaches and/or pools based on water body (i.e., pool) specific FCAs.

Background Information Needs and Information Sharing

The FCA process involves multiple agencies. Some phases of the process, such as monitoring and analysis of fish tissue contaminants, are conducted by one agency while other phases, such

as determination of the fish tissue contaminant concentrations that pose a risk to human health, are conducted by another agency (see Table 19). This makes interstate, as well as intrastate communication particularly challenging. In addition, every agency is facing decreasing budgets and personnel attrition. Therefore, options and alternatives were also suggested to address information needs and improve information sharing among agencies.

The U.S. EPA Fish Contaminant Forum, scheduled for September 18-22, 2005, was suggested as a key opportunity for sharing information on the FCA process. The Great Lakes Protocol and the FDA action levels will both be explained and discussed at this year's meeting. The U.S. EPA has encouraged states to attend and has provided travel funds for a representative from each state. Given the concerns that some states have regarding how the risk-based and FDA RfDs were developed, what assumptions were made, and how the specific methodologies are applied, attending this Forum should be a high priority for each UMR state. The Forum has also requested input from other consortiums or associations that are grappling with fish contaminant issues. A presentation by the UMRBA Water Quality Task Force on its efforts was encouraged by several of the states and the U.S. EPA.

Chapter 8

Recommendations

In developing their recommendations, the UMRBA Water Quality Task Force and workshop participants identified three important guiding factors. First, there should be a reasonable likelihood that any recommendation would really be implemented. Making recommendations is easy; implementing recommendations without the support of the states is improbable. Second, recommendations that require policy or legislative changes are not likely to occur in the near term. The Great Lakes Protocol was developed because the Governors of the Great Lakes states directed their respective agencies to develop consistent, comparable, and compatible approaches for issuing fish consumption advisories (FCAs). Even with these directives, it took eight years to complete the Great Lakes Protocol process. Finally, recommendations can be phased over time, so a recommendation should not be ignored simply because it may take longer to implement. The five recommendations, with their rationale, are presented below.

CONSISTENT ADVISORIES

Recommendation 1: There should be consistent fish consumption advisories on the Upper Mississippi River among border states.

The UMR is a shared water body among five states. When states issue different fish consumption advisories (FCAs) for this shared water resource, it can contribute to public confusion regarding which fish species are safe to eat. FCAs, by definition, are intended to protect human health; so it is important that consistent, comparable, and compatible messages are provided to the public on consumption of UMR fish species.

FCAs contribute to achieving the goals of the Clean Water Act. In particular, fish consumption is a designated use for the river and FCAs provide an indication of whether the designated use is being attained. If the designated use of a river segment is not being attained, then that river segment is listed as impaired and subsequent actions can be initiated to identify the source of the problem and correct it. Different assessments and listings for shared Mississippi River segments will certainly complicate the already complex challenge of developing TMDLs on the river.

Achieving a consistent, comparable, and compatible FCA process for all five UMR states will be neither a trivial process nor a short-term effort. For example, decisions made for the Mississippi River will also affect or be affected by state-wide procedures and policies. The states have indicated that it would be difficult, if not impossible, to have one set of procedures for the Mississippi River and a different set of procedures for the rest of the state. Any changes in the overall FCA process for the Mississippi River will also need to be compatible with their procedures for the rest of their inland waters. Regardless, there is consensus among the UMR states and the U.S. EPA that consistent FCAs are desired for the UMR. This recommendation represents the ultimate goal of the UMRBA Water Quality Task Force.

Recommendation 2: A minimum suite of contaminants, fish species, size classes, sampling locations, sampling periods, sampling frequencies, and sample preparation procedures for fish consumption advisories should be established for the Upper Mississippi River and implemented by all five states.

Differences exist among the UMR states on which fish species, size classes, sampling locations and periods, sampling frequencies, sample preparation (e.g., skin-on fillets, skin-off fillets), and contaminants analyses are used to monitor fish tissue contaminants. This prevents comprehensive assessments of, and guidance on, fish consumption not only for the UMR, but also for all shared waters between states. If a common set of contaminants and fish species to be sampled and analyzed using consistent methodologies were formulated and implemented by all the UMR states, a comprehensive assessment could be conducted for the entire UMR. Such a comprehensive monitoring effort might occur every five years, so trends in fish contaminants could be assessed through time.

States should consider pooling resources and personnel so that implementing this recommendation does not increase already strained resource and time commitments. Pooling resources would be a cost-effective and efficient approach for both fish collection and data analysis. Increased sample sizes and consistent data for shared waters could add value to the states' ongoing programs. This recommendation would make additional data and information available for all the states to use in their water quality assessments and FCAs. However, since some states use only data collected by their own agencies for their assessment and listing process, using information collected by another state might require a change in their procedures. If, however, states' fish tissue monitoring and analysis procedures were compatible, this procedural change might be more likely to occur.

Comparability is needed not only on fish sampling and sample preparation, but also in sample analysis procedures among UMR states. In particular, comparable analytical precision, accuracy, detection levels, and similar analytical parameters are needed to ensure that the data are comparable. Once a consistent sample collection procedure is established, a quality assurance round robin among UMR states for selected fish tissue contaminants should be conducted to determine whether the analytical results from the states' laboratories are consistent or whether there is further need to seek centralization or consistency in laboratory analysis.

COMMUNICATION AND DIALOGUE

Recommendation 3: All Upper Mississippi River states should participate in the U.S. EPA Fish Contaminant Forum to be held in Baltimore, Maryland September 18-22, 2005.

The primary obstacle to enhancing consistency on the UMR is that some states use a risk-based approach to develop human health risk criteria while others use FDA action levels. Clearly there are other differences in the state FCA processes, but the approach used to develop human health risk criteria is the primary reason for the existence of different FCAs on the river. Barriers to consistency in human health risk criteria need to be clearly identified and addressed in order to move closer to consistent, comparable, and compatible FCAs.

The 2005 U.S. EPA Fish Contaminant Forum and subsequent annual forums offer an opportunity for the UMR states to move toward more consistent FCAs in several ways. First, the Great Lakes Protocol draft mercury addendum will be discussed on the first day of the 2005 Forum. Those states who did not participate in development of the Great Lakes Protocol have expressed concerns regarding how reference doses were derived, the derivation of human health risks for both the general population and sensitive population segments, the supporting scientific information, and other factors used in formulation of the Protocol. The FDA also will be presenting information at this Forum on how it derived action levels for mercury. Several states have questions about how the FDA action levels were derived, not only for mercury, but also for PCB, chlordane, and similar organic compounds. A full comparison between the two approaches might not be possible during this limited time period, but, at a minimum, appropriate agency contacts can be established, an initial vetting of the issues begun, and additional information could be requested, along with assignments of follow-up actions. This Forum will not resolve all the barriers to consistent health risk criteria approaches for FCAs on the UMR, but it can help to identify the height and depth of barriers to consistent approaches and the potential for bridging these barriers in the future.

Second, the Forum is seeking information and presentations on how interstate discussions on fish contaminants and FCAs can occur and be facilitated. The UMRBA and its efforts through the Water Quality Task Force represent an excellent case study of how issues related to fish contaminants and FCAs can be, and are being, addressed among states with shared waters. Several members of the UMRBA Water Quality Task Force will be attending the Forum and could make a presentation regarding ongoing efforts on the UMR.

Third, the U.S. EPA Regions will be attending, so discussions emphasizing greater continuity, comparability, and compatibility among U.S. EPA Regions and with U.S. EPA Headquarters can occur. Currently, Region 5 and 7 have different fish monitoring guidance for their regions, which contributes to differences in the UMR FCA process.

Finally, the Forum will give each of the UMR states an opportunity to interact with their counterparts from other states to gain insight, information, and examples of how these states

address the FCA process. Both U.S. EPA Region 5 and 7 strongly encourage the UMR states to participate in this Forum and have provided funds for a limited number of participants from each state to attend.

Recommendation 4: If necessary, following the 2005 U.S. EPA Fish Contaminant Forum, a meeting of Upper Mississippi River states should be convened to specifically address protocols for consistent fish consumption guidance and issuance.

The annual U.S. EPA Fish Contaminant Forum is an excellent opportunity to resolve some of the issues that several UMR states have raised related to fish consumption guidance and issuance. However, it is unlikely that all the concerns and issues will be resolved at the Forum. If the barriers to resolution can be clearly articulated and documented, a meeting to specifically address these barriers could be a fruitful next step. For such a meeting to move toward resolution, however, it is critical that the individuals most directly involved in FCAs in each state attend the post-Forum meeting. Lack of full participation has been one of the problems in the past. It is critical that the real “movers and shakers” be identified prior to the meeting. In addition, the barriers and issues should be clearly articulated before the meeting so they can be specifically addressed.

CLEAN WATER ACT IMPLICATIONS

Recommendation 5: The Clean Water Act Section 305(b) assessment and Section 303(d) listing process should be revisited after obtaining consistency in data and fish consumption advisories.

In four of the five UMR states (Illinois, Iowa, Minnesota, and Wisconsin), waters can be listed as impaired based on whether FCAs have been issued for those waters. In Missouri, fish tissue contaminants are used as the basis for impairment, rather than the issuance of a FCA *per se*. In addition, Missouri’s methodology for deriving its Section 303(d) list must be adopted into regulation, making any modifications to that methodology more difficult to incorporate. Because there is already a great deal of consistency among the states in how they utilize FCAs in their assessment and listing processes, further efforts addressing the assessment and listing process should be tabled until the states have achieved consistency in how FCAs are developed.

Differences in the fish species and contaminants that are monitored and differences in the basis for issuing FCAs are the primary factors accounting for different Section 303(d) listings for shared UMR segments. Recommendations 2 through 4 above should increase the comparability, consistency, and compatibility of FCAs for the UMR. Following implementation of these recommendations, the assessment and listing process can be revisited to determine if additional work is needed to obtain consistent Section 303(d) listings for shared portions of the UMR.

CONCLUSION

The UMR is more than a nationally significant commercial navigation system. It is an integral part of the regional economy, culture, and environment. Commercial and subsistence fishers depend on the river's fishery and many regional and local community economies are supported by recreational use and river-related tourism. It is important that guidance on fish consumption and listing of impaired river segments be consistent, comparable, and compatible for this shared resource. The UMRBA will facilitate the implementation of the recommendations of Water Quality Task Force over the next several years to move toward consistent messages on fish consumption and impairment in the UMR.

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