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# GUIDANCE FOR ASSESSING CHEMICAL CONTAMINANT DATA FOR USE IN FISH ADVISORIES

## VOLUME 4: RISK COMMUNICATION

**Office of Science and Technology**
**Office of Water**
**U.S. Environmental Protection Agency**
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Agency staff in each state provided insights via telephone interviews about fish consumption advisory risk communication programs nationwide. Many fish consumption advisory program staff provided useful and instructive examples which can be found in the text and the appendices of this document.

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This volume is dedicated to the memory of Dr. Clyde "Skip" Houseknecht. We surely miss his vision, leadership, and commitment to the environmental profession.

# SECTION 1

# INTRODUCTION

## 1.1 HISTORICAL PERSPECTIVE

Fish consumption health advisories have been issued in the United States since the mid-1970's. Advisories are a response to concerns about the potential negative human health consequences of consuming chemically-contaminated fish.

Decisions to issue health advisories for a given waterbody are part of the risk assessment and risk management processes associated with contaminant monitoring and management programs. Sharing those recommendations with the appropriate audiences constitutes the risk communication component of health advisory programs.

State governments have the primary responsibility for protecting their citizens from the risks associated with eating chemically contaminated fish (Cunningham et al. 1994). Technical assistance and guidance (such as this manual) are provided by federal agencies, primarily by the U.S. Environmental Protection Agency (USEPA) (Reinert et al. 1991) and the U.S. Food and and Drug Administration (USFDA). Many states rely on USFDA consumption guidelines for advisories and have consulted frequently with USFDA about how to address particular fish contaminant situations.

Issuing health advisories with recommendations about limiting fish consumption and advice about adopting other risk-reducing behaviors is one of the primary management strategies used by states to address the potential human health impact of contaminated fish consumption. Other strategies include longer-term environmental remediation and pollution control activities.

Based on fish tissue contaminant monitoring, states issue local or regional fish consumption advisories or bans. These often target certain human populations, specific waterbodies, and specific fish and shellfish species. Advisories are triggered when levels of contaminants detected indicate that consumption of certain species from certain locations poses an unacceptable human health risk (USEPA 1993). Some local and tribal governments and non-government citizen and environmental action organizations also issue fish consumption health advice.

Advisories issued by different agencies often take various forms. Flexibility in health advisory communication is needed to: (1) address fish contamination issues that differ among the states or other jurisdictions; (2) address the needs of diverse target audiences (i.e., populations at risk) who differ among and within jurisdictions; and (3) reflect philosophical differences about the role of states (and other agencies) in the advisory process or the types of risk assessment and risk management techniques that should be used.

Health advisory risk communication is one part of the total health advisory program. Other components include: (1) fish tissue sampling and analysis, gathering the contaminant data; (2) risk assessment, which involves interpreting the contaminant data in relation to potential human exposure and possible health effects; (3) risk management, which is the evaluation, selection, and implementation of alternative risk control actions; and (4) health advisory program evaluation.

Risk management involves the analysis of the risk assessment data and development of a set of fish consumption recommendations. These recommendations may be specific to certain waterbodies, to certain human populations (e.g., children, women of childbearing age), or targeted toward specific species or sizes of fish. These recommended fish consumption limits are the core of the health advisory information program.

The next phase of the health advisory process, risk communication, considers how this core advice should be presented to various groups of people, and what information should accompany the core advice to ensure people understand and respond positively to the risk management recommendations.

The risk communication process is complicated by the complex nature of health effects associated with eating contaminated fish. Exposure to contaminants, and resultant health effects, may vary depending on the species and size of fish caught at any one location, may vary between locations, and may vary according to the fish cleaning and cooking techniques used by the fish consumer. Additionally, the health effects associated with exposure to contaminants may vary among fish consumers. Some chemicals pose a greater concern for reproductive and developmental anomalies in children and people of childbearing age; others pose a concern as carcinogens. Depending on the potential health effects, different audiences of fish consumers will be the targets of the risk communication efforts.

The final component of the total health advisory program is evaluation. Program effectiveness can be evaluated relative to changes in (1) human knowledge and behavior related to fish and fish contaminants; (2) contaminant levels in humans; and, ultimately, (3) the status of human health.

In August, 1990, the U.S. Environmental Protection Agency sponsored a forum for state health, environmental quality, and fishery management agencies to identify state needs for federal assistance related to fish consumption health advisory programs. One need identified was assistance with the risk communication component of health advisory programs. This manual is an outgrowth of that expressed need.

## 1.2 PURPOSE OF THIS MANUAL

This manual is the fourth in a series of four documents to be prepared by the EPA Office of Water as part of a Federal Assistance Plan to help States implement fish consumption advisory programs. The remaining three documents provide guidance on fish sampling and analysis (Volume 1), risk assessment (Volume 2), and risk management (Volume 3).

Frequent references are made in this volume to the information in Volume 3, risk management. Risk communication is a part of risk management. Developing and refining risk management strategies may depend on lessons learned as risk communication programs are implemented. Thus, Volumes 3 and 4 are integrally linked.

The purpose of this manual is to provide overall guidance to States on developing, implementing, and evaluating health advisory risk communication programs. **This manual provides guidance only and does not constitute a regulatory requirement for the States or other jurisdictions.** The purpose of this manual is

not to require or recommend one specific risk communication approach for all local, state, or tribal health advisory programs, but rather to indicate which approaches can best meet specific objectives. Agencies can analyze their own objectives and develop a risk communication approach most suitable for their particular needs.

This manual is intended to offer guidance about the entire health advisory risk communication process, and serve as a resource and reference to those designing, evaluating, and modifying health advisory risk communication programs. The three-ring binder format was selected by EPA for the manuals in this series to enhance their use as working documents and to facilitate inclusion of additional refinements and updates, such as examples of newly implemented risk communication strategies.

## 1.3 ORGANIZATION OF THIS MANUAL

This manual provides guidance on all aspects of health advisory risk communication.

**Section 2, Risk Communication as a Process of Sharing Information:** Section 2 provides an overview of the health advisory risk communication process, introducing each component of the process and indicating how it relates to other components. The reader who is quite familiar with health advisory risk communication may wish to skim or skip over this section and instead go directly to the following sections that treat specific components of the communication process in depth. For someone who seeks to understand the entire risk communication process before considering its specific components in detail, this section should be read first.

**Section 3, Problem Analysis/Program Objectives:** Section 3 discusses the importance of understanding the context of the fish contamination problem when developing a risk communication program, and suggests potential health advisory risk communication program objectives.

**Section 4, Audience Identification and Needs Assessment:** Section 4 describes the variety of audiences that may exist for health advisory risk communication programs. Both audience-generated and expert-generated information needs are discussed, including techniques for collecting such information.

**Section 5, Communication Strategy: Design and Implementation:** Section 5 reviews various communication tools, considering their ability to reach specific audiences and help achieve communication program objectives. Tools include advisory format and tone, potential advisory content beyond the core fish consumption advice, information dissemination mechanisms, and the timing of information exchange.

**Section 6, Health Advisory Communication Program Evaluation:** Section 6 presents suggestions for several types of evaluation of health advisory communication programs. The purpose of each type of evaluation and appropriate techniques for each are included.

**Section 7, Responding to Inquiries from the Public:** Section 7 describes how people view risks associated with fish consumption, and discusses issues of trust and credibility.

**Section 8:** Supporting documentation for this manual is provided in Section 8, Literature Cited, and in Appendixes A through D.

**NOTE:** The materials and examples cited throughout the guidance documents are included *as examples only*. Inclusion of these materials does not necessarily constitute an endorsement by the U.S. Environmental Protection Agency of the content or the specific advice.

## SECTION 2

## HEALTH ADVISORY RISK COMMUNICATION AS A PROCESS OF SHARING INFORMATION: AN OVERVIEW

The objective of this section is to provide an overview of the health advisory risk communication process. Subsequent sections of this manual fit within the general model described in this section.

The concept of "sharing" information is emphasized in risk communication, particularly in health advisory communication programs. Health advisories are prepared and communicated by a variety of government agencies. Most frequently, state health agencies are involved, but in many states environmental quality and fishery management agencies participate in some aspect of the health advisory program (Reinert et al., 1991). Health advice is also disseminated by other government groups such as Cooperative and Sea Grant Extension services and local and tribal governments, by non-government interest and advocacy groups, and through various news media.

Health advisory recommendations are targeted toward a variety of people -- sport anglers, subsistence fishers, actual and potential fish consumers, high-risk groups, and many sociodemographic groups. Sharing information, perceptions, and understanding among these various participants is critical to successful health advisory communication programs.

Health advisory recommendations are issued based on scientific monitoring and estimation techniques. The science-based health advisory program often leads to erroneous expectations that health advisories should generate a consistent, rational response among the public, resulting in complete compliance with recommended fish consumption levels. Such is often not the case, however.

Scientific experts may believe that their information, and hence recommendations, are objective, reasonable, and logical. Segments of the public, however, may not share those perceptions about the quality, and the seriousness, of the health advisory recommendations.

Health advisory risk communication programs must be viewed as processes of sharing information among expert and fish consumer, rather than a one-way transfer of information from expert to public. Similarly, government agencies must realize that agency objectives are not the only ones to be achieved through health advisory programs.

Fish consumers bring their own objectives and desires to the fish consumption issue. These may include desires for a satisfying fishing experience, an inexpensive protein source, or a sense of pride at catching one's own food. The objectives and fish consumption recommendations of the agency are one major component of the risk communication process; the objectives and fish consumption-related behaviors of the public are the other major component.

Springer (1990) proposed a model that could be used to guide development of health advisory communication programs. This model grew out of the "interactive" risk communication paradigm (Scherer, 1991), emphasizing information exchange among agencies and the public. The model contains several essential elements (Fig. 2.1):

# RISK COMMUNICATION PROCESS

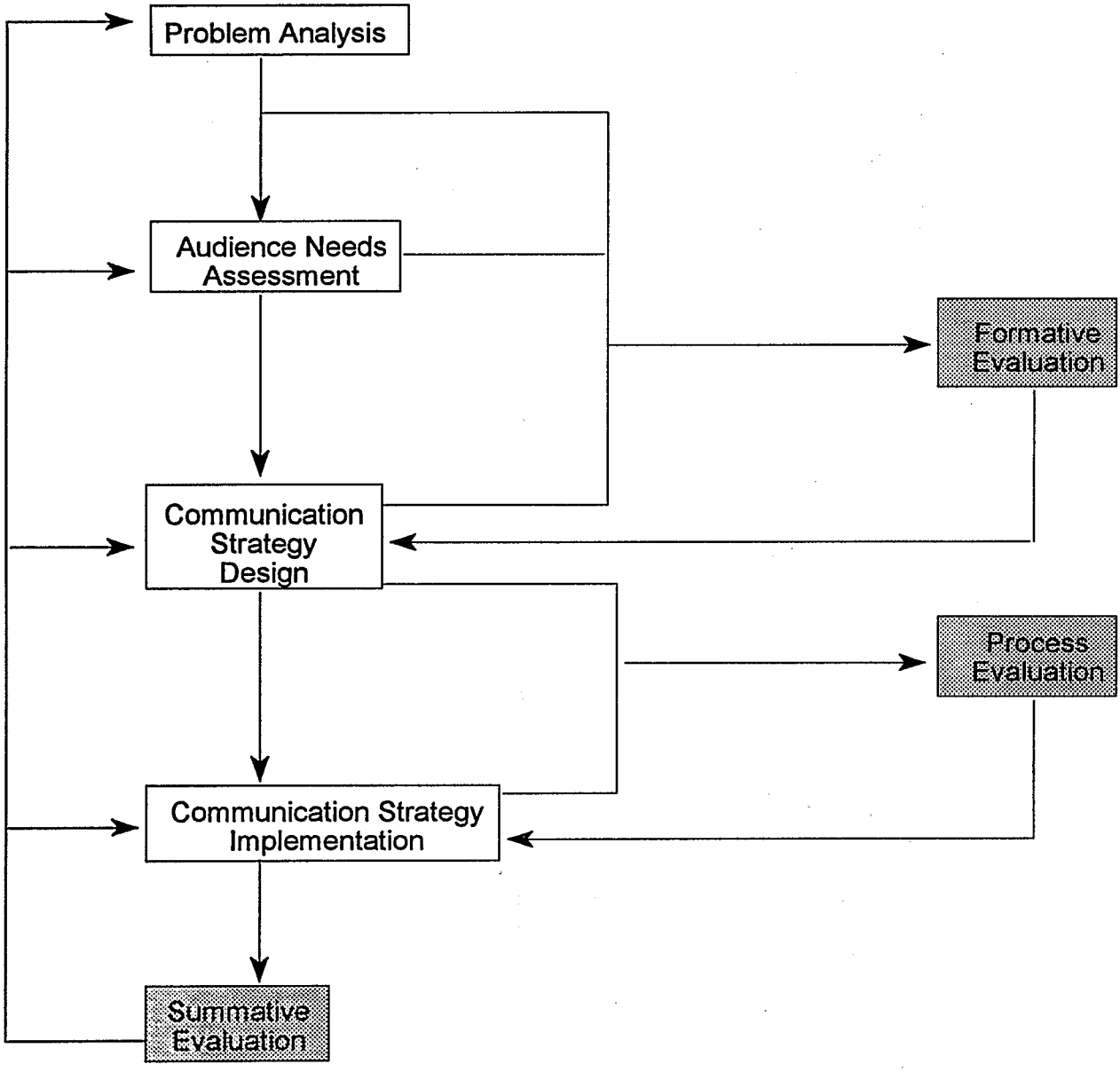


Figure 2.1 Risk communication process for fish consumption health advisories (based on Velicer and Knuth, 1994).

(1) problem analysis and articulation of program objectives;

(2) audience identification and needs assessment;

(3) communication strategy design;

(4) communication strategy implementation; and

(5) program evaluation.

This chapter provides an overview of the elements of the health advisory risk communication model. Subsequent chapters treat each element of the model in greater depth. The reader who is very familiar with health advisory risk communication programs may wish to skim or skip over this chapter. The reader who seeks to understand the entire process fully before considering all of the specific elements in each phase should read this chapter first.

## 2.1 PROBLEM ANALYSIS

Problem analysis (Fig. 2.2) allows the risk communicator to understand the internal and external context in which the health advisory program will be conducted. This includes considering the social, scientific, and political context of the fish contaminant issue in that specific location. Internal factors include agency philosophy, staff, and resources. External factors include local and regional economics, human population characteristics including reliance on fish consumption, and risk characteristics of the chemicals of concern.

The problem analysis phase includes articulating specific objectives to be accomplished through a health advisory communication program. First-order objectives (sometimes termed "goals") are idealistic, general program outcomes that reflect an agency's mission and mandate. Second-order objectives are specific, measurable outcomes to be achieved by the health advisory program.

Agencies and target audiences should have a clear understanding of which objectives are to be achieved through a health advisory communication program. Without such understanding, it is virtually impossible to identify the "most appropriate" health advisory communication strategies. Communicators and target audiences alike should be aware that not all participants in health advisory programs will share the same set of objectives, leading at times to confusion or conflict.

## 2.2 AUDIENCE IDENTIFICATION AND NEEDS ASSESSMENT

Audience identification and needs assessment includes identifying and characterizing potential target audiences who should participate in the health advisory communication program (Figure 2.3). Specific criteria relating to the health advisory program objectives are used to help the risk communicator determine potential target audiences. Through this phase, the risk communicator analyzes what types of information and communication styles are appropriate for each audience, providing the information base for the next phase of communication strategy design.

# ADVISORY RISK COMMUNICATION:

## *PROBLEM ANALYSIS*

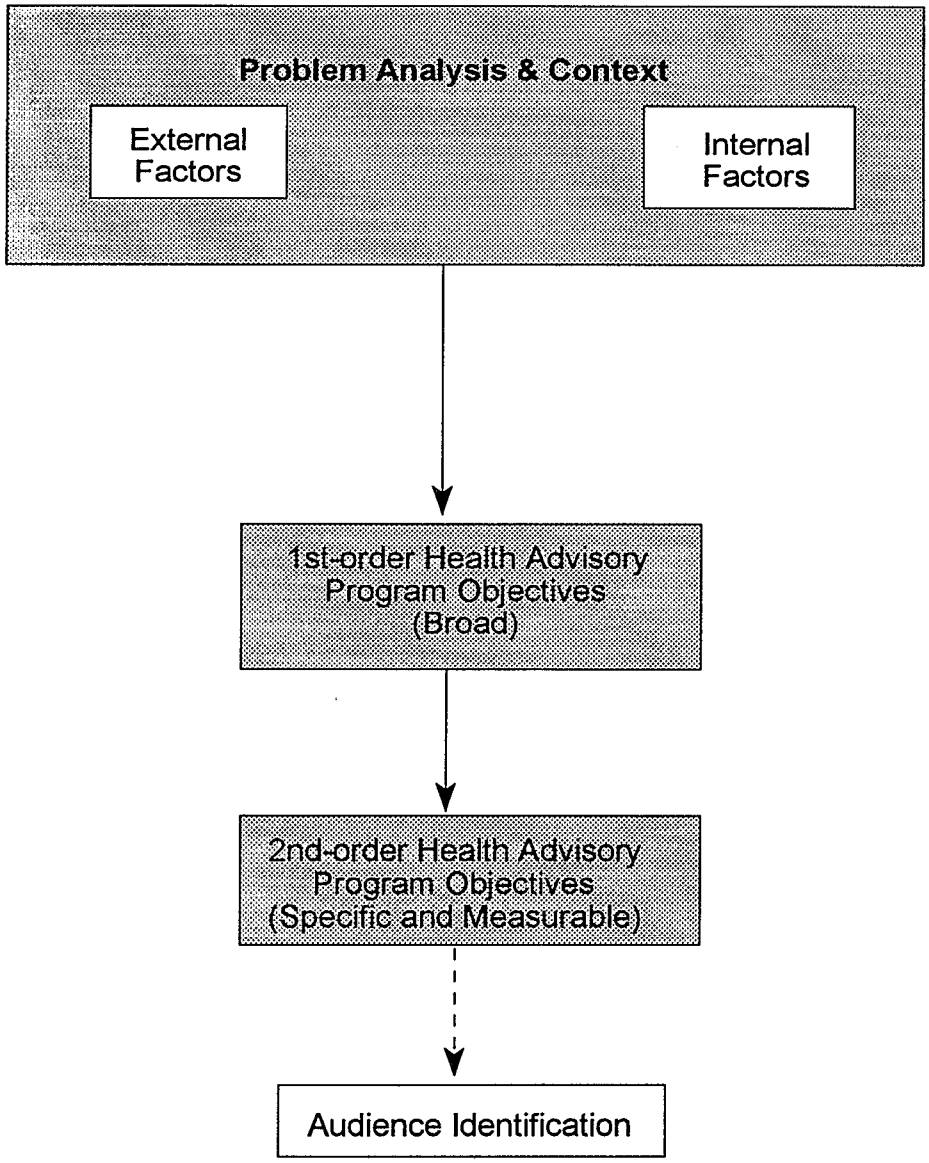


Figure 2.2. Problem analysis phase of the risk communication process for fish consumption health advisories.

# ADVISORY RISK COMMUNICATION:

## *AUDIENCE IDENTIFICATION AND NEEDS ASSESSMENT*

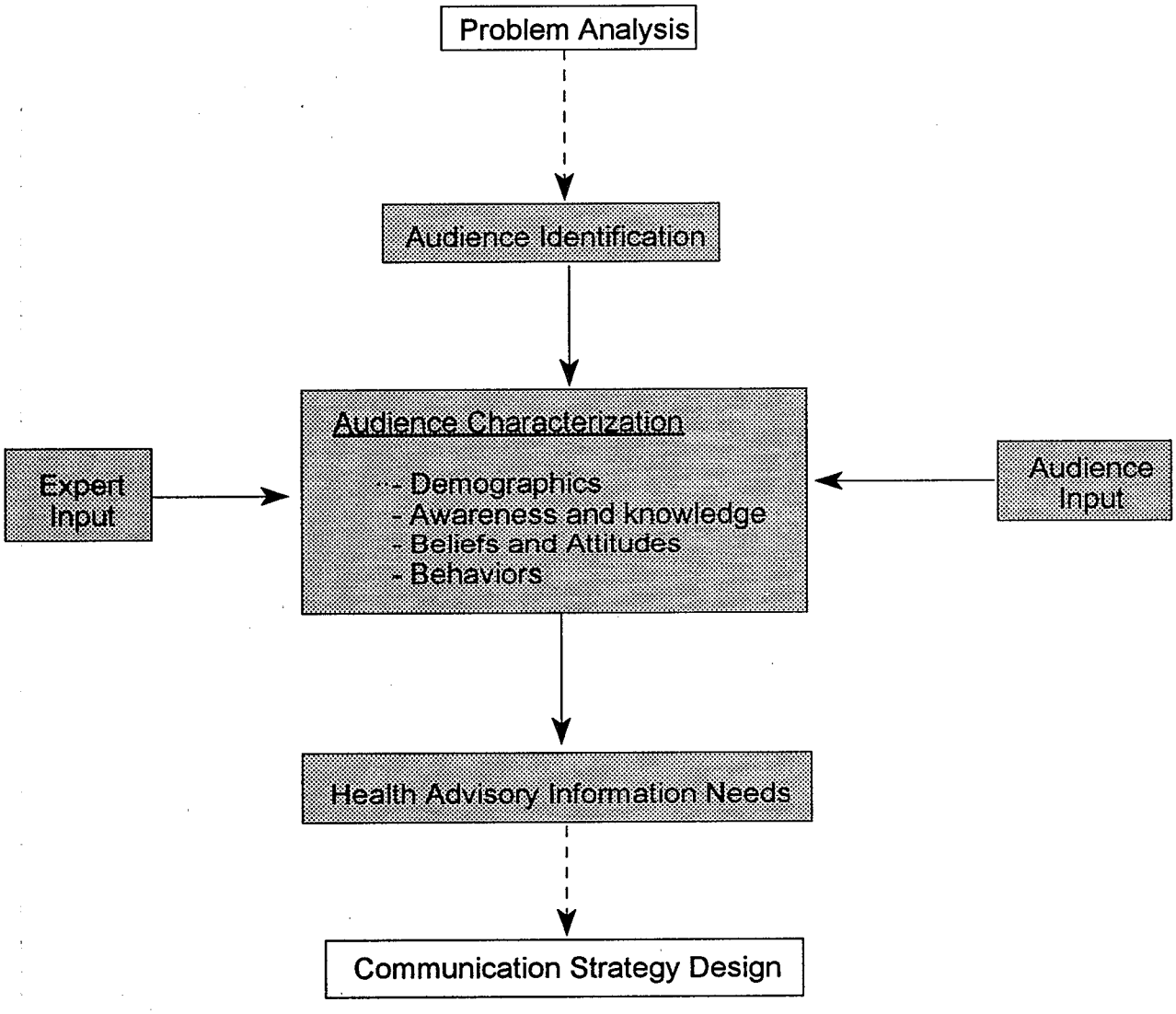


Figure 2.3. Audience needs assessment phase of the risk communication process for fish consumption health advisories.

### 2.2.1 Identifying Target Audiences.

Identifying potential target audiences for health advisory communication programs should flow from the objectives articulated during problem analysis. The information needs of potential target audiences and the specific communication strategies used to convey that information may differ substantially from group to group. To achieve a variety of objectives or reach a variety of audiences, a variety of communication strategies is usually required.

Agencies should use care during audience needs assessment to identify the universe of target audiences necessary to reach. Agencies should consider both the objectives of the health advisory communication program and the range of behavioral and sociodemographic groups of people implied by those objectives.

### 2.2.2 Audience Information and Communication Needs.

Health advisory communicators should identify who the target audiences are relative to the objectives to be achieved, and their information and communication needs. This includes understanding what the target audiences initially know and believe about health advisories and fish consumption, how they behave relative to fish consumption, and what information they desire.

Perceptions of what is important to know about health advisories and fish consumption may differ considerably between target audiences and "expert" health advisory communicators (such as health and fishery agency professionals) (Springer 1990). If communicators design communication programs solely on their own beliefs about what audiences should know, they may omit information or dissemination techniques that will be most useful to the target audiences. Audiences can and should be part of the process of identifying information needs.

### 2.2.3 Audience Behavior, Knowledge, and Beliefs.

Understanding the linkages between fish consumption behaviors, knowledge, and beliefs is important for communicators. Ultimately, fish consumption is the behavior most health advisory communication programs are designed to influence. Related behaviors include fishing and use of potential information sources (e.g., fishing regulations guides, newspapers, personal communications). Understanding which information sources will be used by audiences to receive health advisory information is critical when designing a communication strategy. Understanding what behaviors fish consumers engage in is necessary when deciding what existing behaviors to reinforce or to change via health advisory messages.

## 2.3 COMMUNICATION STRATEGY: DESIGN AND IMPLEMENTATION

Communication strategy design involves constructing health advisory recommendations and information appropriate to (1) the needs of the target audiences; and (2) the health advisory program objectives (Fig. 2.4). Strategy implementation involves sharing this information using dissemination mechanisms that will reach each audience of concern. The intent of this phase is to develop and implement strategies to communicate: (1) the core fish consumption recommendations determined through risk assessment and risk management; and (2) any other information that will be needed by target audiences to interpret or respond positively to the core advice.

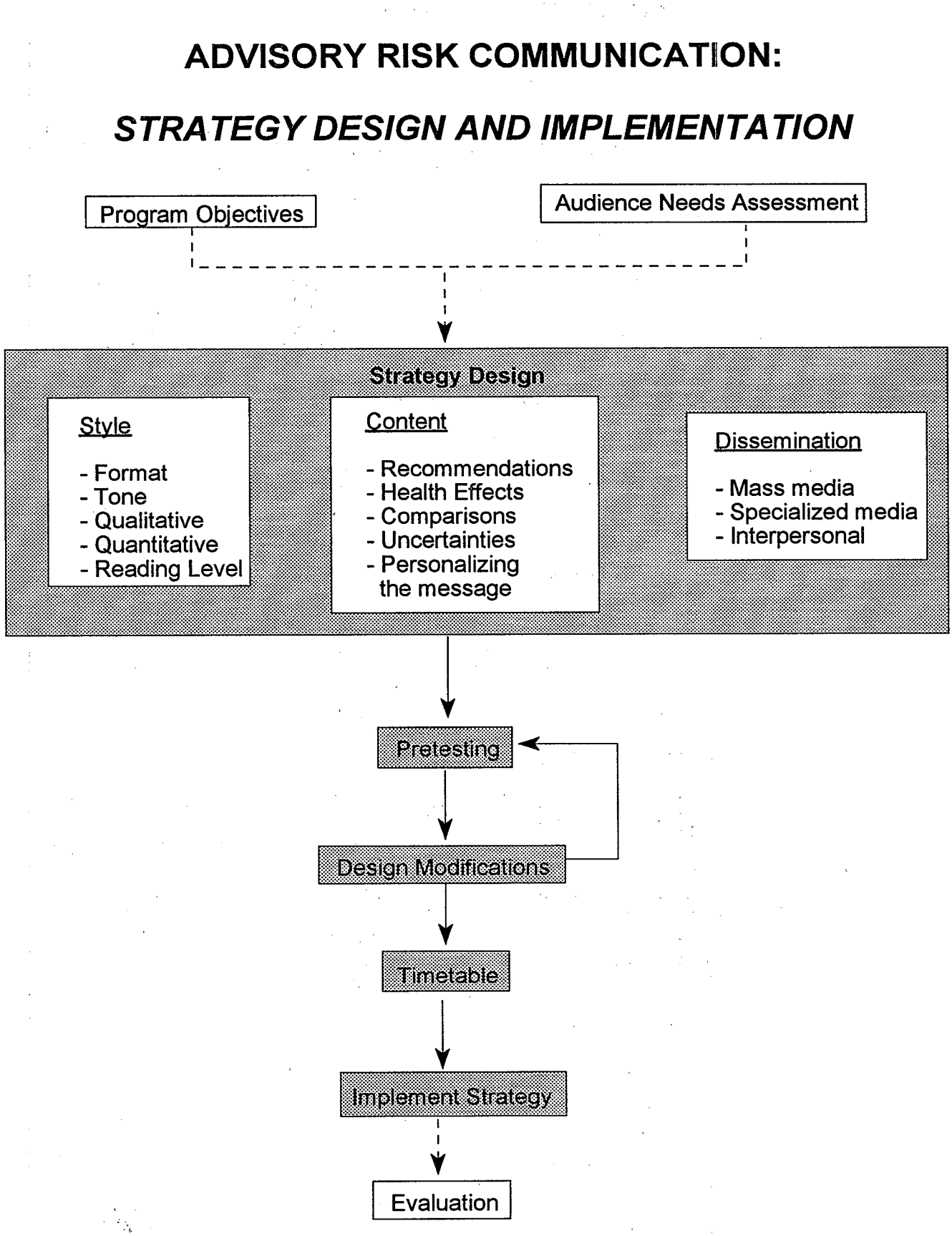


Figure 2.4. Strategy design and implementation in the risk communication process for fish consumption health advisories.

A variety of tools should be considered during the design phase, including the health advisory style (e.g., format, tone, reading level), content, and dissemination mechanisms. During strategy design, appropriate mechanisms for evaluating the effectiveness of the communication program should also be developed. Good evaluations cannot be planned at the end of the communication program. Rather, planning for useful evaluations of the effectivess of health advisory communication programs begins during the program objective-setting stage, and continues through communication strategy design and implementation.

### 2.3.1 Developing the Advisory Content.

A variety of information may be included in a health advisory beyond the core fish consumption advice. Depending on the target audience, health advisories may include information such as:

(1) a description of risk-reducing behaviors other than limiting or eliminating fish consumption (e.g., fish cleaning and cooking techniques);

(2) explanations of how eating fish compares to other dietary risks;

(3) description of the negative and positive health effects associated with fish consumption, with special emphasis on what groups of people are most endangered by or derive the most benefit from sport-caught fish consumption; and

(4) explanation of the assumptions and uncertainty entering into the risk assessment-risk management process that forms the basis for issuing health advisories.

Decisions about what information to include in any advisory should reflect the self-identified needs of the target audiences as well as the objectives of the health advisory program.

### 2.3.2 Styles for Presenting Advisory Information.

Presentation styles should meet the needs and abilities of the target audiences. Style characteristics include advisory format, tone, mixture of qualitative and quantitative information, and reading level.

### 2.3.3 Advisory Dissemination Mechanisms.

The mechanisms by which potential fish consumers receive information about health advisories and contaminated fish consumption include interpersonal sources (e.g., friends, government officials), mass media (e.g., newspapers, television), and specialized media (e.g., printed fishing regulations guide, health advisory brochure).

### 2.3.4 Timing of Advisory Dissemination.

Timing the release of health advisory recommendations will depend in part on what dissemination mechanism is chosen. Health advisory recommendations to be printed in the fishing regulations guide, for example, must be available at the time

the guide is printed. Reminders about the advisory throughout the fishing season may cause anglers to think more about health advisories, and lead to greater compliance with advisory recommendations (Knuth et al., 1993).

## 2.4 EVALUATION

Evaluation occurs throughout the risk communication process (Fig. 2.5). It is the critical element that helps: (1) ensure a health advisory communication program is being designed to meet the needs of the target audiences and the objectives of the agency; (2) monitor whether the communication program is being implemented as intended; and (3) assess to what extent audience needs and agency objectives have been met. Throughout the risk communication process it is critical to include activities, benchmarks, and milestones that require formative, process, and summative evaluation data to be collected and used.

During any of these evaluation processes, new communication issues or problems or previously unidentified audiences or audience needs may surface. When this happens, the health advisory communication program cycles back to the initial steps of the process, problem analysis and audience needs assessment (Fig. 2.5). Evaluation may result in modifications to one or more elements of the communication program.

### 2.4.1 Formative Evaluations

Formative evaluation occurs as program objectives are selected, audience information needs identified, and the communication strategy planned. Formative evaluations are designed to assess the likelihood of attaining program objectives, by assessing the appropriateness of potential objectives and the strengths and weaknesses of alternative communication strategies.

### 2.4.2 Process Evaluations

Process evaluation occurs as the communication strategy is implemented. Process evaluations focus on the correspondence between communication strategy design and implementation. These evaluations are designed to assess to what extent communication strategies are being implemented as planned, and to assess the adequacy of administrative, personnel, or other resources necessary to keep the communication program on track.

### 2.4.3 Summative Evaluations

Summative evaluations are sometimes termed outcome and/or impact evaluations. Summative evaluation occurs at the end of the communication program, focusing on outcomes achieved, especially outcomes relative to the program objectives articulated at the start of the communication process. These evaluations are designed to document short- or long-term results of health advisory communication programs. Evaluators assess whether or not objectives were achieved.

## 2.5 INSTITUTIONAL SUPPORT

A successful comprehensive health advisory risk communication program, as described in this model, requires institutional support of all program components. This includes philosophical and budgetary support from the agency administration and staff and any oversight organizations (e.g., state legislature with budget

# ADVISORY RISK COMMUNICATION:

## *EVALUATION*

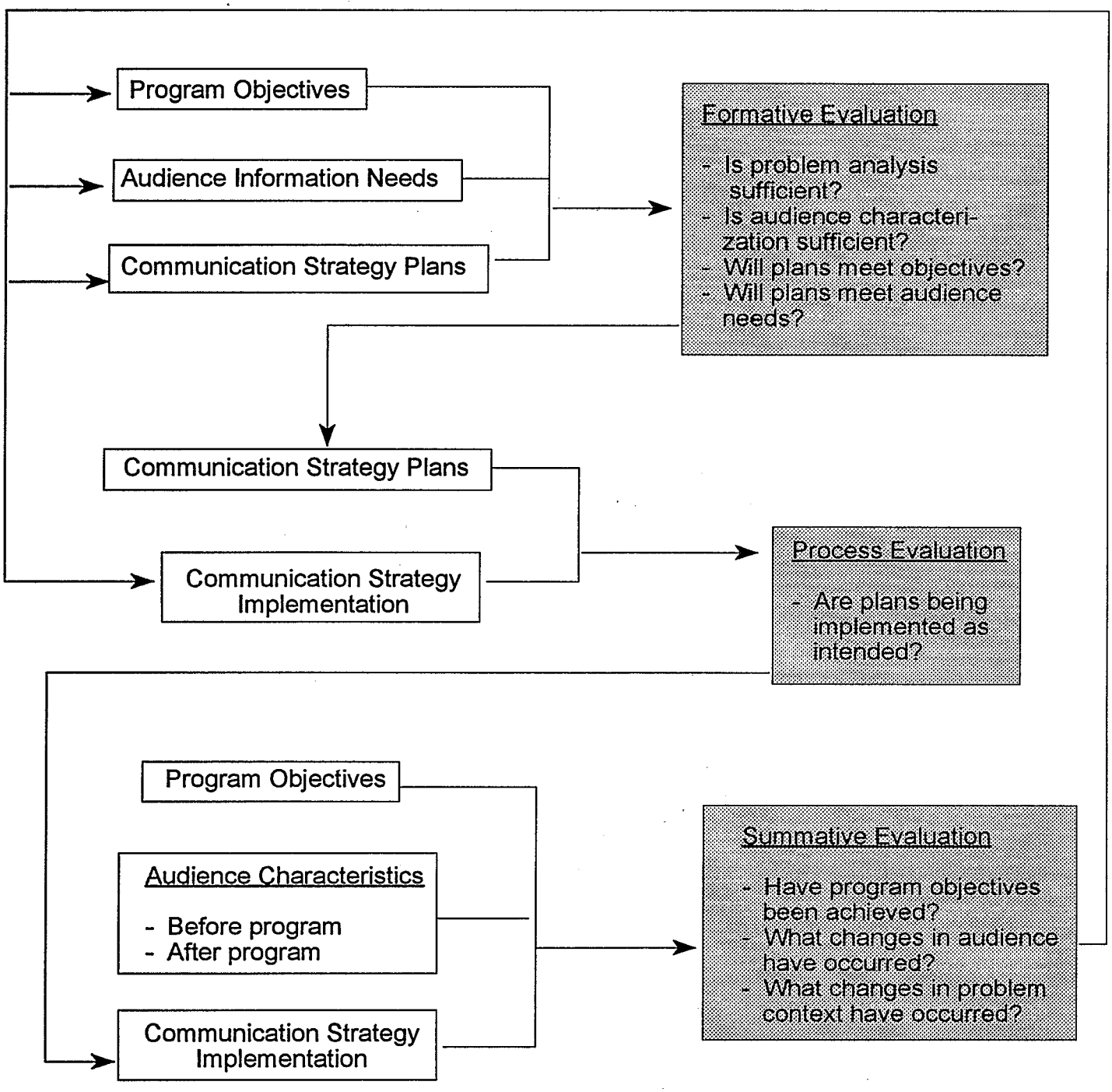


Figure 2.5. Formative, process, and summative evaluation in the risk communication process for fish consumption health advisories.

oversight), as well as appropriate staffing needs. Commitment from the agency's decision-makers and from the ground-level staff with daily public contact are both critical to successful communication efforts. Agency credibility is destroyed if personnel within the agency publicly question the validity or seriousness of health advisory fish consumption recommendations, either outright or by publicizing a lack of staff adherence to recommended fish consumption limits.

Staffing a health advisory risk communication program requires personnel with specialized training in risk communication, but not necessarily with risk communication as the only job responsibility. The degree of training required and the amount of time spent on the program depend on program objectives, diversity and needs of target audiences, complexity of the information needs of target audiences, and the relative emphasis placed on health advisory risk communication programs within the context of the total agency.

Necessary institutional support of risk communication programs suggested by the U.S. Department of Health and Human Services for all types of public health agencies includes (USDHSS, 1993):

(1) a capacity to evaluate the effectiveness and efficiency of health risk communication messages, materials, and programs, including a clear set of criteria and methods for such evaluation;

(2) a set of guidelines for effective health risk communication that is used by the agency; and

(3) greater coordination of health risk communication programs between similar agencies.

For health advisory programs, this may translate into institutional support for:

- adopting specific health advisory communication program objectives and desired outcomes (see Section 3 of this manual),

- staff with the knowledge and abilities to evaluate health advisory programs (see Section 6), and

- greater coordination and communication between agencies within the same state (e.g., health, environmental quality, fishery management) or between similar agencies in different states (e.g, health agencies within a given region).

Particularly for fish consumption health advisories, establishing a multi-agency risk communication team may be necessary. In many states, health, environmental protection, and fishery management programs are in separate agencies, yet each agency has some role to play in the health advisory process, including communication. These agencies may have conflicting objectives, which will be reflected in the way in which the health advisory program is viewed and supported. These agencies also have different relationships with members of the public. For example, a recreational angler may contact a fishery management agency for health advisory information, even if the health department is the "official" issuing agency. For these reasons, an interagency team assigned to develop mutually agreeable communication objectives and to design and implement the communication program may be essential to a successful health advisory program.

## SECTION 3

## PROBLEM ANALYSIS/PROGRAM OBJECTIVES

The primary objectives of this section are to: (1) discuss why the context of the fish contamination problem triggering the health advisory should be considered during the risk communication process; and (2) describe potential health advisory communication program objectives.

### 3.1 THE CONTEXT OF THE FISH CONTAMINATION PROBLEM

Fish contamination and the need for health advisories occur in a social, scientific, political, and economic context. Fish consumption health advisories would not be required if the contaminated waterbody was not of interest to and used by people. It is likely that a health advisory program will have an impact on the perceptions and activities of a variety of people associated with that waterbody. This may include anglers fishing that location, the families of anglers who may wish to eat the fish caught, or the businesses supporting the angler through tackle sales or lodging.

Agencies should expect that those people affected (economically, socially, culturally, psychologically) will demand a clear, concise explanation of the rationale for health advisories, and the validity of the underlying assumptions. Agencies should also expect that the response of individuals to health advisory recommendations will differ based on their own understanding of the recommendations, and their perception of the implications of those recommendations for their existing lifestyle.

Health advisory risk communicators, therefore, should assess a set of external and internal factors to fully understand the context of the risk communication problem before moving forward with selecting program objectives and developing communication strategies. Without an understanding of the context in which the health advisory risk communication is to occur, unrealistic program objectives may be articulated, and communication strategies doomed to failure may be selected.

External factors to consider include:

(1) the extent of and degree of certainty about the health problem associated with contaminated fish, including likely severity and frequency of adverse health effects;

(2) the characteristics of the community to be affected by the health advisory, including past relationships with the agency, and the industries or activities supporting its economic base (e.g., is the community tied closely to for-profit recreational fishing enterprises?; are anglers current or former employees of the industry who may have worked with chemicals all their lives and so be wary of health advisory credibility?);

(3) the importance of the affected waterbody to the community culture (e.g., is the community's subsistence food source tied to the affected water?);

(4) interagency arrangements and coordination; and

(5) existing public perceptions and behaviors.

Internal factors to consider include:

(1) intra-agency support such as staff and budget;

(2) agency mandate and mission; and

(3) relative importance of health advisories among the variety of agency responsibilities.

## 3.2 ESTABLISHING OBJECTIVES FOR HEALTH ADVISORY COMMUNICATION PROGRAMS

The context of the fish contamination situation, discussed above, will influence the selection of health advisory communication program objectives. Objectives should be selected that are appropriate to the agency's mission and mandate, and to the fish contamination circumstances the health advisory program is designed to address. See Volume 3 in this series, Risk Management, for discussion of the impacts that may result from health advisory risk management programs. Communication program objectives should be developed to help attain desirable impacts and avoid undesired impacts.

### 3.2.1 Types of Objectives

Objectives may be of two types. First-order objectives (sometimes termed "goals") are idealistic, general program outcomes that reflect an agency's mission and mandate. Because they are stated in general terms, first-order objectives are not usually measurable outputs. Second-order objectives, however, are specific, measurable outcomes to be achieved by the health advisory program.

Second-order objectives may focus on implementation activities (e.g., number of health advisory brochures to be distributed to low-income women) or products (e.g., changes to be produced in angler behavior). Second-order objectives provide an important basis for audience identification and communication strategy design, and are critical for purposes of later program evaluation. Summative evaluation will measure whether or not the second-order objectives were achieved.

A range of potential first- and second-order objectives for health advisory programs exists. Knuth and Connelly (1991) surveyed Great Lakes region state agencies to determine what the states considered to be important objectives. Five major groups of first-order objectives were identified, including those focused on: (1) human health risk reduction; (2) enabling people to make their own, informed, decisions about fish consumption; (3) educating about risk-reducing fish preparation methods; (4) public support and resource use; and (5) the need to follow agency mandates (Table 3.1).

**Table 3.1 First-order objectives for health advisory programs as identified for the Great Lakes region (from Knuth and Connelly, 1991).**

| |
|---|
| **Human Health Risk Reduction** |
| Reduce public health risks associated with consumption of fish. |
| Reduce health risks to licensed sport anglers. |
| Reduce health risks to special at-risk groups of people. |
| Reduce health risks to people who rely on fish as a subsistence food resource. |
| Reduce health risks to unlicensed anglers. |
| **Informed Individual Decisions** |
| Allow people to make their own, informed decision about eating locally-caught fish. |
| Help people select lesser-contaminated species of fish to eat. |
| Motivate people to keep their consumption of locally-caught fish within the levels listed in the advisory. |
| Inform people about safe species and/or locations to fish. |
| Maximize overall public health associated with appropriate nutritional choices adjusted for individual circumstances and risk. |
| **Risk-reducing Fish Preparation Methods** |
| Help people select risk-reducing fish cleaning and cooking methods. |
| **Public Support and Resource Use** |
| Encourage public support for programs to reduce or clean up toxic contamination in local waters. |
| Motivate people to take action to clean up or stop pollution of local waters. |
| Encourage public support for fishery management in local waters. |
| Encourage beneficial uses of sport-fishery resources. |
| Protect tourism-based economies from sudden changes or losses. |
| **Follow Agency Mandates** |
| Meet legal mandates of government agencies. |

### 3.2.2 Assigning Priorities to Objectives

The priority assigned to health advisory program objectives such as those in Table 3.1 sets the stage for the subsequent phases of the health advisory communication process. For example, if licensed sport anglers are selected as the priority health risk reduction objective, the next phase - target audience characterization - will be limited to that group, rather than focusing on other audiences.

Agencies within the same state may differ in the priority they assign to health advisory objectives. In the Great Lakes study (Knuth and Connelly, 1991), priority objectives differed by type of agency (i.e., health, environmental quality, fishery management) involved in the health advisory program. When involved in multi-agency health advisory programs, staff should be aware that agency mandates, philosophy, and traditional clientele will influence the selection of program objectives, identification of important target audiences, and, indeed, each element of the health advisory communication process. **Identifying the commonalities in purpose rather than highlighting the differences is the first step toward increasing interagency effectiveness within a state.**

### 3.2.3 Establishing Second-order Objectives

Ideally, specific objectives relative to each target audience will be established. Measurable, or second-order, objectives provide guidance during the development and implementation of the communication strategy about who to contact and with what message. Second-order objectives provide the criteria against which evaluation data are compared to eventually judge the success of the communication program. When writing second-order objectives, consider how program evaluation will be conducted. Ideally, the evaluation plan will be written at the same time as objectives. Second-order objectives should include a target date or time period so evaluators know when results should be anticipated (e.g., achieve by April, 1998).

Second-order objectives may be activity-oriented or product-oriented. Activity-oriented objectives indicate what specific activities are expected during the communication strategy implementation phase. Product-oriented objectives indicate what those activities are expected to produce.

Measurable activity-oriented objectives specify the activities that will be completed during the health advisory communication program, e.g.:

> "Distribute 30,000 health advisory brochures by March, 1996."
>
> "Conduct 25 health advisory information meetings for sporting groups statewide during 1995."
>
> "Conduct training sessions for at least 250 health professionals associated with low-income women's health care programs during 1995."
>
> "Post 100 health advisory signs at access points along Lake Ontario by June, 1996."

Measurable product-oriented objectives specify what the health advisory program is expected to accomplish, e.g.:

> "Achieve awareness of the health advisory among 90% of licensed anglers by 1996," or
>
> "Achieve compliance with fish consumption recommendations among 75% of women of childbearing age residing in counties bordering the Great Lakes by 1997."

It is often easier and less costly to evaluate to what extent activity-oriented objectives have been met than to evaluate to what extent product-oriented objectives have been met. Evaluation of activity-oriented objectives often requires only good bookkeeping. Evaluation of product-oriented objectives may require costly or involved new measurements.

For example, to evaluate an activity-oriented objective "to distribute 25,000 fish advisory booklets by April, 1996", a bookkeeper can track how many were printed, and of those, how many were left in April, 1996. To evaluate a product-oriented objective such as "achieve a level of 80% of anglers receiving the fish advisory who follow the recommendations by April, 1996", a survey of a statistically-valid sample of anglers may be required.

When writing objectives, consider including a mix -- some that can be evaluated with little cost, and others that may require more evaluation resources, particularly if the latter address the outcomes you hope to achieve through your communication program. You may find later you do not have the resources (staff, time, money) to conduct the type of evaluation needed to confidently assess whether an outcome has been achieved or not. You may, however, be able to seek the resources needed to conduct the evaluation. If your communication plan does not include such product-oriented objectives that require evaluation of outcomes, you will have little basis from which to request more evaluation resources.

Examples of product-oriented evaluation measures are listed in Table 3.2. Items on the list may be modified to be used as specific, measurable second-order objectives by inserting a target number to be achieved (e.g., a specific percent awareness of the advisory among licensed anglers) and a date by which it is to be achieved. Specificity of these objectives is critical. They provide a foundation for identifying target audiences and designing the communication strategy, and a basis for summative evaluation discussed in Section 6 of this manual.

What a risk communication program should achieve is not influenced only by the agency's objectives. Rather, the target audience may have distinct needs and objectives associated with the health advisory program (see Section 4). The needs of the target audience, once assessed, may cause revision of the original agency-identifed list of program objectives.

**Table 3.2 Examples of "product statements" from health advisory risk communication programs. These can be used to develop specific second-order program objectives by inserting a quantitative target and timeframe (from Knuth and Connelly 1991).**

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**Angler Awareness**

Extent of awareness of the advisory among licensed anglers.

Extent to which anglers are aware if they are fishing for a species with an advisory or not.

Extent to which anglers are aware if they are fishing in a body of water with an advisory or not.

Extent of awareness of the advisory among the general public.

**Consumption Maintained at Advisory Level**

Extent to which anglers maintain their fish consumption at or slightly below the levels in the advisory.

Extent to which women of childbearing age maintain their fish consumption at or slightly below the levels in the advisory.

Extent to which children maintain their fish consumption at or slightly below the levels recommended in the advisory.

Extent to which other fish consumers (non-anglers) maintain their fish consumption at or slightly below the levels in the advisory.

Extent to which anglers practice catch-and-release fishing instead of keeping the fish to eat when fishing for species affected by contaminants.

**Consumption Significantly Below Advisory Level**

Extent to which children reduce their fish consumption far below the levels in the advisory.

Extent to which women of childbearing age reduce their fish consumption far below the levels in the advisory.

Extent to which anglers reduce their fish consumption far below the levels in the advisory.

Extent to which other fish consumers (non-anglers) reduce their fish consumption far below the levels in the advisory.

**(Continued on next page.)**

**(Table 3.2. Continued from previous page.)**

**Angler Behavior**

Extent to which anglers change the target species they fish for to avoid those species more likely to accumulate contaminants.

Extent to which anglers change the size of fish they keep to avoid larger fish more likely to have accumulated contaminants.

Extent of angler use of fish cleaning and cooking methods that may reduce contaminants consumed.

Extent to which anglers change the locations they fish to avoid contaminated waters.

Extent to which anglers reduce their frequency of fishing.

Extent to which fishing license sales change due to advisories.

## 3.3 PROBLEM ANALYSIS IN AN ONGOING PROGRAM

Problem analysis and setting objectives are not unique to new health advisory programs. Ongoing health advisory communication programs should also be reviewed regularly (see Section 6, Evaluation).

Changes in any of the key external or internal factors of the fish contaminant problem, discussed in Section 3.1, may result in a new definition of the communication problem, and thus new program objectives. As a communication program is implemented, new audiences, or additional needs of existing audiences, may be identified. If current audiences are being reached by, and responding to, health advisory recommendations, agencies should consider redirecting program objectives to meet the needs of other target audiences not previously addressed. Program planning, budget decisions, and objectives should be modified to maintain past program successes while meeting the information needs of more or new target audiences.

Fish consumption or other behavioral recommendations produced through the risk assessment and risk management processess may change. Better information about actual fish consumption patterns within a community may lead to use of a different fish consumption rate in risk assessment calculations, leading to different recommendations for a health advisory. The environmental conditions prompting the need for a health advisory may change, creating a need to change the health advice. Any changes within the risk assessment or risk management processes may demand changes in the risk communication process. Frequent changes in risk assessment (see Volume 2 in this series) or risk management (see Volume 3 in this series) approaches that result in modified fish consumption recommendations should be avoided, however. Even excellent communication programs cannot surmount the credibility issues that are created when fish consumption health advice is constantly modified, especially if those modifications are due to changes in the decision-making process rather than real changes in contaminant levels.

Each of these changes in the communication context and changes in underlying assumptions, environmental conditions, or target audiences, may cause the original problem analysis to become obsolete. Because health advisory program objectives are based on the problem analysis, objectives may also be obsolete. Regular review is required to ensure the original program assumptions are still relevant, and that the original program objectives should still be pursued.

Even if no obvious or major changes in environmental conditions or risk assessment procedures have changed, periodic review of the problem definition and the objectives is required. As communication programs are implemented, they should have an effect on the target audiences. As changes occur within target audiences, communication program objectives may also need to change. For example, imagine an initial program objective to "achieve 50% awareness of advisories." After the communication program has been implemented, that objective may be changed to "maintain a 50% awareness", or "achieve 75% awareness of advisories."

Only with continual review of the problem definition and the relevancy of objectives will ongoing communication programs continue to improve.

## 3.4 SUMMARY CHECKLIST

1. Assess external factors influencing the health advisory communication context.

2. Assess internal factors influencing the health advisory communication context.

3. Identify and prioritize first-order objectives for the health advisory communication program.

4. Identify and prioritize second-order objectives for the health advisory communication program.

5. Review and revise problem analysis and program objectives periodically.

# SECTION 4

# AUDIENCE IDENTIFICATION AND NEEDS ASSESSMENT

The objectives of this section are to: (1) suggest potential target audiences for health advisory risk communication programs; (2) discuss the utility of audience-generated and expert-generated risk communication information needs; (3) describe potential information needs; and (4) describe potential techniques for determining information needs for specific programs.

## 4.1 HOW TO IDENTIFY AND CHARACTERIZE POTENTIAL TARGET AUDIENCES

### 4.1.1 Importance of Audience Identification

Audience segmentation is the practice of identifying and grouping people who should be receiving health advisory information. The segments thus identified are termed "target audiences." Criteria for segmenting audiences usually include some combination of behavioral, demographic, and cultural parameters.

Audience segmentation allows the risk communicator to design messages and dissemination mechanisms that have the greatest potential for reaching particular target audiences. Some of the most successful forms of health advisory audience segmentation recognize: (1) the behaviors and attitudes sought as program outcomes; and (2) the dissemination channels that could be used within the communication program.

For example, an agency might focus on a target audience of "low-income women of childbearing age who live in counties adjacent to the Great Lakes." Such an audience could be selected for several reasons, e.g.:

(1) the fish consumption behavior of women of childbearing age is often a critical factor in protecting public health relative to reproductive and developmental effects;

(2) low-income communities may have a greater tendency to eat locally-caught fish subject to advisories; and

(3) residents of counties bordering the waterbody of concern may be more likely to eat locally-caught fish.

Messages targeted specifically to this audience could be designed to focus on the reproductive and developmental hazards associated with contaminated fish consumption, and the alternatives to eating locally-caught fish. Dissemination mechanisms could be designed to capitalize on the likely information-gathering behavior of this group. Health advisory information could be disseminated through local health clinics, especially those serving low-income women, or through public assistance and education programs targeted toward low-income women, such as programs through local Cooperative Extension.

### 4.1.2 Relationship to Objectives

The risk communicator should review the health advisory communication program objectives to determine which audiences to target through health advisory

communication programs. Both first-order and second-order objectives provide guidance for identifying audiences of interest (See Section 3). Objectives may specify explicit types of audiences (e.g., licensed anglers, women of childbearing age) or people within specific locations (e.g., residents of counties bordering contaminated waters). During the audience identification stage, at-risk audiences not recognized during the problem analysis phase may be identified. Program objectives should be modified to reflect emphasis on those new audiences of concern.

See Volume 3 in this series, Risk Management, for a discussion of potential cultural, societal, and economic impacts considered in fish consumption health advisory risk management decisions. These possible impacts will provide insight about potential target audiences for the risk communication program.

### 4.1.3 Potential Audiences to Consider

Target audiences may be identified based on criteria of audience fish consumption behavior, potential health effects, information an agency seeks to instill, information sources used, or cultural and demographic characteristics. Objectives for overall risk management and for health advisory communication should be considered when identifying target audiences. Audience segmentation is most successful when individuals within a particular audience have similar information content needs and can be reached through similar information dissemination mechanisms.

See Volume 3 in this series, Risk Management, for discussion of populations at risk and fish consumption patterns to be considered in the risk management process. Each population of concern identified in the risk management process should be considered a potential target audience for the risk communication program.

Potential target audiences include:

**General public statewide.** Purpose may be to raise awareness of fish contamination issues generally, and to reach potential fish consumers. Potential fish consumers not easily identified include those who may receive "gift fish" from angler friends, those who eat fish from the marketplace, or those who may begin to fish in the future. This audience must be informed to work actively for pollution controls and remediation activities for the ultimate resolution of fish contamination problems.

**General public at contaminated locales.** Purpose same as for statewide general public, but communications are targeted to local contamination issues.

**Licensed anglers statewide.** Purpose may be to create awareness of the state health advisory program, to inform all anglers (i.e., people who fish) of general health advisory information (e.g., health effects, risk-reducing fish preparation techniques), to ensure anglers either have or know how to obtain health advisory information pertinent to the locations they fish most frequently, and to instill a moral commitment in these anglers not to give fish away to others without also giving the health advice. Specifying licensed anglers suggests a mechanism through which communication can occur, i.e., printed

materials associated with the license-purchase. Specifying licensed anglers also overlooks individuals who do not or are not required to purchase a license (e.g., children below the age at which a license is required; marine anglers in many marine states).

**Licensed anglers at specific locales.** Certain locations may merit intensive communication efforts due to the frequency of fishing, the severity of the contamination problem, or other characteristics. Specifying licensed anglers has the limitations noted above for statewide licensed anglers.

**Unlicensed anglers.** Purpose may be to reach those anglers who are either not required to purchase a license (e.g., marine anglers in many states with fresh and marine waters), or those fishing without a license illegally. Normally, more specific audience definition is needed to be able to target the information program appropriately (e.g., marine anglers, children, elderly, low-income anglers, native communities).

**Recipients of fish from anglers.** These individuals may be family or friends of anglers. They may be children, women of childbearing age, or other at-risk groups. The responsibility and ability of the angler to communicate health advisory information to these individuals should be considered. Reaching this group shares the communication challenges of reaching the general public.

**Sporting groups.** These groups are often composed of anglers and outdoorspeople who are on average more committed and involved in the fishing experience than their non-affiliated peers. Behavior changes (recommended in a health advisory) that focus on maintaining the fishing experience as part of the lifestyle of these anglers may be key to stimulating health-protective behaviors.

**Women of childbearing age.** This audience may or may not be the same as or associated with other audiences noted above. Women of childbearing age may be anglers, or may be in the household of or neighbor to an angler. Particular health effects information critical to this audience may be transmitted directly to individuals in this audience, or through other conduits such as the household angler or specialized women's services such as health clinics.

**Children.** As with women of childbearing age, children may or may not be anglers themselves. Children may participate in certain activities (e.g., sportfishing clubs), or have certain information needs (e.g., catch-and-release fishing ethic) that will influence communication strategies. Children may also be an effective conduit to reach adults with health advisory information.

**Non-English speaking communities.** In addition to requiring health advisory information that is presented in the native language, these communities also often require communication programs that are sensitive to the cultural norms of the society. For example, fish may have a certain religious or spiritual significance, or people may be totally unaccustomed to risk-reducing fish cleaning and cooking

techniques. Certain communities may not rely on or use print media at all, and therefore require other modes of communication.

**Subsistence fish consumers.** These individuals rely on fish consumption as a protein source in their diet, implying relatively high consumption levels, and possibly few alternative protein sources available.

**Clients of specific programs** (e.g., health care, low-income assistance). Programs of particular importance for health advisory communication are identified based on the clients they serve, and the level of risk to which those clients may be exposed.

For example, women of childbearing age, a particular target audience, may be further segmented into women who use public health clinics. Low income subsistence fish consumers may be segmented into those who use low-income assistance or nutrition programs. Non-English speaking audiences may be further segmented into those who use English language tutorial programs. People with certain health conditions that predispose them to greater potential risk or benefit from fish consumption can be identified within health care programs (see also Volume 3 in this series). For example, people with heart disease may benefit from additional fish consumption; people with chronic diseases requiring medication may be concerned about potential interactions with chemical contaminants ingested during fish consumption. Identifying program clients indicates a potentially effective communication mechanism, i.e., communicate health advisory information via normal program delivery.

**Professionals delivering specific services** (e.g., health care, English language tutorials, low-income assistance). Professionals delivering programs to other target audiences may themselves be a target audience. Unless they understand the importance of health advisory information, they are unlikely to assist with the delivery of that information to their own clients.

### 4.1.4 Importance of Information Needs: Audience-Generated vs. Expert-Generated

Perceptions among the public about the seriousness of many types of environmental risk often differ, and public perceptions differ from expert conclusions (Scherer, 1991; Velicer and Knuth, in press). In some cases, expert risk assessments suggest a low threat, but the public perceives a serious threat. In other cases, experts suggest a serious danger whereas public audiences perceive little or no danger. Experts must understand how their messages will be received, interpreted, and responded to by target audiences. Such understanding will help them be able to develop and use convincing reasons that encourage compliance with health advisory fish consumption recommendations.

Often, an expert's perception will differ considerably from that of target audiences regarding what information is important for making a decision whether to follow health advisory recommendations or not. Further, an expert's perception of existing beliefs and behaviors within a target audience may not be accurate. Expert perceptions should be tested and confirmed by gathering such information directly

from the target audience as possible within the limits of the health advisory program.

Many factors influence how an individual perceives the seriousness of a given risk. For health advisories, these factors may include internal cues such as prior experience, age, health, gender, and economic status of the potential fish consumer; and external cues such as the level of confidence and credibility associated with the source of the risk information, and the importance and perceptions of other people within the social circle of the potential fish consumer.

If an angler has eaten the fish she catches for many years, has had no noticeable adverse health effects, and then learns there is a health risk associated with eating those fish, she may not heed the warning, believing that the health problem would have already surfaced if the threat was real. If health warnings appear to be targeted most strongly toward women of childbearing age because of the wording used, older men, for example, may pay little or no attention to advice to limit fish consumption. If few alternative food sources exist because of an economic inability to attain other sources of protein, fish consumption limits may go unheeded, even though other risk-reducing behaviors may be available, such as trimming the fat from the fish. If the agency issuing the health advisory has a poor track record of responding to public needs or of honest communication, few potential fish consumers may heed the warnings issued.

## 4.2 INFORMATION NEEDS: AUDIENCE-GENERATED

Target audiences are the most accurate source of data necessary for planning a health advisory communication strategy that will respond to the needs and limitations of the target audiences. Data collected from target audiences include factors believed to be important by the health advisory agency (e.g., baseline advisory knowledge within the target audience), and factors identified by the audiences as being important (e.g., expressed needs for information about relative health risks from various protein sources).

### 4.2.1 Types of Information Needs

Awareness, beliefs, and behaviors associated with health advisories and consumption of locally-caught fish are integrally linked (Knuth, 1990). A social-psychological model of the relationship among these factors (Fig. 4.1) has been proposed, based on a series of theoretical and empirical studies (Connelly et al., 1992; Knuth et al., 1993). The model suggests each of these types of information may be necessary for planning, implementing, and evaluating a health advisory communication program. What are the external variables, level of awareness, set of beliefs, and existing behaviors among the target audiences?

In this model, several types of variables are important to consider in a communication program. External variables are the characteristics of the audience itself that influence which health advisory information sources will be used, and how information may be interpreted in an individual or societal context. External variables include: age; gender; residence; income; education; race or ethnicity; family status; prior fishing experience; and the source of information an individual uses to learn about health advisories. External variables are also required to categorize potential target audiences for health advisory communication efforts and to assess differences in response among the various audiences.

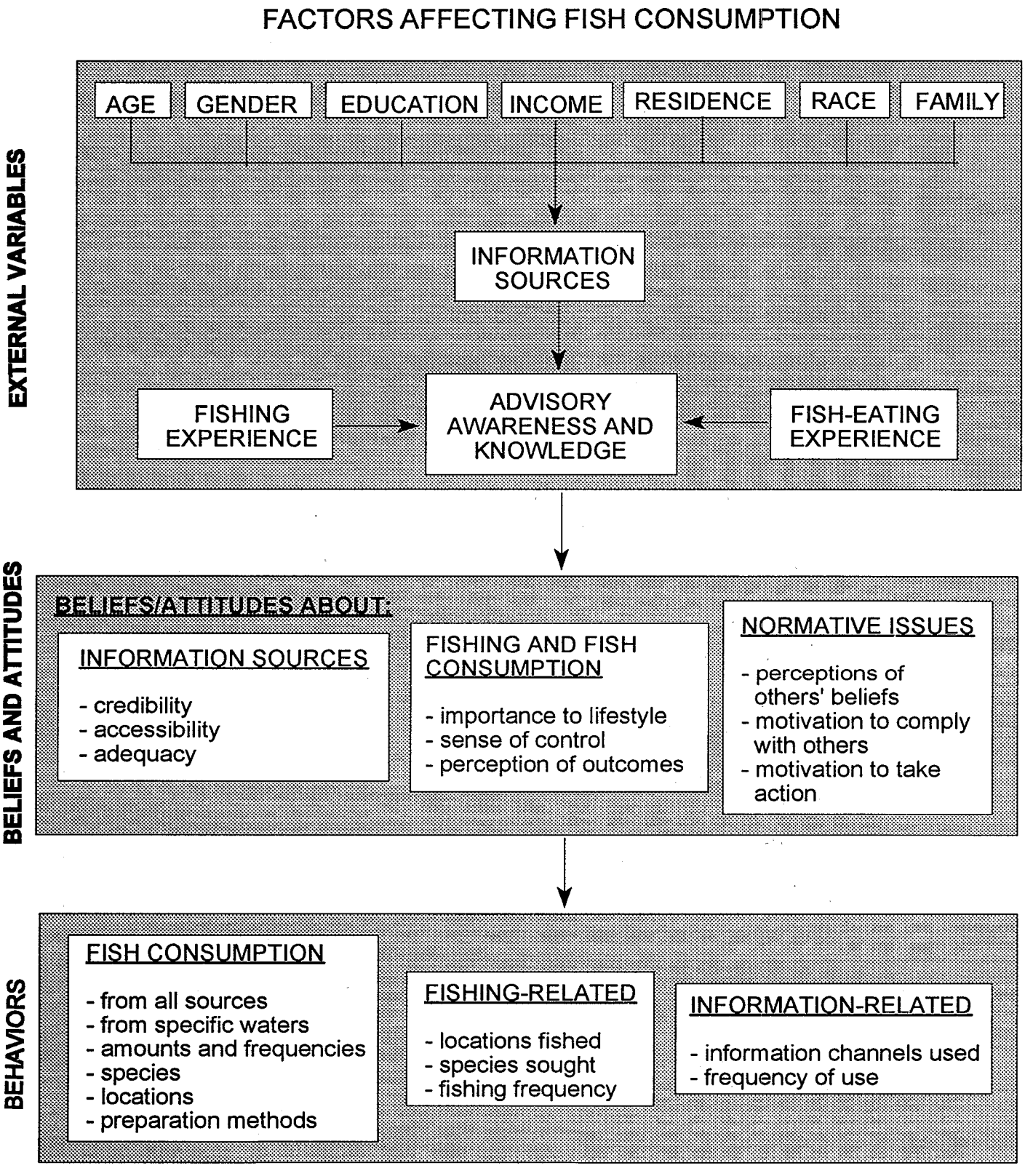



Figure 4.1. Conceptual diagram of the social-psychological process determining response to fish consumption health advisories (based on Knuth et al., 1993).

Beliefs about the health advisory and about fish consumption are influenced by other factors. These include beliefs about the health advisory information sources, an individual's knowledge, and individual beliefs about the pertinence of that information. Understanding initial beliefs among target audiences will help the communicator design responsive communication programs.

Ultimately, health advisories target behavior. Behaviors related to fish consumption include: general fish-eating habits and consumption of fish listed in the health advisories; fish cleaning and cooking techniques; and fishing behavior (e.g., locations fished, species sought). Communicators must understand pre-communication program behaviors to (1) design effective communications that will influence behaviors; and (2) be able to measure what effect the communication program has had on fish consumption-related behavior.

Health advisory communicators can generate a range of target audience information needs based on the initial (pre-communication program) status of health advisory knowledge, beliefs, and behaviors among the target audiences, and other self-identified needs from the audiences.

#### 4.2.1.1 Initial knowledge and beliefs

The social-psychological model of responses to health advisories suggests that knowledge and beliefs associated with health advisories and fish consumption are important influences on fish consumption behavior. Health advisory program objectives may include achieving a specific level of awareness or knowledge about health advisories in target audiences. Therefore, an initial understanding of target audience knowledge and beliefs is important for designing the appropriate communication strategy as well as evaluating the effectiveness of communication efforts.

Health advisory awareness can be assessed as general recognition that health advisories exist within a state, or as specific recognition of waters and fish species listed in health advisories.

Beliefs that have been linked empirically to fish consumption behavior include beliefs about:

- the safety of eating any fish from local waters;
- the safety of eating some types of fish from local waters;
- the health risks posed by eating fish from local waters;
- the relative importance of health risks vs. health benefits associated with fish consumption;
- the link between consumption of fish from local waters over many years and potential health risks;
- the importance of following health advisory recommendations; and
- the extent to which the individual has complied with advisories in the past.

#### 4.2.1.2 Initial behavior

If health advisory programs judged program success solely by strict compliance with recommended fish consumption levels, success would be difficult to achieve. In a nonregulatory program, agencies have little leverage to stimulate adherence to the recommendations among target audiences. Behaviors that are important to health advisory program success include more than just the fish-eating habits of target audiences. Rather, agencies may choose to judge program success based on the degree of change in a host of behaviors related to fish consumption. Highly committed anglers, and anglers fishing regionally unique (but contaminated) fisheries, have shown tendencies to adopt risk-reducing fish preparation behaviors but not necessarily to abide by the fish consumption rates recommended in the advisories (e.g., Connelly et al., 1992; Connelly and Knuth, 1993).

The range of behaviors that could be assessed for health advisory programs include the following. Measurement of these behaviors prior to initiation of a new communication program, or the next phase of an existing communication program, will provide baseline information on which to base post-program evaluations of impact. Understanding these behaviors also increases the ability of the health advisory communicator to develop a communication program responsive to the needs of the target audiences.

- **Fish consumption.** This measure includes overall fish consumption, from all sources, as well as fish consumption from waters affected by health advisories. Fish consumption patterns provide the health advisory communicator with an understanding of the current behavior of the target audience relative to the specific fish consumption recommendations of the advisory. The degree of change in behavior necessary to meet advisory recommendations will be evident.

- **Fish preparation methods.** These methods include both fish cleaning and cooking procedures. Certain methods decrease the amount of human exposure to contaminants through consumption, for some fish species and for some contaminants (see Volume 3 in this series, Risk Management). Contaminant reductions are limited to those contaminants that tend to accumulate in fatty tissues (e.g., PCBs) rather than in muscle (e.g., mercury). Effects may be most pronounced in relatively fattier fish. Risk-reducing cleaning techniques include removing the dorsal and ventral fat, removing skin, and filleting the fish. Consumption of viscera should always be discouraged since the levels of chemical contaminants found there are much higher than in the edible fillets. Risk-reducing cooking methods include those that allow the fat to drain from the fish tissue, such as baking, broiling, and grilling. Understanding the extent of use of these techniques can indicate the extent to which risk-reduction might occur through a means other than outright decreases in fish consumption. Alternatively, if initial behaviors indicate a majority of fish consumers have adopted risk-reducing fish preparation techniques, this knowledge can

enter into risk management decisions. For example, under the Great Lakes Uniform Health Advisory, agencies have proposed basing contaminant exposure estimates on the assumption that all or most locally-caught fish are skinless fillets. Assessing behaviors of the target audiences allows agencies to plan risk communication programs, and validate certain assumptions of the risk management program.

- **Locations fished.** The places where anglers fish may have a profound impact on their likely exposure to contaminants. Some agency program objectives, particularly those of fishery management agencies involved in health advisory programs, reveal a concern about maintaining interest and participation in the fisheries of the state, or maintaining use of fisheries dispersed throughout numerous waters to avoid overuse of particular locations. Understanding what locations anglers frequent and why provides insights about how to persuade individuals to shift to less contaminated waters.

- **Species sought.** Within a contaminated water body, several species are often more contaminated than others. Understanding which species anglers seek and why can provide information about how to suggest shifting to less-contaminated species, if necessary.

- **Fish caught vs. fish kept.** Catch and release fishing can help achieve objectives of limited fish consumption while maintaining an active fishery, in some cases. Understanding the species caught, reasons for catching fish, and likelihood of an angler releasing caught fish can help the health advisory communicator decide if it may be worthwhile to promote greater catch and release fishing in a particular area, and the potential receptivity of the target audiences to such advice.

- **Information channels used.** Understanding how potential fish consumers receive their information related to fish consumption is critical to choosing dissemination mechanisms. Information channels considered do not have to be limited to those that are fishing-related (e.g., fishing regulations guides, lake-specific brochures). Rather, communicators should consider channels through which potential fish consumers regularly receive any type of information to determine if it is possible to include additional information about health advisories within those materials. For example, women of childbearing age may regularly receive health-related information at public health clinics. Thus, a potential channel, via health brochures in clinics, is identified for this target audience. Low-income families may regularly receive dietary or nutritional advice through in-home visits from Cooperative Extension agents or social workers, or printed materials through public assistance programs. With some cooperation between these social service agencies and the health advisory program, a

potentially effective method for disseminating health advisory information has been identified.

See Volume 3 in this series, Risk Management, for a discussion of behaviors that may affect exposure to contaminants (e.g., fish preparation). These behaviors should be considered in a risk communication program, either as baseline behaviors, or as ultimate behaviors the agency hopes to foster in the target population.

#### 4.2.1.3 Expressed information needs

As discussed above, agencies may assess the initial knowledge and behaviors of target audiences to identify information needs and provide a basis for later program evaluation. In addition, agencies may also ask the audiences what information they deem necessary in health advisories. Ideas expressed directly by individuals within target audience groups are termed "expressed information needs." Target audiences are allowed to express themselves regarding the types of information they wish to have available in health advisories when they are asked for open-ended expression of information needs, or asked to prioritize a set of potential health advisory information developed by the agency. In several studies of anglers and potential fish consumers (Connelly et al., 1992; Knuth and Connelly, 1993), expressed information needs have included the following:

- Description of potential health problems from eating contaminated fish for adults, children, and/or unborn children;
- Description of health benefits associated with fish consumption;
- Information on risk-reducing fish cleaning and cooking techniques;
- Information on which species to eat, not only which to avoid;
- Information on how to choose relatively safer sizes of fish to eat;
- Information on how to choose relatively safer fishing locations;
- Information on how health risks change as more or less fish is eaten;
- Description of chemical contaminants and sources to the water body;
- Description of risk assessment and risk management assumptions and methods used in the health advisory program; and
- Comparison of fish consumption health risks with risks from eating other types of protein (especially marine vs. freshwater fish), other dietary risks, other consumption behaviors such as drinking and smoking, and/or other activities such as driving a car.

### 4.2.2 Techniques for Determining Information Needs from Audiences

Selecting appropriate techniques for determining the information needs of the target audiences will depend on several factors, including: (1) the health advisory program budget and staff availability; (2) how quickly the information is needed; (3) the novelty of the advisory program (new or continuing); and (4) the types of

audiences an agency is targeting. Major categories of information-gathering techniques include in-person interviews and discussions with individuals or groups, mail and telephone surveys, and document review.

Costs associated with each of these techniques range from low ($100's) to very substantial ($10,000's). Actual costs for a given technique will vary depending on the number of participants and whether the work is contracted out to a commercial firm or conducted in-agency. Cost considerations are listed below for each technique. Specific dollar figures will vary according to variability in expenses within agencies, effects of sample size, and variation in charges from commercial firms.

Selecting participants from among the target audience population can be done in many ways for each of these techniques. Individuals may be identified through a registry if one exists (e.g., records of fishing license purchasers, low-income nutrition assistance program participant lists), or through intercepts at central locations, such as fishing access sites or at meetings of English-language tutorial classes. Intercept contacts have the benefit of assuring identification of actual anglers or fish consumers, depending on the intercept site.

Once identified through registries or intercept, participants can be recruited for immediate or later participation in the following types of exercises. Detailed descriptions of these information-gathering methods can be found in Dillman (1978), Basch (1987), Desvouges and Smith (1988), Desvouges and Frey (1989), USDHHS (1989), USEPA (1990), and USEPA (1992a).

#### 4.2.2.1 Interviews and discussions

In-person contacts with members of the target audience can be one-on-one or in groups. In-person contacts have a benefit of establishing a rapport between agency personnel and members of the target audience, and allow for greater exchange of ideas. In-person interviews may be conducted on-site, at fishing access locations, or at an individuals' home or social setting. Individual interviews may last from 10 minutes to two hours or more.

Focus group discussions are designed to enable a group of people to focus on one to several areas of discussion. Focus groups typically involve 8-10 participants, and may last about two hours. Public meetings are small to large sessions at which information is presented by the agency and individuals in attendance are asked to respond. Each of these techniques require trained staff, as interviewers or group facilitators and recorders.

**Individual interviews.** Individual interviews for establishing information needs of target audiences are characterized by the following strengths and weaknesses:

**Strengths:** Confidentiality of personal responses can be assured, unless agency regulations preclude keeping data confidential; In-depth probing by interviewer is possible to enhance quality of information; Information is available relatively quickly; Can be used with individuals with limited literacy skills.

**Weaknesses:** Cannot accomodate large numbers of participants at one time; Time-consuming to complete many interviews; Costly in terms of staff time.

**Costs: ($100 - $600 per participant).** Higher costs for: (1) individual staff time conducting interviews; (2) efforts to contact potential participants if the audience is difficult to identify or reach; (3) analysis time if much effort is needed to summarize data; (4) large numbers of people interviewed; (5) monetary or other financial incentives are required to entice participation; (6) travel associated with interviews conducted in remote locations.

Lower costs if: (1) small numbers of participants are involved; (2) participants are relatively easy to identify; (3) question development can build on past efforts rather than beginning from scratch; and (4) interviews will be conducted locally.

**Special Case:** Individual interviews may be conducted as part of a creel survey effort conducted by a fishery management agency. Creel surveys contact anglers on-site during the fishing activity. The main objective of creel surveys is to gather catch information for fishery management programs, but the personal contact may be used as an opportunity to: (1) obtain the name, telephone number, and address of the fishery user for later participation in a health advisory study (e.g., mail or telephone survey); or (2) ask very brief questions about how the existing health advisory information is reaching and being received by the angler. Normally, the creel survey does not allow for in-depth evaluation of the health advisory risk communication program, but can be used to produce very specific information such as the number (or %) of actual anglers who are aware of the advisory recommendations.

**Focus groups.** Focus groups for establishing information needs of target audiences are characterized as follows:

**Strengths:** Provides insights about target audience perceptions, beliefs, language, and behavior; Group discussion provides interaction among participants, often leading to greater understanding of concepts; Ability to probe in-depth often produces insights into why people think or act in certain ways; Information is available quickly.

**Weaknessses:** Success depends in part on ability of moderator to keep group on task and to probe for more information when needed; Confidentiality of responses cannot be assured; Can accomodate only a few participants; Costs may include incentives for group participation (e.g., a dinner prior to the discussion); Cannot make population generalizations; Demands much participant time; May not be appropriate for certain cultures in which peer pressure, deference to others, or other factors may inhibit interactions among people.

**Costs: ($100 - $500 per participant).** Higher costs if: (1) many focus group sessions are deemed necessary; (2) participants require some financial incentive; and (3) interview site is remote and requires substantial travel by staff.

Lower costs if: (1) one or a few focus group sessions are conducted; (2) extensive facilitator training is not needed for an experienced

facilitator; (3) focus group format builds on past efforts; and (4) data analysis is typically a summary of the focus group sessions, perhaps including a transcript of the meeting.

**Public meetings.**

**Strengths:** Yield information at low cost; Commonly used in state agencies, so staff experienced in the technique are usually available; Sometimes issues are raised within the crowd that would not be raised in a smaller group when an individual might be asked for greater elaboration; Can allow for agency-public interaction and dialogue if designed appropriately.

**Weaknesses:** Meetings may be too local issue-oriented and not focus broadly enough on health advisories; Audience responses may be very emotional; A host of issues other than health advisory communication programs may be surfaced, especially with an inexperienced facilitator; Committing to statements in a public forum sometimes entrenches the speaker even further in holding a particular viewpoint, so public meetings may be undesirable in highly charged atmospheres; and Rarely is there an opportunity to hold public meeting speakers truly accountable for what they say at the meeting.

**Costs: ($1,000 - $5,000 per meeting).** Higher costs may be associated with staff time involved in planning and facilitating the public meeting, and possibly with travel to the site. Facilitator training is necessary, as are good site arrangements and facilities, proper advertising of the public meeting, and followup after the meeting with participants.

Public meetings are usually characterized by relatively low cost per participant. Data summaries are generally low cost, and may include staff debriefings immediately after the meeting, and analysis of meeting transcripts.

### 4.2.2.2 Surveys

Mail and telephone surveys may be either random or targeted. Random sample selection, assuming sufficient sample size, allows the agency to draw generalizations about the initial characteristics of the entire target population prior to developing a health advisory communication program. Such a strategy is very useful if an intensive outcome-evaluation is planned after the communication program is implemented. Population generalizations prior to program implementation provide the baseline against which to evaluate population characteristics after program implementation.

Targeted sample selection usually involves a smaller sample size than random sample selection for the purposes of pre- and post- evaluation. Individuals may be targeted for selection based on the desire to maximize variability among individuals surveyed, thereby maximizing the potential for identifying a full range of information needs among the audience. Normally, the goal with targeted sample selection is not to derive generalizations about the population, but rather to identify the variety of information needs that may exist.

**Mail surveys.** Mail surveys for establishing target audience information needs are characterized by the following strengths and weaknesses:

**Strengths:** Allow for gathering information from people who may not be accessible in person; Time involvement of participant is usually limited to one-half to one hour; Provides confidentiality, unless agency regulations preclude guaranteeing confidentiality; Allows respondents to think about their response before it is finalized; Can accomodate many participants.

**Weaknesses:** Involves costs of printing and mailing in addition to staff time; Often time-consuming to allow for sufficient response time and reminders; Does not provide for in-depth probing; Low response rates are possible; Bias may exist between those who respond and those who do not respond; Inappropriate for audiences with limited literacy skills.

**Costs: ($5,000 - $100,000 per study; $10 - $25 per participant for typical sample sizes).** Higher costs are associated with questionnaire development if the effort does not build on past mail surveys, large amounts of postage, staff effort in selecting the sample if it is not an easily-identifiable group, and staff costs associated with implementation (mailings) and data entry and analysis. Large sample sizes increase only some implementation costs (e.g., not questionnaire development).

Costs are lowered if the sample size is minimized (but large enough to produce useful results), if the questionnaire repeats or builds on earlier efforts, and if data analysis is straightforward.

**Telephone surveys.** Telephone surveys for establishing target audience information needs are characterized as follows:

**Strengths:** Allows for contacting people who may not be available in person; Allows for probing for more in-depth information; Assures confidentiality of responses, unless precluded by agency regulation; Time involvement of participant usually limited to one-half to one hour.

**Weaknesses:** Usually little time for participant to reconsider responses; Requires extensive staff time; Requires telephone numbers of participants; Excludes people without telephones; Excludes those who will not respond to unsolicited calls.

**Costs: ($5,000 - $100,000 per study; $15 - $30 per participant for typical sample sizes).** Higher costs are associated with purchase or rental of telephone equipment if needed, cost of telephone calls, staff time associated with calling, questionnaire development if the survey does not build on prior efforts, large sample sizes, very lengthy or complicated questionnaires, and extensive data analysis and interpretation.

Lower costs are associated with shorter questionnaires, repeats or modifications of earlier efforts, smaller sample sizes, and use of experienced staff who require little new training.

#### 4.2.2.3 Document review

Documents produced or used by target audiences offer insight about which issues those audiences consider important relative to health advisories. Typically, document review is used after a health advisory communication program has already been established. Documents produced by non-agency sources in response to fish contamination or health advisories indicate the magnitude of concern within a community, how health advisory information is being received and interpreted, and perceptions about the agencies involved in the health advisory program.

Documents useful for review include newspapers, particularly editorials, letters received by the health advisory agency, and brochures or fact sheets produced by interest or advocacy groups in response to an agency's advisory materials. Qualitative, rather than quantitative, review of these documents is often sufficient to identify the range of topics represented. Analysis of documents may include simply generating a list of all topics/concerns mentioned. Topics on the list can then be considered for inclusion in the health advisory communication program. The frequency of certain concerns can be recorded to provide some indication of priority or importance, at least among the audiences represented by the documents reviewed.

**Document review.** Document review for establishing target audience information needs is characterized as follows:

**Strengths:** Provides an accessible means of data about perceptions of health advisories before a new round of the communication program is developed; Relatively low-cost; Language used is that of the target audience; All information is audience-generated, reflecting real issues among the target audience; Can alert health advisory agency about perception issues it will face when working with a target audience.

**Weaknesses:** May not be representative of the beliefs and perceptions within the entire population; Only the ends of the spectrum may be evident (e.g., those most positive or most negative about health advisories); No interaction between agency and audience; Information may not be in a form that is useful to the agency.

**Costs: ($100 - $4,000 per effort).** Higher costs are associated with staff time obtaining and analyzing documents, and purchasing computer equipment used for analysis.

Costs are lowered if documents to be analyzed are readily available, and if staff already have document analysis experience.

### 4.3 INFORMATION NEEDS: AGENCY OR EXPERT-GENERATED

In addition to information collected from target audiences prior to developing a communication strategy, program experts are also a productive information source. Agency staff, health experts, and other risk communication experts have a wealth of

experience with health advisory or similar communication problems. They can offer predictions about the potential responses of certain target audiences, and suggest the information needs of those audiences based on previous program implementation, or empirical or theoretical research. Experts, however, may not understand the target audiences fully, and should not be relied on as the sole source of audience information needs.

### 4.3.1 Relationship to Objectives

Agency staff should review the program objectives, particularly second-order objectives, when generating a list of information needs to be addressed via health advisory communication programs. The target audiences identified and the outcomes sought will suggest what information needs are important to meet prior to developing a communication strategy.

Agency staff can consider and record any insights they have about each target audience named in the objectives. These insights may be hypotheses about how an audience will respond to particular communication strategies, or observations about audience responses to similar communication strategies in the past.

### 4.3.2 Techniques for Determining Audience Information Needs via Experts

Ideas about audience information needs may be solicited from individuals and groups within the health advisory agency, or by working with experts in other agencies or universities. Workgroups may be assigned to brainstorming or other group discussions to identify the range of information they perceive is needed by each target audience, and why.

Roundtable discussion of the reasons why information may be important to a given audience helps clarify the quality of the expert's perception as well as begin the process of identifying how that information might best be presented in the communication program. Perceived information needs may also be solicited individually or in writing, although these approaches lack the opportunity for the communicator to probe in-depth with the participants.

An advantage of using experts to identify target audience information needs is their accessibility, particularly if in-house experts with knowledge of the desired target audiences are consulted. Use of experts may be less time-consuming than consulting directly with members of target audiences, because they may be in-house, and because usually no more than a few experts are involved. Using agency staff, whether in-house or from a partner agency, establishes a sense of commitment to the program within those who participate. This mutual commitment to the health advisory program may be particularly important, since in many states more than one agency is involved (e.g., health, environmental quality, fisheries).

Experts to involve in this process need not be limited to those with a particular subject matter expertise, i.e., health advisories. Fishery experts may be able to offer insights about the preferred fishing locations and species of certain target angler audiences, and the likelihood of various responses to health advisory messages. Social service experts may be able to suggest language and cultural norms that should be considered for specific ethnic or income-limited audiences. Local health care providers may have insights about local population health characteristics, nutritional characteristics, and fish consumption patterns, as well as information channels used by target audiences.

The key to using experts to determine critical content and dissemination issues in health advisory programs is to recognize potential limitations to the experience and knowledge of the expert. Have they worked with each of your important target audiences? How similar to health advisories have been the issues on which they have worked? How recently have they had contact with the target audiences? How have they and/or their programs been received by the target audiences in the past?

A potential limitation of using experts to generate information needs for the health advisory program is the resulting lack of information collected directly from the target audiences. Such information provides a baseline about the condition of the target audience prior to implementation of the communication program, and cannot be replicated through the intuition or experience of the expert. Caution should always be used in the degree of reliance placed on expert-generated information. Although experts may believe they understand and represent the information needs of the target audiences, their perceptions may not reflect those audience needs accurately (Velicer and Knuth 1994).

## 4.4 AUDIENCE CHARACTERIZATION IN AN ONGOING PROGRAM

The characteristics and information needs of target audiences change over time. As target audiences participate in health advisory communication programs, their information needs, attitudes, and behaviors also change. Periodic review of target audiences and their information needs is required to keep health advisory communication programs current and responsive.

Target audiences are not the only component of health advisory programs that may change. The health advice may change because the assumptions in the risk assessment and risk management processes have changed. Better contaminant monitoring procedures may indicate greater or lesser contaminant levels in fish tissue than originally measured. An agency developing a partnership with another agency in the same or a neighboring state may lead to adoption of different assumptions about risk acceptability, appropriate level of conservative risk assessment assumptions, or other philosophical and procedural changes that result in changed fish consumption advice.

When such changes occur, or are anticipated, a new assessment of the information needs of the target audiences should be conducted. What kinds of questions will they have in response to the new health advice? What issues of credibility will the agency face as health advice is modified? Changed health advice may also target new at-risk populations. These populations then become new target audiences whose information needs communicators must strive to understand, as discussed throughout Section 4.

## 4.5 SUMMARY CHECKLIST

1. Segment audiences based on behavioral, demographic, and cultural parameters, and based on use of information channels.

2. Compare potential target audience list with audiences named in program objectives.

3. Identify types of information to be collected from target audiences:

    a) initial knowledge and beliefs

    b) initial behavior

    c) expressed information needs

4. Choose and implement a technique for collecting information from target audiences:

    a) individual interviews

    b) focus groups

    c) public meetings

    d) mail surveys

    e) telephone surveys

    f) document review

5. Identify types of information to be collected from agency staff or other health advisory/risk communication experts.

6. Implement techniques for collecting information from experts.

7. Summarize and compare information needs identified by target audiences and experts.

8. Periodically review and revise audience characterizations and assessments of information needs.

# SECTION 5

# COMMUNICATION STRATEGY: DESIGN AND IMPLEMENTATION

The objectives of this section are to (1) describe various content, format, and dissemination tools that can be considered when designing a communication strategy; and (2) provide examples of tools that have been used in health advisory programs.

After health advisory communication program objectives are articulated and target audiences characterized, the specific methods for achieving the desired outcomes must be identified. This stage of the communication process, strategy design, includes identifying the content of advisory information necessary to achieve program objectives, selecting appropriate dissemination mechanisms, and constructing a timeline or flow chart for the program activities (see Appendix B for an example communication strategy from the Michigan Department of Public Health). Appropriateness of potential communication tools should always be considered relative to communication program outcomes desired, and potential effectiveness with each target audience.

The health advisory communicator should understand that even with a carefully-designed communication strategy, risk communication is limited in what it can accomplish. Risk communication can provide information to target audiences and to health advisory program personnel, but it cannot guarantee that certain behaviors or attitudes will be adopted by people at potential health risk due to fish consumption habits.

## 5.1 TOOLS FOR THE COMMUNICATION STRATEGY

Health advisories are typically communicated via some form of written materials, but may include oral and visual communication. Tools to consider in designing the communication strategy include the format and tone of the advisory, the advisory content, and advisory dissemination mechanisms.

### 5.1.1 Potential Advisory Content/Messages

The health advisory may include a variety of information in addition to the core fish consumption advice. Including information beyond basic fish consumption advice helps enhance the likelihood that the potential fish consumer will heed the recommended fish consumption limits.

The content of a health advisory refers to the complete set of information within a health advisory package. For example, a health advisory within a fishing regulations guide may be simply a list of waterbodies, fish species, and recommended consumption limits. Or, an advisory could include a list of chemicals triggering each species' advisory for each waterbody, and a description of the health effects associated with each chemical. An advisory may also include advice about how to reduce exposure to contaminants by reducing the amount of fish consumed and by cleaning and cooking the fish in a manner that reduces chemical intake. Decisions about how much information to include beyond the core fish consumption advice depend on several factors, including the identity and needs of the targeted audiences and the dissemination mechanisms that can be used.

The content of a health advisory may or may not be relevant to the target audiences. The challenge for the risk communicator is to develop health advisory content so the information is relevant to the variety of target audiences who will be reached, and is characterized by message clarity, balance, and accuracy (USDHHS, 1993).

#### 5.1.1.1 Core Consumption Recommendations

In its most basic form, a fish consumption health advisory includes a set of fish consumption recommendations. These recommendations indicate the fish consumption limits derived through the risk assessment and risk management processes. A health advisory may be a one-sentence warning containing the basic fish consumption advice (e.g., "Do not eat fish from Lake Ontario"), or an elaborate matrix with varying fish consumption recommendations depending on the body of water, the fish species, the fish size, or the person to be eating the fish. See Volume 3 in this series, Risk Management, for a discussion of health advisory and regulatory options for fish consumption programs.

The risk management approach chosen will determine what information is included in the core consumption recommendations. Fish consumption recommendations may include details such as (for examples, see Appendix B):

(1) **Various frequencies of consumption.** Consumption recommendations may suggest various consumption frequencies for particular types of fish, or types of target audiences. Differential severity of response to contaminant exposure may warrant different consumption frequency advice for various target audiences. Consumption frequencies in health advisory recommendations include

(a) unlimited consumption (no restrictions);

(b) consumption limited to a certain number of meals over a specified time period (e.g., one meal per week, one meal per month, 10 meals over a two-week vacation period each year); or

(c) no consumption.

(2) **Consumption frequencies that vary for different audiences.** Based on risk management goals, health advisory recommendations may be constructed to provide more-restrictive health advice to those audiences at the most risk of adverse effects from contaminants. In such cases, fish consumption recommendations may differ for groups of people even though they are eating the same types of fish from the same bodies of water. The audiences distinguished most frequently with separate (more restrictive) fish consumption advice include women of childbearing age and children (e.g., under the age of 15) (see Examples 5.1 and 5.2).

**EXAMPLE 5.1 Sample wording for special audiences** (from New York State Health Advisory, 1994, see Appendix B).

*(from statewide advisory)*: "Health advice is also given for infants, children under the age of fifteen, and women of childbearing age. The DOH recommends that they not eat any fish species from the specific waterbodies listed in the advisory. The reason for this specific advice is that chemicals may have a greater impact on developing organs in young children or in the fetus. They also build up in women's bodies and are often passed on in mother's milk. Waters which have specific advisories have at least one species of fish with an elevated contaminant level, which means that a contamination source is in or near the water."

*(from a special Marine Waters flyer)*: "**Women of childbearing age and children under the age of 15** should eat **NO** striped bass taken from Long Island Sound west of Wading River. **Other individuals should eat no more than one meal per month** of these striped bass."

**EXAMPLE 5.2 Sample wording for special audiences, advising how to space meals out over time** (from Anderson et al., 1993, see Appendix B).

"People who regularly eat sport fish, women of childbearing age, and children, are particularly susceptible to contaminants that build up over time. If you fall into one of these categories, you should be especially careful to space fish meals out according to the advisory table that follows. Your body can get rid of some contaminants, such as mercury, over time. Spacing the meals out helps prevent the contaminants from building up to harmful levels in the body. For example, if the fish you eat is in the "One Meal A Month Group", wait a month before eating another meal of fish from **any** restricted category.

Women beyond their childbearing years and men face fewer health risks from contaminants such as mercury. However, if you are in this group, you should also follow the advisory to reduce your total exposure to contaminants. For these groups, it is the **total** number of meals that you eat during the year that becomes important and many of those meals can be eaten during a few months of the year. If most of the fish you eat are from the "One Meal A Week" category, you should not exceed 52 meals per year, likewise, if most of the fish you eat are in the "One Meal A Month" category, you should not exceed 12 meals per year. Remember, eating one meal of fish from the "One Meal A Month" group is comparable to eating four fish meals from the "One Meal A Week Group"."

**(3) Consumption frequencies that vary for water bodies.** Risk assessment information may be available for specific waterbodies within a state. Agencies may recommend fish consumption limits that vary based on the types and extent of chemical contamination within each waterbody, rather than blanket fish consumption advice for a particular fish species throughout the state. In some cases, it may be impossible to monitor all or most waterbodies for contaminants. One state, New York, responds by issuing a general

statewide advisory in addition to its waterbody-specific fish consumption recommendations (Example 5.3).

**EXAMPLE 5.3 New York's general statewide advisory** ( from NY Dept. of Health, 1994 Health Advisory, see Appendix B).

"The general health advisory for sportfish is that you eat no more than one meal (one half-pound) per week of fish taken from the state's freshwaters, the Hudson River estuary, or the New York City Harbor area. This general advisory is to protect against eating large amounts of fish that haven't been tested or contain unidentified contaminants. The general advisory does not apply to fish taken from marine waters. Ocean fish, although less tested, are generally less contaminated than freshwater fish. In addition, fish that live further out from shore may be less contaminated than those that live close to the shore."

**(4) Consumption frequencies that vary by fish species and size.** Depending on the extent of fish monitoring information available in the risk assessment process, agencies may issue health advisories with consumption advice that differs by fish species and size of fish. Instead of issuing an advisory such as "Do not eat any fish from Smith Lake", advisories may restrict consumption of only selected species, or selected sizes within any species (e.g., "Do not eat rainbow trout greater than 25" total length").

The rationale for issuing fish consumption recommendations specific to fish species and sizes is based on the differential rates of contaminant accumulation and availability to people through consumption. In general, fish with fattier tissues accumulate more contaminants than leaner fish, larger (older) fish contain more contaminants than smaller (younger) fish, and predatory fish accumulate more contaminants than prey species (See Volume 3, Risk Management, for more detailed discussion).

Fish consumption advice based on eating smaller fish can be tied into fishery management goals of catch and release fishing (see Example 5.4).

**EXAMPLE 5.4 Description of catch and release fishing** (based on Oregon Health Division advisory news release, 1994).

Eating smaller fish, or no fish from certain waters, helps promote catch-and-release fishing opportunities in Oregon's waters. A catch-and-release approach allows fishermen to still enjoy fishing as a high-quality recreational experience, according to ODFW officials.

Some tips on releasing fish include:

- retrieve the catch quickly and release it immediately;

- keep the fish in water as much as possible;

- remove the hook or lure carefully;

- leave deeply swallowed bait hooks in the fish by cutting off the line;

- avoid squeezing the fish and if the fish does not swim away, help revive the fish.

### 5.1.1.2 Chemicals of concern and their effects

The reasons for recommended restrictions on fish consumption may not be apparent to the potential fish consumer without some understanding of the contaminants causing the need for restrictions. An individual's response to restrictive fish consumption recommendations may be influenced by the potential health risks involved. For example, women of childbearing age may be willing to eat contaminated fish and assume a health risk of developing cancer 30 years hence; they may not be willing to assume a health risk of bearing developmentally-delayed children.

Health advisory information about fish contaminants may include (for examples, see Appendix B, and Example 5.5):

(1) the names of chemicals detected in fish tissue;

(2) the types of health problems associated with the contaminant (e.g., acute vs. chronic, cancer, birth defects, development delays);

(3) differential effects for certain human populations (e.g., why effects are different for adults vs. children); and

(4) sources of these contaminants in the environment.

**EXAMPLE 5.5 Description of contaminants in fish and their effects** (from Minnesota Fish Facts, 1994, see Appendix B).

**"What contaminants are found in Minnesota fish?**

Fish in Minnesota lakes and rivers accumulate **mercury**. Mercury recycles between land, water, and air and enters plant and animal tissue. Although mercury is a naturally occurring metal, most of the mercury which enters Minnesota waters comes from household and industrial wastes during incineration, from latex paints, and from burning coal and other fossil fuels. Mercury levels are slowly increasing in lakes in the northern part of the state.

Fish in some lakes and nearly half of the rivers which have been sampled for the advisory program contain **PCBs**. These synthetic oils had many uses and are found in electrical transformers, cutting oils, and carbonless paper. Although they were banned in 1976, they do not decompose easily and remain in the water and lake sediments for years. PCB levels in Minnesota's waters are slowly decreasing.

**What are the health risks of eating contaminated fish?**

PCBs, dioxin, and methylmercury build up in your body over time. It may take months or years of regularly eating contaminated fish to accumulate levels which are a health concern. As you follow the fish advisory, the amount of methylmercury you take into your body is safely eliminated between meals. Larger amounts may harm the nervous system. The fetus is especially sensitive to mercury poisoning. Delays in infant development have occurred following high maternal exposures to methylmercury. The first symptoms of adult poisoning include incoordination and a burning or tingling sensation in the fingers and toes. As mercury levels increase, your ability to walk, talk, see, and hear may all be affected in subtle ways. Fish consumption advice offered by the Minnesota Department of Health is intended to keep the mercury in your body below levels that damage the nervous system.

Exposure to PCBs is linked to infant development problems in children whose mothers were exposed to PCBs before becoming pregnant. Meal advice for PCB-contaminated fish is intended to protect children from developmental problems. PCBs also cause changes in human blood, liver, and immune function of adults. In addition, PCBs cause cancer in laboratory animals and may cause cancer in humans."

See Volume 2 in this series, Risk Assessment, for specific information about the characteristics of various fish contaminants, including toxicity data.

### 5.1.1.3 Identification of "safer" fish species, sizes, and fishing locations

Fishing and eating fish may be important elements of an individual's lifestyle, either by choice or necessity. Health advisories that simply warn "Do not eat fish from ..." a given waterbody provide few alternatives to the angler and potential fish consumer. Rather, health advisories that contain information directing potential fish consumers to alternative sources of fishing or fish respond to an individual's need or desire for safer opportunities.

This information may be stated explicitly (e.g., "Brown Lake tested free of contaminants in 1993 and poses the least risks associated with fish consumption."), or may be in the form of general guidance. By omission, core consumption advice that lists only those species known to be contaminated implies that other species within those waters are safe for unlimited consumption. Similarly, advisories that list confirmed contaminated waters imply that unlisted waters are not contaminated.

New York includes the following advice on how to make choices to reduce exposure to contaminants from fish (see Appendix B):

> "Choose uncontaminated species from waterbodies which are not listed in the advisories; Choose smaller fish, consistent with fishery regulations, within a species since they may have lower contaminant levels. Older (larger) fish within a species may be more contaminated because they have had more time to accumulate contaminants in their bodies."

See Volumes 2, Risk Assessment, and 3, Risk Management in this series for a discussion of methods and impacts associated with health advisory programs. Some target audiences may benefit from being directed to safer, or less risky, sources of fish rather than only being directed away from sources high in contaminants. See Example 5.6 for a sample explaining a variety of ways to reduce health risks.

**EXAMPLE 5.6 List of risk-reducing strategies in addition to abiding by fish consumption meal limits** (from 1994 Minnesota Fishing Regulations).

**"Reducing Your Risk**

* Eat fish species that are less contaminated. PCBs build up most in fatty fish such as carp, catfish, and lake trout. Mercury levels are highest in large predatory fish such as walleye and northern pike. Species such as perch, sunfish, and crappie have the least amount of contaminants.

* Keep smaller fish for eating. Younger fish have had less time to accumulate contaminants.

* Reduce meal size and frequency. Anyone who eats freshwater fish more than once per week, especially those species listed above, could be at some risk.

* Remove PCBs by properly cleaning, trimming, and cooking fish. This chemical concentrates in the fat of fish. By removing the fat when you clean and cook fish, you can reduce your exposure to PCBs by 20 percent or more. Remove all fat from turtle meat."

### 5.1.1.4 Adverse health effects from eating fish

Similar to including information about contaminants and their health effects, health advisories may include information specifically about the adverse health effects from eating contaminated fish. Types of health effects information that could be included in fish consumption health advisories are:

(1) that health effects associated with contaminated fish consumption may develop only after decades of exposure;

(2) an explanation of acute vs. chronic exposure and health effects;

(3) cancer-causing or cancer-promoting effects (see Example 5.7);

(4) the potential for reproductive and developmental health impacts either in the fish consumer or in a developing fetus (Example 5.8); and

(5) comparison of the various types of potential health effects.

**EXAMPLE 5.7 How do I answer the question, "Is it safe to eat any fish that are likely to have carcinogenic chemicals in them?"** (based on Chun and Den 1992).

Your question on carcinogens is an excellent one. USEPA has identified some chemicals as known, probable, or possible human carcinogens based primarily on human data, and on animal studies. If we believe a chemical is a carcinogen, we assume that all levels of exposure will have some level of cancer risk. If in asking your question you want to know if there are levels of exposure that are free from risk, the answer is no. If, on the other hand, you are asking about whether certain levels of chemical exposure due to eating fish are too small to be of a health concern, the answer is yes. Our goal is to reduce the level of exposure to where it will be safe to eat the fish you catch here. We do that through programs designed to prevent or clean up polluted waters, and by providing advice about how to limit your fish consumption from certain waters in the state.

**EXAMPLE 5.8 Explanation of noncarcinogenic health impacts** (from Draft Guidelines for Eating Fish from Georgia Waters, 1994, see Appendix B).

**"What are the health risks of eating contaminated fish?**

PCBs can cause infant development problems in children whose mothers were exposed to PCBs before becoming pregnant. This consumption advice is intended to protect children from developmental problems. PCBs can also cause changes in human blood, liver, and immune functions of adults. Some forms of PCBs also cause cancer in laboratory animals and may cause cancer in humans, but these guidelines are designed to prevent this from happening."

See Volumes 2 and 3 in this series, Risk Assessment and Risk Management, for discussion of risk characterization and specific health effects associated with fish contaminants.

### 5.1.1.5 Health benefits of eating fish

Agencies may decide to include information about the health benefits of eating fish (Example 5.9) for several reasons. First, the absence of such information may present an unnecessarily negative image of a natural resource with the potential of providing a nutritious food source, especially to families in need, or the potential for providing an economically-important recreational fishery.

Second, health benefits information may be useful to certain types of people who seek to balance the risks and benefits to which they are exposed. For example, people prone to heart disease may benefit from understanding the health benefits of fish consumption rather than being scared away from all or most fish consumption if only the consumption restrictions are presented.

Third, general dietary advice may be useful for public health reasons to promote shifts from reliance on high-fat protein sources to low-fat protein sources. Fourth, including fish consumption health benefits information encourages a more realistic view of risks within our society. That is, the health advisory becomes a vehicle for educating society about the complexity of judging what is "safe" vs. "unsafe", emphasizing that the judgment of risk is not clearcut.

**EXAMPLE 5.9 Explaining health benefits of fish consumption** (from NY Dept. of Health, 1994 Health advisory, see Appendix B).

**"Health Benefits**

When properly prepared, fish provide a diet high in protein and low in saturated fats. Almost any kind of fish may have real health benefits when it replaces a high-fat source of protein in the diet. You can get the health benefits of fish and reduce unwanted contaminants by following this advisory."

See Volume 3 in this series, Risk Management, for a discussion of nutrition and health benefits associated with fish consumption.

### 5.1.1.6 Comparison of health benefits and adverse health risks: tailoring the message to an individual's personal circumstances

As noted above, agencies may seek to help potential fish consumers understand that fish consumption provides health benefits as well as potential risks. Agencies may also wish to explicitly help the reader compare the importance of those benefits and risks. For such comparisons to be meaningful and ultimately, useful, to the reader, they should address personal circumstances as much as possible.

The relative importance of the health benefits and health risks associated with fish consumption will differ depending on an individual's circumstances. These differences should be made clear, so an individual will understand the potential health benefits and risks involved for him or her (Example 5.10).

**EXAMPLE 5.10 Comparing health risks and benefits.**

You may be concerned about comparing the risks and benefits of eating fish. Consider your own lifestyle and health background. If you have high cholesterol, you may be wise to eat fish as often as once a week. For you, the benefits of eating fish may be more important than the cancer or other risks. But if you are also feeding your children fish, you might be concerned about the developmental risks they may face from exposure to contaminants. For your children, you can choose fish low in contaminants, and choose fish from a variety of sources.

Some people may desire that the agency compares health risks and benefits, seeking only an answer to the question: Should I eat this fish?. Advisory program staff can acknowledge the concern for safety, explain the health advisory development process briefly, and reiterate the advisory recommendations for the specific location. Answering such a question is a good opportunity to begin to explain some of the factors an individual may consider when deciding to eat a fish or not, provided the explanation is brief (see Example 5.11).

**EXAMPLE 5.11 How do I answer the question, "Is it safe for me to eat this fish?"** (based on Chun and Den 1992).

Your concern for safety is our concern also. Any cancer-causing chemical found in fish is potentially dangerous. Some chemicals may cause other problems instead of cancer. Based on our samples of fish harvested here, we feel it is safest if you limit your consumption of fish caught here to 6 meals within a year's time. I can't tell you the amount of contaminants in this particular fish without testing it in the lab. Limiting your diet of fish caught from here will limit your potential exposure to contaminants.

See Volume 3 in this series, Risk Management, for a discussion of comparisons of health risks and health benefits associated with fish consumption.

### 5.1.1.7 Comparison of contaminant management programs for sport- vs. commercially-caught fish

Audiences may be curious about the relative risks of contaminants in store-bought fish vs. the fish they catch themselves. It may be difficult to convey in a risk communication program the differences between regulatory (i.e., commercial fish catch inspection) vs. voluntary (i.e., health advisory) approaches to protecting human health. Communication progams may explain the different assumptions involved in commercial inspection vs. sport-fish health advisory programs, and the potential differences that may result (Example 5.12 and 5.13).

**EXAMPLE 5.12 Comparing fish contaminant programs for sport- vs. commercially-caught fish** (from "Fish Facts: Eating Minnesota Fish", Minnesota Department of Health, 1994, see Appendix B).

**"What about commercially available fish?**

Fish from oceans, estuaries, and inland waters may contain small amounts of mercury and PCBs as well as other contaminants. The amounts of contaminants that may be present in commercially available fish can add to what you are already taking in from sport fish. Fish available in food stores and restaurants are subject to inspection and regulation. Nationwide, fish with levels of contaminants above Food and Drug Administration levels of concern are not allowed on the market. However, it is possible that commercially available fish will meet federal standards for food safety, yet not meet Minnesota Department of Health guidelines for fish that can be eaten in unlimited quantities. The Minnesota Department of Health and Minnesota Department of Agriculture support increased analysis of contaminants from all sources."

**EXAMPLE 5.13 Comparing fish contaminant programs for sport- vs. store-bought fish** (from Draft "An Expectant Mother's Guide to Eating Minnesota Fish", Minnesota Department of Health, 1994).

**"What About Store-Bought Fish?**

The fish or shellfish you buy from your grocery store or fish market can also contain contaminants. Although there are laws to limit these contaminants, not all commercial fish are tested.

Pregnant or nursing women should not eat swordfish or shark. Canned tuna have mercury levels comparable to many Minnesota-caught fish. It is safe for a pregnant woman to eat up to 7 ounces of tuna each week - if it is the only source of mercury-contaminated fish, including sport-caught fish, eaten that week.

Most commercial ocean fish, such as shellfish, flounder, pollack, and cod, are low in PCBs. A pregnant or nursing woman can safely eat these once a week.

Remember to consider ALL sources of fish you eat when making your choices."

### 5.1.1.8 Comparison of health risks from fish consumption with other risks

Risks associated with fish consumption may be compared with other types of risks such as:

- voluntary risks such as boating, smoking, drinking;
- involuntary risks such as being struck by lightning;
- dietary risks such as eating red meat or peanut butter as protein sources; and
- non-dietary risks.

Very few empirical data exist to support or discourage the use of risk comparisons in health advisories. Few studies have examined the actual effects of presenting comparative risk information to audiences on any risk topic. Communicators considering the use of comparative risks such as those listed above should pretest the draft materials to determine likely response to the information among target audiences.

Empirical data based on anglers' desired information provide insights about expressed information needs of these audiences. Anglers have expressed a desire for information comparing risks of fish consumption with (in order of priority) (a) risks from eating other types of protein; (b) other health risks such as smoking and drinking; and (c) risks from other activities such as driving a car or boating (Connelly et al. 1992; Connelly and Knuth 1993). General risk statements may be helpful for placing the level of risk in some context (Example 5.14).

Including information about other risks may be especially appropriate for some audiences. For example, audiences for whom fish is a major protein source may benefit from information on relative risks associated with alternative protein

sources. If these audiences reduce fish consumption, that protein presumably must be provided through another source. Volume 3, Risk Management, includes explanations of potential risk comparisons to consider in health advisory programs.

**EXAMPLE 5.14 Comparison of risks from eating fish with general cancer risks** (from Minnesota Fish Facts, 1994, see Appendix B).

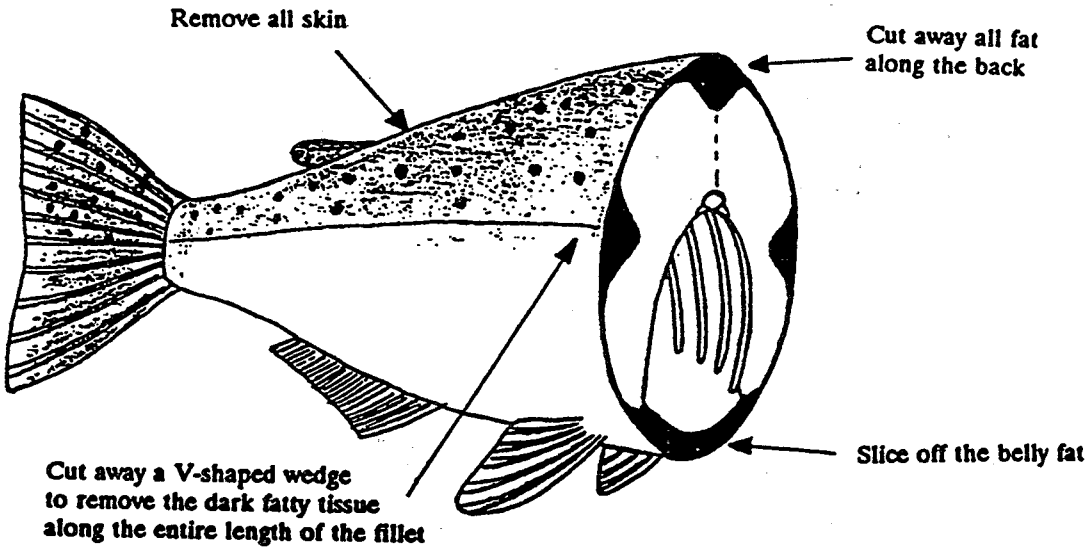
"Currently, cancer will affect about one in every two people in Minnesota, primarily due to smoking, diet, and hereditary risk factors. If you follow the advisory over your lifetime, the PCBs or dioxin in the fish you eat may not increase your cancer risk at all. At worst, using Environmental Protection Agency methods to calculate risk from a lifetime of eating contaminated fish, it is estimated that approximately one additional cancer case may develop in one of 2,500 to 10,000 people eating contaminated fish according to the advisory. Eating fewer meals of contaminated fish will further decrease your cancer risk."

### 5.1.1.9 Risk-reducing fish cleaning and cooking methods

Exposure to some contaminants may be reduced through use of specific fish cleaning methods (such as removing the skin, filleting the fish, removing dorsal and ventral fat, and removing viscera) and cooking techniques (e.g., methods such as baking or broiling that allow fats to drain away from the fish flesh). Volume 3 in this series (Risk Management) contains details about the types of contaminants most likely to be reduced through these means.

See Example 5.15 and Appendix B for examples of fish-cleaning diagrams. See Example 5.16 for a sample of text explaining fish preparation techniques.

**EXAMPLE 5.15 Fish cleaning diagram** (from Anderson et al. 1993, see Appendix B).



Including information about risk-reducing fish preparation techniques may be important for several reasons. First, these techniques allow those who are not willing or able to follow the fish consumption restrictions to reduce their risks by reducing exposure to some contaminants even though they may be eating fish in excess of recommended limits.

Second, these techniques may offer a further margin of safety for those fish consumers who are keeping their consumption within recommended limits.

Third, health advisory recommendations may be derived from risk assessment data based on contaminant levels in skin-on fish fillets, skin-off fish fillets, or in whole fish. These risk assessment/risk management assumptions should be communicated to fish consumers. People who eat fish prepared in a manner different than that assumed in risk assessment/risk management may be exposing themselves unintentionally to a greater health risk due to lack of knowledge of the assumptions on which health protection programs are based. For example, if risk assessment assumptions include exposure data based on contaminant levels in skin-off fillets, an individual who regularly eats skin-on fillets will be at a greater contaminant exposure than assumed in the risk assessment process.

**EXAMPLE 5.16 Description of how to prepare fish and reduce contaminants** (from 1993 Michigan Fishing Guide).

**"Remove fats as you prepare the fish for the table.**

You can reduce the amount of fat and certain contaminants, such as pesticides and PCBs, in fish you eat by:

**Trimming fatty areas** (see figure). The belly, the top of the back, and the lateral line are often fatty.

**Puncturing or removing skin before cooking.** This allows fats to drain off and helps remove or reduce the thin layer of fat located just beneath the skin.

**Cooking so fats drain away.** Bake, broil, or grill on a rack, or poach and discard the liquid. Avoid pan frying in butter or animal fat or making fish soups or chowders. These methods hold fat-containing juices.

**Deep-frying trimmed fillets in vegetable oil.** After frying, drain the oil from the fillets and throw away any liquid you used to cook the fish, including the frying oil.

**Note: There are no known methods to remove mercury from fish."**

Fourth, fish cleaning and cooking techniques reduce contaminant exposure only for some types of contaminants (e.g., organic compounds) (See Volumes 2 and 3). Fish consumers who assume trimming the fat from fish will reduce all contaminants (e.g., heavy metals) may be unwittingly exposing themselves to greater levels of contaminants than intended. In situations such as these, the fish consumer must be informed about (a) fish preparation techniques; (b) the contaminants of concern in specific locations; and (c) the effectiveness of specific techniques in reducing the exposure for the specific chemicals of concern.

### 5.1.1.10 Risk assessment and risk management assumptions

Health advisory information may include explanations of the assumptions underlying risk assessment processes and risk management decisions. Risk assessment assumptions include such chemical characteristics as environmental persistence and bioaccumulation, and human characteristics such as body weight and meal size (see Volume 2 in this series). Risk management includes such assumptions as selected acceptable levels of risk, assumed fish preparation techniques, severity of likely economic and societal impacts, and decisions about how conservative (protective) health advisory recommendations should be (see Volume 3 in this series for a general discussion; Volumes 1 and 2 provide technical data).

Communicating assumptions and uncertainty is an important component of health advisory risk communication. Not doing so may produce the false impression that a certain set of health advice is the only existing "truth." These impressions may lead to a loss of credibility when fish consumption recommendations or other health advice change in the future in response to different assumptions or changing environmental conditions.

Some of these assumptions may be critical for the potential fish consumer to know, others may be important only for the fish consumer who seeks to be informed about as many aspects of health advisories as possible. Assumptions critical for every fish consumer should be included in widely-disseminated health advisory materials. Assumptions important only to those seeking specific details about health advisory programs may be available in brochure or list form upon request to the agency.

Risk management assumptions that presume certain personal behavior (e.g., meal size, eating only fish fillets) must be explained in health advisories. In the absence of this information, the individual may not behave in the ways assumed, and thus be exposed to higher risks than desired. Even with the explanation of such assumptions, individuals may not behave in the ways assumed, but in these cases the lack of the desired behavior may be due to personal choice rather than being uninformed about the "expected" behavior.

Risk assessment and risk management programs, and their assumptions, are not static. Assumptions change, changing health advice and fish consumption recommendations. New scientific information or understandings may result in modified health advisory recommendations. Putting the changes in perspective for audiences who are aware of past and current advisories is critical to maintaining confidence and trust in the agency.

Uncertainty in science, and thus, uncertainty in health advice, are realities (see Section 7.2, this volume). Society, however, has been attuned to treating scientists as omniscient experts. Credibility is often destroyed when scientific conclusions or health advice change, especially if changes are frequent. Jim Colquhoun (NY Department of Environmental Conservation) suggests health advisory staff should acknowledge the high probability that we will learn more about the effects of contaminants over time.

The lack of certainty about the effects of contaminants justifies the use of safety factors in risk assessment and risk management (see Volumes 2 and 3 in this series). Some or all target audiences may benefit from knowing that such safety

factors are an element of health advisory program assumptions. Future scientific studies may show that some contaminant characteristics once feared may not be so dangerous after all, or conversely, that unforeseen dangers are associated with some contaminants. Health advisory information may include explanations that the current fish consumption advice is the best available to help protect human health, based on currently available data.

#### 5.1.1.11 Countering personal anecdotes.

An obstacle to effective risk communication is the "power of the personal anecdote" (Jim Colquhoun, NY Departmet of Environmental Conservation, personal communication). Health advisory program staff may hear comments such as, "I have been eating these fish for 30 years, and I'm still here." Jim Colquhoun suggests the following explanation:

> People need to hear that just as there is a wide variety of body forms, innate abilities, and facial features among people, there is a wide range of sensitivity to toxic materials. One effective way to describe this to the public is to first acknowledge their position (e.g., "You raise a good point."), then relate a common observation of a bioassay experiment such as the following. When several animals are exposed to the same dose of an experimental toxicant, the most sensitive among them will be affected more quickly and severely than the rest. Similarly, some may hang on long after the rest have succumbed. When we rely on anecdotes, we are weighing the outliers about the same as the majority which fall somewhere in between.

A similar, but opposite anecdote might indicate an overly reactionary response to health advisories, e.g., "My uncle ate Lake Ontario salmon regularly for a few years and died of cancer." Communicating that such cause-and-effect conclusions are not certain is difficult, especially if health advisory and other communication programs give the impression that our understanding of contaminants is complete. Communicators may acknowledge the potential link between contaminants in fish and certain health effects such as cancer, but also stress that it is exceedingly difficult to attribute a specific cause (i.e., fish consumption) to any individual case of a disease being contracted.

### 5.1.2 Advisory Format and Tone

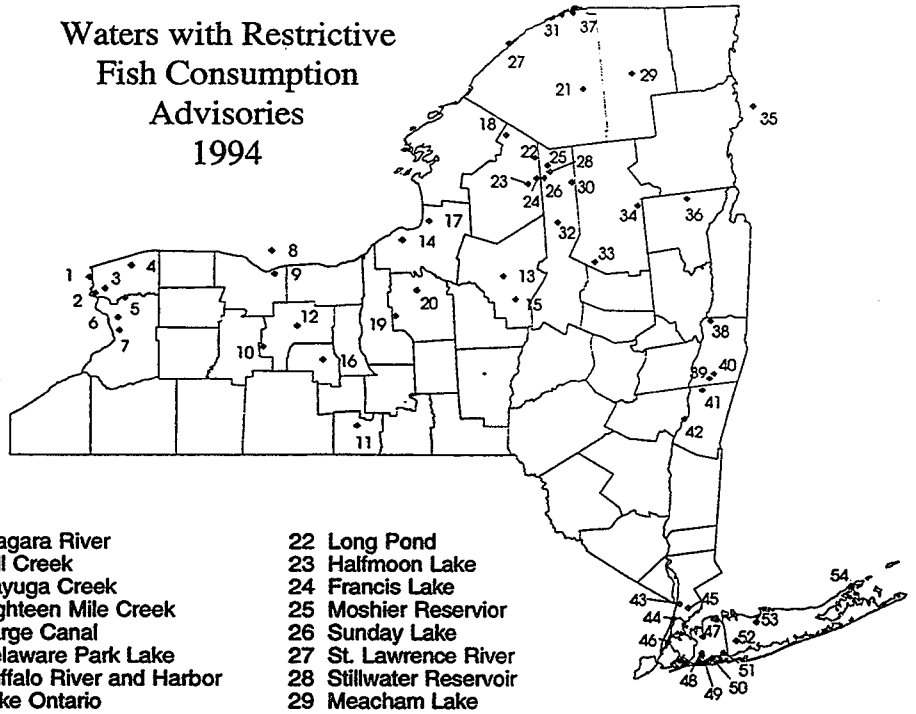
Only one major research study (Connelly and Knuth 1993) has performed an in-depth examination of peoples' preferences for different styles of health advisory information presentation. Variables studied included (1) peoples' preferences for text, tables, and graphics or diagrams within health advisory materials; (2) reactions to a commanding, authoritative tone vs. a cajoling, appealing tone; (3) desire for quantitative vs. qualitative risk-related information; and (4) appropriate reading levels for printed health advisory materials. That study provides the basis for the following discussion.

#### 5.1.2.1 Text vs. tables vs. graphics

For most fish consumers, a combination of text, tables, and diagrams (rather than only one of these forms) will likely be most effective. The use of diagrams is particularly important when agencies try to explain complicated information that can be expressed visually.

Instructions about proper fish cleaning techniques is the type of information most often presented graphically within advisories (Example 5.15). Maps showing locations of waters subject to advisories and those not subject to advisories may also be appropriate (Example 5.17), particularly if an agency's goals include informing anglers of alternative, safer locations at which to fish. In most cases, diagrams will be most successful when accompanied by explanatory text. The text is necessary to add context to the diagram, and to provide multiple learning methods for the reader (for examples, see Appendix B).

**EXAMPLE 5.17 Health advisory location map** (from New York State Health Advisory, 1994, see Appendix B).




1 Niagara River
2 Gill Creek
3 Cayuga Creek
4 Eighteen Mile Creek
5 Barge Canal
6 Delaware Park Lake
7 Buffalo River and Harbor
8 Lake Ontario
9 Irondequoit Bay
10 Canadice Lake
11 Koppers Pond
12 Canandaigua Lake
13 Threemile Creek
14 Oswego River
15 Mohawk River
16 Keuka Lake
17 Salmon River
18 Indian Lake
19 Skaneateles Creek
20 Onondaga Lake
21 Carry Falls Reservoir
22 Long Pond
23 Halfmoon Lake
24 Francis Lake
25 Moshier Reservior
26 Sunday Lake
27 St. Lawrence River
28 Stillwater Reservoir
29 Meacham Lake
30 Big Moose Lake
31 Massena Power Canal
32 Fourth Lake
33 Ferris Lake
34 Round Pond
35 Lake Champlain
36 Schroon Lake
37 Grasse River
38 Hoosic River
39 Nassau Lake
40 Valatie Kill
41 Kinderhook Lake
42 Hudson River
43 Saw Mill River
44 Harlem River
45 Sheldrake River
46 East River
47 Whitney Park Pond
48 Hall's Pond
49 Smith Pond (Roosevelt Park)
50 Loft's Pond
51 Upper Massapequa Reservoir
52 Belmont Lake
53 St. James Pond
54 Spring Pond

In many cases, the core consumption recommendations of a health advisory will be most clearly presented in tabular form (Example 5.18). Such tables can include a variety of information such as location, species, size of fish, recommended fish consumption limits, and chemicals of concern. Tables containing the basic fish consumption recommendations allow the reader to scan the information quickly to find the waterbody or species-specific advice needed for any particular fishing trip. Text surrounding the tables provide the explanation and elaboration that may be needed to convince the reader to abide by the health advisory recommendations (for examples, see Appendix B).

**EXAMPLE 5.18 Health advisory table listing consumption advice** (from Anderson et al. 1993; see also Appendix B).

Meal Advice for Eating Sport Fish from **Lake Michigan**

| Fish | No Restriction | One Meal a Week (52 meals/year) | One Meal a Month (12 meals/year) | One Meal every 2 Months (6 meals/year) | Do NOT Eat |
|---|---|---|---|---|---|
| Carp | | | | | All Sizes |
| Catfish | | | | | All Sizes |
| Chinook Salmon | | | < 26" | > 26" | |
| Coho Salmon | | < 17" | 17-28" | >28" | |
| Brown Trout | | | < 18" | 18-27" | > 27" |
| Lake Trout | | | < 21" | 21-26" | > 26" |
| Walleye | | < 17" | 17 - 26" | > 26" | |
| Whitefish | | | < 23" | > 23" | |
| Yellow Perch | < 9" | > 9" | | | |
| Brook Trout[2] | | | All Sizes | | |
| Pink Salmon[2] | | | All Sizes | | |
| Rainbow Trout[1] | | | < 22" | > 22" | |
| Smelt | All Sizes | | | | |

### 5.1.2.2 Commanding vs. cajoling tone

Unlike regulatory programs, health advisory programs rely on voluntary compliance by the target audiences to achieve program objectives such as human health protection. The tone of information communicated in health advisories may influence the degree to which an individual feels motivated to comply with the fish consumption advice.

When presented with the same basic message (i.e., anglers should limit their fish consumption) in two different styles, anglers studied clearly preferred a cajoling, conversational, explanatory tone rather than a commanding, directive, authoritative tone (Example 5.19). The success of health advisory programs depends in part on the confidence fish consumers place in the agency, but also on the rapport established between agency and potential fish consumer. Cajoling messages have the potential to instill a sense of partnership and concern about the individual or household; commanding messages may instill negative feelings about impositions of government agencies into a personal lifestyle activity such as fishing and eating self-caught fish.

**EXAMPLE 5.19 Commanding vs. a cajoling tone** (from Connelly and Knuth 1993).

**Commanding Tone:**

Limit your fish consumption. You should limit the amount of Great Lakes fish you eat. If you do eat contaminated fish, you should space your meals out over time rather than eating several meals over a short time period.

**Cajoling Tone:**

How much fish should you eat? Some Great Lakes fish should be eaten in moderation. Exactly how much fish you should eat depends on how often you eat fish and the level of fish contamination. A person who only eats fish during a one-week vacation has little to worry about compared to the person who eats fish every week during the summer. We eliminate contaminants from our bodies, and we do it more efficiently than fish do. You can help that process by simply spacing meals of more contaminated fish out over time.

### 5.1.2.3 Quantitative vs. qualitative

The use of quantitative vs. qualitative information, as with each of the communication tools available, depends on the information needs and abilities of the target audiences. Fish consumer preferences for quantitative vs. qualitative information are not clearcut. Quantitative information may help potential fish consumers understand the actual magnitude of certain concepts (e.g., comparative risks). In some cases, however, understanding relative magnitudes may be sufficient, and thus qualitative information may be an appropriate choice for presenting information. Severity of comparative risks and degree of contaminant exposure from certain fish species or waterbodies are types of information that may be represented both quantitatively and qualitatively (Example 5.20).

**EXAMPLE 5.20 Qualitative vs. quantitative risk comparisions** (example from Connelly and Knuth 1993).

QUALITATIVE

| Risk Comparisons Risk of Death | |
|---|---|
| Level of Risk | Activity |
| Higher Risk | Smoking 1-2 packs of cigarettes per day |
| | Having 200 chest x-rays per year |
| | Eating 1-10oz meal per week of mixed Great Lakes salmonids at 1984 contaminant levels |
| | Driving a motor vehicle |
| Moderate Risk | Eating 1-8oz meal per week of mixed Great Lakes salmonids at 1984 contaminant levels |
| | Eating 1-8oz meal per week of mixed Great Lakes salmonids at 1987 contaminant levels |
| | Breathing air in U.S. urban areas at early 1980's contaminant levels |
| | Recreational boating |
| Lower Risk | Drinking 1-12oz beer per day |
| | Recreational hunting |
| | Complications from insect bite or sting |

QUANTITATIVE

| Risk Comparisons Risk of Death | |
|---|---|
| Level of Risk (chances out of 1,000) | Activity |
| 35-125 | Smoking 1-2 packs of cigarettes per day |
| 7-30 | Having 200 chest x-rays per year |
| 5-30 | Eating 1-10oz meal per week of mixed Great Lakes salmonids at 1984 contaminant levels |
| 17 | Driving a motor vehicle |
| 11-12 | Eating 1-8oz meal per week of mixed Great Lakes salmonids at 1984 contaminant levels |
| 3-6 | Eating 1-8oz meal per week of mixed Great Lakes salmonids at 1987 contaminant levels |
| 0.1-6 | Breathing air in U.S. urban areas at early 1980's contaminant levels |
| 3.5 | Recreational boating |
| 1-2 | Drinking 1-12oz beer per day |
| 1.5 | Recreational hunting |
| 0.014 | Complications from insect bite or sting |

### 5.1.2.4 Reading level vs. audience abilities

The educational level an individual has completed will influence his or her ability to comprehend written messages. Health advisory materials may be evaluated using a readability test to estimate the educational level a reader must have to be able to understand the materials. The risk communicator can then determine if the draft health advisory information is likely to be understood by a majority of the target audience by comparing the readability score with the educational characteristics of the target audience.

Readability tests only offer an estimate of the ability of an audience to understand the text. Pretesting the information directly with each target audience is the best way to measure whether information is likely to be understood.

Readability tests generally measure the structural difficulty of written materials, such as the sentence structure and word length. Computer software exists to allow readability evaluations of long documents (e.g., Rightwriter, Grammatick).

The language in which an advisory is presented should match the written language abilities of the target audience. If English is not the native language of the audience, alternative languages for advisory documents should be considered (see Appendix B for examples). Depending on the audience, such materials may include both English and the native language, or just the native language. If members of the audience are bilingual or the audience is composed of those who read English and those who do not, both languages are appropriate. For example, an advisory printed in both English and Spanish may be appropriate for an Hispanic immigrant community in which the majority of adults read Spanish but the youth read English.

The language of some cultures does not correspond to the written language of English. In such situations, advisory warnings depicted through graphics, diagrams, or other visual symbols should be considered. Wisconsin has developed a visually-oriented format for the Hmong community (see Appendix B). Among the Hmong, the written language is not the preferred communication mode. In response, Wisconsin developed a series of colorized maps to indicate waters subject to advisories, and the type of fish consumption restrictions. Stoplight colors were used: red meant stop (do not eat), yellow meant caution (some restrictions exist), and green meant okay to eat. Such maps are also useful with other audiences who do not speak or read English.

### 5.1.3 Advisory Information Dissemination Mechanisms

The health advisory information must be packaged to conform to the characteristics of the dissemination mechanisms, or channels, that will be used. This usually requires tailoring the format and content of the information.

Choice of dissemination mechanisms must be influenced by the characteristics of the target audiences. What information sources do audiences currently use for health advisory or other kinds of information? What additional sources may be accessible to audiences? Potential dissemination mechanisms include mass media, specialized media, and interpersonal contacts.

See Appendix B for health advisory program examples of mass media and specialized media materials.

#### 5.1.3.1 Mass media

Mass media dissemination may involve written, video, and/or audio messages, via television, radio, newspapers, magazines, billboards, or transit posters. Some types of mass media (e.g., television, newspapers) can provide both general coverage of health advisory-related issues, and specialized coverage of very specific messages an agency is trying to convey. Example press releases are in Appendix B.

Opportunities for coverage through mass media include: featured news stories as new or updated health advisories are issued; public service announcements; entertainment programming especially on health or outdoors programs or columns (e.g., segments on televised fishing shows); interview and live call-in shows; and editorial columns or announcements. Each of these opportunities has the potential to reach different types of audiences and to convery different messages.

One of the best ways to gain access to and some degree of influence over various media sources is to establish an ongoing relationship with certain key contacts in media organizations, such as health and nutrition editors and sports or outdoors editors and columnists. If an agency becomes a regular supplier of various types of newsworthy information, not just health advisories, each type of news becomes more likely to be featured. In an ongoing relationship, media staff are more likely to call to confirm details of a story than in situations in which the agency contact is totally unfamiliar to the media organization.

Be prepared for media inquiries. Pam Shubat, Minnesota Department of Health, suggests keeping a written list of important "soundbites" handy near the telephone. Insert these messages into every media call.

The U.S. Dept. of Health and Human Services describes the features of using mass media in health communications as follows (excerpted from USDHHS 1993):

> The mass media can transmit news quickly to a broad audience but cannot alone be expected to motivate behavior. The mass media are generally the public's primary source of information but may be less trusted than more intimate sources of information, and are constrained by time, space, and newsworthiness, among other factors, to the extent they can explain complex information properly and fully.
>
> Media (news) may focus too much attention on new information or information affecting limited segments of the population; may increase the chances for miscommunication of complex or controversial news; may communicate incomplete information (most crucially leaving out information explaining what should be done about a health problem). Loss of control over how the information is communicated may be a trade-off for broad and rapid transmission.
>
> Whether mass media is intentionally selected as one channel, or whether a health issue appears as news, you should remember that the purpose of the mass media is to inform and entertain, not educate. Therefore, if the message is too complicated, or simply not considered interesting enough for use by the media, you will be obligated to redesign the message so that it is more appealing to media professionals and their perceptions of what their audience wants. Working with media professionals will help assure that messages are interesting as well as accurate, and may help you obtain greater exposure for your program.

#### 5.1.3.2 Specialized media

Specialized media may involve written, video, and audio materials designed specifically for communicating health advisory information to selected audiences, and distributed primarily by the health advisory agencies. A variety of specialized media are available and have been used in health advisory programs. Specialized media pertinent for health advisory information include the following (see Appendix B for examples).

**Media types:**

- **Fishing regulations guides** published by state agencies but including health advisory information in addition to fishing regulation information. The health advisory information in such guides may be the complete text of health advisory brochures produced in the state, or may include an excerpt with directions about how to obtain more detailed information. See Appendix B.

- **Health advisory brochures** and pamphlets may be designed for general public distribution or for selected audiences. Brochures for selected audiences can key into the specific behaviors and health risk/benefit tradeoffs pertinent to that group (e.g., women of childbearing age). See Appendix B.

- **Lake-specific fishing brochures** may be produced that highlight the specific fishery as well as the specific health advisory for that location. See Appendix B.

- **Newsletters** help develop an ongoing rapport with selected audiences. Newsletters are often an effective means to reach other information "gatekeepers", i.e., those people who are key sources of information for larger numbers of people in the target audiences an agency hopes to reach. For example, biannual or quarterly newsletters to health care providers can remind them of the importance of discussing health advisory recommendations with their clients.

- **Fact sheets** are typically made available by request, or limited in distribution to audiences in areas where interest in health advisories has been expressed. Fact sheets typically include a level of detail that may not be necessary for general distribution. Fact sheets may be prepared about certain aspects of the health advisory program (e.g., Fact Sheet on Health Advisory Risk Assessment), certain chemicals (e.g., Fact Sheet on Health Effects of Mercury), or certain waters (e.g., Fact Sheet on Lake Ontario Health Advisory). See Appendix B.

- **Posters** may be created for general advertising of health advisories (e.g., at festivals or fairs), or for alerting users of contaminated waterbodies about health advisories. Posted health advisory warnings are typically limited in the amount and types of information they may convey. See Appendix B.

- **Free-loan videotapes** may be particularly effective for reaching groups of people if tapes are loaned to organization or community associations. Videotapes can be very effective for communicating certain techniques, such as fish cleaning, that are easier to understand via demonstration. Videotapes can also be effective in conveying the thoughts of real people who are faced with decisions about how respond to health advisories. The emotions sometimes triggered by health advisories can be reflected on videotape and thus recognized as legitimate, instilling more trust in the agency among the target audiences who view the videotape and see how the agency responds to real concerns.

- **Postcards,** to be returned to the agency, can be included in fishing regulations guides, tourist magazines, chamber of commerce materials, etc. as an easy way for people to request more details about health advisories for the specific locations in which they will be fishing.

- **Comic strips** often cannot portray details of health advisories, but can capture the attention of specific audiences enough to stimulate an interest in learning more about fish consumption health recommendations.

Communicators must identify specific locations and techniques for distributing each of these specialized media, considering the needs and abilities of the target audiences.

**Distribution techniques:**

- **Fishing regulations guides** and general **health advisory brochures** may be effectively placed at bait shops and fishing supply stores, and points of fishing license sales.

- **Specialized brochures** for women of childbearing age may be placed in women's clinics and pediatrician's offices.

- **Lake-specific brochures** may be made available at local bait shops, marinas, chambers of commerce, and motels.

- **Fact sheets** may be advertised in general information such as fishing regulations guides, but available by special request only, or distributed at selected gatherings such as public hearings or information meetings.

- **Posted notices** can be displayed at heavily used fishing access sites, along reaches of particularly contaminated waters, or in urban or other areas in which a high concentration of potential frequent fish consumers may occur. Posted notices, however, are subject to vandalism or theft, and may require a high level of maintenance.

- **Free-loan videotapes** may be particularly effective for reaching groups of people if tapes are loaned to organization or community associations. They may also be displayed at festivals or fairs to attract people to an information booth at which further personal contact can be made, or set on loop viewing in health clinics to inform a specific client base about the issues associated with fish consumption.

### 5.1.3.3 Interpersonal contacts

Interpersonal contacts may have the greatest effect in stimulating a response to fish contamination, either through adherence to the fish consumption limits in the advisory or adoption of other behaviors (e.g., fish preparation techniques) that may reduce exposure to contaminants (Connelly et al. 1992). Personal contact establishes a relationship of trust and respect between people, but it also allows for more complete understanding of health advisory information. The potential fish

consumer can ask questions and receive answers immediately, and can directly observe and be instructed in risk-reducing techniques such as proper fish-trimming procedures.

Interpersonal contacts can be on-site or off-site. On-site contacts include those contacts with fish consumers at the site of fish catch, fish preparation, or fish consumption. Roving creel survey clerks gathering fisheries management data from individual anglers can also distribute health advisory brochures at the end of the creel interview. Communication interns may be stationed at frequently-used fishing access sites to interact directly with anglers as they enter and leave the fishing site. Staff may be stationed at fish cleaning stations or at fishing tournaments, to distribute written information about health advisories, and/or demonstrate risk-reducing fish trimming procedures. Low income nutrition assistance programs often involve visits to individuals' homes. These visits may be an ideal time to demonstrate in the home proper fish-cleaning and fish-cooking techniques.

Such on-site, personal contacts are costly in terms of staff time and training, but may be appropriate for potentially high-risk populations. To increase effectiveness of such contacts, key individuals in the community may be targeted through personal contacts. These individuals then become trained to transfer this information to the rest of the community.

In certain locations such as the Great Lakes and marine areas, charter boat operators may be the key individuals that have the most potential to influence the behavior of potential fish consumers. Efforts should be made to elicit the help of these individuals in communicating an appropriate message to their clients. Health advisory program staff should recognize, however, that a "limit fish consumption" message should not be conveyed as a "do not catch fish" message when interacting with this audience. Charter boat operators depend on fishing for their livelihood. Many are willing to work within a health advisory program that encourages safe fish harvest and consumption, because they can provide their clients with a healthier experience. Charter operators will not be willing to work with a program that strongly discourages use of the fishery.

Off-site personal contacts include town meetings, membership group meetings, private counseling in health clinics or other offices, and staffing a toll-free telephone hotline (e.g., "800" number). Health advisory program staff may attend sporting group meetings to discuss health advisory program development and fish consumption recommendations. Staff may arrange town meetings at contaminant sites of high local concern, responding to questions raised by the community members and sharing fish consumption advice and materials.

### 5.1.4 Timing of Information Exchange

Timing the dissemination of specific health advisory recommendations or general fish consumption information depends on the accessibility of the target audience and on the type of dissemination mechanisms to be used. Advisories to be printed in fishing regulations guides, for example, must be available at the time the advisory goes to print. Delays in contaminant monitoring programs, and therefore in determining current consumption advice, may affect the range of alternative communication mechanisms available.

A sense of timing, or knowing when to release health advisory information for maximum public impact, is a critical factor for effective risk communication efforts

(e.g., USDHHS, 1993). Knuth et al. (1993) demonstrated the effectiveness of multiple contacts throughout the fishing season for causing anglers to think about health advisories more frequently during the fishing season, potentially increasing health advisory compliance.

Health advisories disseminated via fishing regulations guides are continual reminders to anglers (if they consult their guides regularly). News releases, town meetings, and other dissemination mechanisms, however, can be timed to coincide with certain peaks in potential fish harvest or fish consumption. Such peaks may include:

(1) the opening days of fishing seasons, particularly for those species targeted in health advisories;

(2) the summer vacation season;

(3) the fall and spring spawning migrations of some species, targeted heavily by anglers; and

(4) religious holidays emphasizing fish consumption, particularly in religiously-centered communities (e.g., the Lenten season for Hispanic or Catholic communities).

Information about fish contaminants or fish consumption in general may be featured throughout the year in print or electronic media, stimulating greater public awareness and leading to greater compliance with advisory recommendations.

## 5.2 PRETESTING THE COMMUNICATION STRATEGY

The purpose of pretesting is to ensure that the content, structure, and dissemination of the health advisory materials are consistent with communication program objectives. Pretesting also helps predict if the draft materials are likely to achieve the ultimate outcomes desired. Pretesting health advisory communication strategies includes analyzing the target audiences' responses to draft risk communication materials and mechanisms through techniques that yield insights about the knowledge, beliefs, behavior, and language of those audiences. Pretesting is part of formative evaluation; see Section 6.2 on Formative Evaluation for further discussion and examples.

Pretesting usually involves selection of a test group designed to reflect as many characteristics of the ultimate target audiences as possible. It is not usually necessary to ensure a large, statistically representative sample from the ultimate population. The purpose is not to draw statistically significant conclusions about the likely responses of the target population should the draft communication materials be adopted. Rather, the purpose of pretesting is to identify the range of concerns and potential problems that may occur should the draft materials be implemented.

Pretesting options include personal contacts (e.g., personal or telephone interviews, focus groups) and self-administered questionnaires (e.g., mailed forms). Interviews and focus groups typically allow for greater interaction between agency personnel and the pre-test participant, and sometimes between participants as in the case of focus groups. Such interaction often produces more in-depth information than can be gathered through mail surveys, for example.

Selection of the individuals involved in pretesting is important. Agency personnel familiar with the objectives of the health advisory risk communication program should be included in pretesting. This agency group should be asked to: (1) evaluate the accuracy of the draft text; (2) assess the likelihood that the draft materials will facilitate achieving the communication program objectives; and (3) assess whether the content addresses each of the desired outcomes (e.g., attitudes, knowledge, behaviors). See Example 5.21 for a sample comment sheet for use in agency reviews. Each agency staff reviewing the draft materials would be asked to complete the comment sheet.

Individuals within the target audiences should be involved to assess whether the draft materials are relevant, useful, and comprehensible. This target audience group should be asked to indicate specific problems with the materials, suggest improvements if they can, and suggest what they see as the likely outcomes should these materials be used (e.g., what behavior would they predict for themselves after receiving these materials?).

Mechanisms for collecting pretest information from target audiences include individual and group contacts. Selected individuals may receive information either delivered personally or through the mail. After they have had time to review it, agency staff may contact those individuals by telephone or personal visit, to ascertain the individual's response to the draft materials. Typically, a series of questions including both open- and closed-ended questions will be most productive. Closed-ended questions assure the agency will collect pretest information on specific aspects of the draft materials about which some uncertainty exists. The use of open-ended questions ensures the agency will likely learn of any very positive or negative characteristics of the draft materials which may have been totally unanticipated by the risk communicators.

Mail surveys may also be used during pretesting, with the mail questionnaire received either simultaneously with or after the receipt of the draft materials. Use of mail surveys for pretesting may require several followup contacts with potential participants to ensure they will complete and return their forms in a timely manner.

Focus groups may also be used for pretesting purposes. Focus groups typically consist of 8 to 10 participants, led by an experienced facilitator, and often accompanied by an observer/recorder. Participants in focus groups may receive the draft health advisory materials before or at the focus group meeting. Over the course of about two hours, the meeting facilitator poses focused questions for the group, attempting to ensure each person has an opportunity to present their viewpoints, but allowing the group some interaction so people can build their ideas off others' comments. The benefit of the focus group approach is the dialogue that can occur among participants. Through this dialogue, the risk communicator can often gain insight into the reasons for people's responses to draft health advisory materials moreso than is possible in interview or mail survey settings. See Example 5.22 for sample focus group questions.

**EXAMPLE 5.21 Comment sheet for agency reviewers involved in health advisory information pretests** (drawn from USDHHS 1993).

**Reviewer:**

**Health Advisory Target Audience:** (List who the information is designed to reach.)

**Major Objectives:** (List from the health advisory program.)

**Production Quality:** (Do the materials look professional? Is the format appropriate for the intended audiences and the intended dissemination mechanisms?)

**Content:** (Is the content clear and accurate? Is it up to date? Is it stimulating? Does it perpetuate myths? Is it balanced?)

**Credibility:** (Is the content credible to the target audiences? Are the proposed dissemination mechanisms credible to the audiences?)

**Ability to Attract Attention:** (What are the distinguishing qualities that are innovative or unique, yet appealing to the target audiences?)

**Ability to Convey Information:** (Are the messages positive and clear?)

**Ability to Change Attitudes:** (Are the persuasive techniques used appropriate for the target audiences?)

**Ability to Elicit Appropriate Action:** (Do the materials describe desired behavior? Do they illustrate skills required?)

**Appropriateness for Target Audience:** (Will the materials meet the needs of the designated audiences?)

**Appropriateness for Statewide Distribution:** (Will the materials stand alone, or require specific interpretation? Are they inappropriate for certain audiences or geographic regions?)

**Recommendations:** (How should the draft materials be modified before being adopted? What type of further pretesting is needed?)

**EXAMPLE 5.22. Sample focus group questions for pretesting health advisory materials** (adapted from USDHHS 1993).

What seems to be the main idea this information is trying to get across to you?

Was there anything in the information that was confusing? What was it? What do you think was confusing?

What was particularly worth remembering from this information?

What did you like about this information?

What did you dislike in this information, what bothered you?

Was there anything in the information that was hard to believe? What was it?

Was there anything left out of this information that you still want to know about health advisories or fish consumption? What do you want to know?

### 5.2.1 Summary of pretesting techniques

Strengths and weakness of each group of pretesting technique are as follows; cost comparisons were provided in Section 4:

**Individual interviews:**

**Strengths:** Discussion between interviewer and participant produces in-depth responses; Some responses may be participant-generated (i.e., through open-ended questions), with opportunity for followup by the interviewer; Early draft materials presenting general concepts can often be used as the basis for participant assessment; Participants are generally assured confidentiality; For telephone interviews, time commitment of participant is usually limited to about one-half hour; Depending on resources available, a statistically-valid sample may be used to allow generalizations about the population; Analyses can generally be completed moderately quickly.

**Weaknesses:** In-person interviews are very costly in terms of time and staff resources; Numerous in-person, individual interviews may be difficult to schedule given time constraints of the interviewer and participants; Requires skilled interviewers, particularly for useful open-ended questions.

**Mail surveys:**

**Strengths:** Can involve a statistically-valid sample of the population to yield insights about the entire population; Individuals are guaranteed confidentiality to a great extent; Participant time commitment is limited to one-half to one hour; Allows full consideration of materials that require some consideration and thought by the participant.

**Weaknesses:** No direct interaction between agency and participant; Materials must be fairly well-developed before being mailed; Often time-consuming to allow for mailed requests and returned responses; Analyses often time-consuming; Often costly in terms of materials and time.

**Focus groups:**

**Strengths:** Direct interaction between agency and participants allows for greater in-depth discussion and probing by the facilitator; Some responses may be participant-generated; Individuals within group can build off others' ideas; Health advisory materials can be in draft concept form for discussion; Can be completed, including analysis, fairly quickly.

**Weaknesses:** Confidentiality of individuals' statements is not possible; Requires skilled facilitator to keep group on task and assure all participants have an opportunity to speak; Size of group does not yield statistically-valid generalizations about the population; Requires fair time commitment from participants.

## 5.3 IMPLEMENTING THE COMMUNICATION STRATEGY

Prior to implementation, a timetable of implementation activities should be prepared. The timetable should be checked to assure all elements of the communication strategy (e.g., each dissemination mechanism, timing issues) are represented. Care should be taken to assure a smooth flow of implementation activities, allowing sufficient preparation time and early scheduling of any activities that are prerequisites for other components of the communication plan.

Included in the implementation timetable should be certain checkpoints or milestones (see Section 6.2 on Formative Evaluation) that are measured during implementation. Such checkpoints help staff track progress according to what was planned, and identify problems before they become major impediments to program success. Problems identified may indicate changes that are needed to the content of health advisory materials, dissemination mechanisms, or timeline. The original communication strategy can be altered to include the new information being learned through implementation of the communication program. Monitoring and flexibility are often the keys to program success.

During implementation of the health advisory communication strategy, staff should periodically assess whether:

- planned communication activities are being conducted;

- the context of the health advisory communication problem has changed (e.g., has another organization distributed unanticipated, contradictory information?);

- each target audience is being reached;

- responses of target audiences seem to be those desired as reflected in the program objectives (but recognize that achieving some objectives or observing specific results may occur long after the health advisory program is implemented);

- modifications are needed to the original timeline, and why;

- modifications are needed to the planned communication activities, and why;

- modifications are needed to the staff and budget requirements anticipated for the communication program.

## 5.4 MODIFYING THE COMMUNICATION STRATEGY IN AN ONGOING PROGRAM

Communication strategies should not remain static over time. The context of the communication problem may change, demanding a revised problem analysis and modified program objectives (see Section 3). The information needs of the target audiences may change over time, requiring different advisory content or tools to disseminate that content, or new audiences may be identified (see Section 4).

"Pretesting" information (see Section 5.2) in an ongoing program occurs constantly. Each time an individual receives health advisory information, it is being tested. The key as an agency is to remain responsive to, indeed, to identify, every opportunity for gathering these "pretest" data.

Inquiries received by an agency from individuals requesting clarification of health advisory information are a rich source of test data. Who were the individuals who seemed to have difficulty with various aspects of the health advisory? Why did they have questions? What modifications are warranted in health advisory content or dissemination methods during the next revision? Inquiries may be received by telephone, mail, at public meetings on health advisory or other related or unrelated topics, at state fairs, at workshops, indeed, anytime agency staff interact with citizens. To the extent possible, such feedback should be recorded and shared with those involved in the health advisory communication process (see Section 6, Evaluation).

The health advisory risk communication process is iterative (see Fig. 2.1). Evaluation (see Section 6), no matter how extensive, may result in communicators returning to the problem analysis, audience needs assessment, communication strategy design, or communication strategy implementation phases of the communication process.

## 5.5 SUMMARY CHECKLIST

1. Review health advisory communication program objectives.

2. Review target audience needs assessment.

3. Determine the health advisory format and tone relative to target audience needs. Consider:

   a) use of text, tables, and graphics;

b) using a cajoling rather than a commanding tone;

c) using a combination of quantitative and qualitative information;

d) reading level of the materials vs. the reading abilities of the target audience.

4. Determine the health advisory content relative to target audience needs, and to the limitations of eventual dissemination mechanisms. Consider:

a) core fish consumption recommendations;

b) description of chemicals of concern and their effects;

c) explicit comparisons of the relative safety of fish species, sizes, and/or fishing locations;

d) description of adverse health effects from eating fish;

e) description of health benefits of eating fish;

f) comparison of health benefits and health risks;

g) comparison of health risks from fish consumption with other risks;

h) description of risk-reducing fish cleaning and cooking methods;

i) description of assumptions made in risk assessment and risk management decisions;

j) description of uncertainties in risk assessment; and

k) suggestions how to tailor general core fish consumption recommendations to an individual's personal circumstances.

5. Determine which dissemination mechanisms are accessible to target audiences, and meet the needs for communicating the content required. Consider:

a) mass media;

b) specialized media; and

c) interpersonal contacts.

6. Determine the frequency with which information should be disseminated via each of the dissemination mechanisms.

7. Package the health advisory information to conform to the characteristics of the dissemination mechanisms that will be used.

8. Conduct pretesting to determine the most effective health advisory content, format, and dissemination mechanisms to reach target audiences. Consider using:

   a) in-person individual interviews;

   b) telephone surveys;

   c) mail surveys; and

   d) focus groups.

9. Construct a timetable of all anticipated events in the communication program, indicating milestones to be monitored.

10. Implement the communication strategy, conducting periodic assessments of the implementation process.

# SECTION 6

# DEVELOPING, IMPLEMENTING, AND INTERPRETING A RISK COMMUNICATION PROGRAM EVALUATION

The objectives of this section are to: (1) discuss the importance of preparing for program evaluation throughout the design and implementation of the communication program; and (2) describe the purpose and techniques of formative evaluation, process evaluation, and summative evaluation. Evaluation is a key feature that creates an iterative risk communication process. Results of an evaluation may send the risk communicator back to the problem analysis phase, to audience characterization, or to the strategy design and implementation phases (Figure 2.5).

## 6.1 PLANNING FOR EVALUATION

The capacity to conduct meaningful evaluations is determined in large part as the communication program is planned. Evaluation conducted only as an afterthought after implementation of the communication program has been completed is likely to be of less value to the health advisory program than an evaluation planned and conducted as an integral part of the risk communication process.

Creating the capacity to conduct meaningful evaluations includes:

(1) **Specifying clear, measurable objectives** that indicate the outcomes to be achieved for each target audience. These objectives indicate what outcomes should be measured during summative evaluation.

(2) **Measuring target audience characteristics** prior to beginning the communication program. Such measurements conducted at the time audience information needs are assessed provide the baseline, or before-program, data necessary for evaluating the changes associated with the implementation of the communication program.

(3) **Developing clear plans** specifying intended communication activities, audiences, staff involvement, budget, etc. Process evaluations conducted during program implementation must have a basis for comparison to assess if program resources are being used as intended.

(4) **Including appropriate data-gathering activities** throughout the implementation of the communication program to ensure the information necessary for evaluation is available when needed. For example, if evaluation will be based in part on the number of telephone calls received requesting information, a log of such calls should be kept throughout the program period.

(5) **Committing staff time, budget, and other resources to evaluation** as an integral part of the health advisory communication program. Costs for communication program evaluation may range from several hours of staff time during formative evaluation to tens of thousands of dollars for comprehensive, statewide summative evaluation studies.

## 6.2 FORMATIVE EVALUATION

### 6.2.1 Purposes

Formative evaluation is an assessment of the quality of the risk communication planning efforts. Formative evaluation has also been termed **planning evaluation.** It is conducted while the communication plans are still being formed. Formative evaluation assesses the accuracy of the original characterization of the risk communication problem, and helps the risk communicator determine if the problem analysis phase of the risk communication program is adequate.

Formative evaluation is a key element in ongoing programs. The results of process and summative evaluations will likely point to modifications required in some aspect of the risk communication program. As new (modified) communication plans are developed, formative evaluation is important.

#### 6.2.1.1 Match between objectives and implementation plans

Formative evaluation considers to what extent the planned communication program is likely to achieve the communication program objectives. Questions such as the following are answered:

- Is the content likely to facilitate achievement of health advisory program objectives? If not, why not?

- Is the content relevant to the desired outcomes (e.g., advisory knowledge, community education, fishing behavior, fish consumption behavior)?

- Is the content likely to be relevant and useful to the target audiences?

- What barriers exist in the target community or location that might mitigate against the proposed communication plan?

Evaluation of draft content and dissemination plans at this early stage allows for critical improvements to be made in the communication program before costly commitments have been made in terms of materials or time. Early evaluation also allows the risk communicator to confirm that the original risk communication problem was defined accurately. If not, the communication process returns to the problem analysis phase.

Formative evaluation at this stage may also help to clarify program objectives, indicating objectives that may simply be unrealistic or inappropriate for that particular agency to achieve. Formative evaluations may result either in refined communication program plans, or in refined program objectives.

### 6.2.2 Techniques

Formative evaluation occurs during the problem analysis and objective-setting, audience needs assessment, and communication strategy pretesting phases of the risk communication process. Formative evaluation costs may range from several hours of staff time in brainstorming and review activities, to several thousands of dollars spent on pretesting activities. Minimal resources are needed for readability tests; modest resources for on-site interviews; and more substantial resources for several focus groups or numerous in-depth individual interviews (USDHHS 1993).

#### 6.2.2.1 Formative evaluation in problem analysis

During the problem analysis phase, formative evaluation prompts staff to consider whether all relevant characteristics of the context in which the health advisory program will be conducted have been considered adequately. Staff from multiple agencies involved in the health advisory program should be involved. In some cases, selected members of potential target audiences, or of service organizations whose clients are potential target audiences, should be involved as "advisors" to suggest any elements of the communication context that may have been overlooked by agency staff. Often, group brainstorming and discussion is a productive technique to ensure adequate problem analysis.

#### 6.2.2.2 Formative evaluation during audience needs assessment

Formative evaluation during the audience needs assessment phase is conducted to ensure each potential audience is assessed, and adequate profiles are developed. Staff should compare communication program objectives with the target audiences being assessed. Profiles for each audience deemed important in the program objectives should be available when designing the communication strategy. Audience profiles should be checked to ensure they are as complete as possible within time and resource constraints, and specific enough for eventual evaluation of communication program outcomes. Information collected during the audience needs assessment usually provides the baseline against which changes in audience behavior or beliefs related to fish consumption will be evaluated.

Formative evaluation during the audience needs assessment phase can also be used to double-check the relevancy of the program objectives. If the audience needs assessment indicates a particular target audience has already adopted appropriate fish consumption patterns, that audience may be dropped from the program objectives or receive less emphasis than originally planned.

#### 6.2.2.3 Formative evaluation during communication strategy design

Pretesting draft health advisory materials is the most common type of formative evaluation during the design phase of the communication strategy. Pretesting helps ensure health advisory materials will be relevant, understandable, credible, and acceptable to the target audiences, and have a good likelihood of resulting in desired responses among the audiences. Pretesting normally involves review of draft health advisory materials by members of the target audience, either in individual or group settings. See Section 5.2 for detailed discussion of pretesting techniques and examples.

Formative evaluation during the strategy design phase also includes periodic comparison of the proposed communication tools with the program objectives and the audience needs identified in the previous phase of the communication process. As various communication tools are considered for adoption, they may be assessed relative to the following:

- How does the proposed health advisory content relate to program objectives?

  e.g., Are the materials sufficiently clear for an angler to determine how to clean a fish for maximum contaminant reduction? Do the

materials indicate clearly which contaminants and which fishing locations these techniques would be useful for?

- How does the proposed health advisory content relate to the information needs of the target audiences, identified during the audience needs assessment?

  e.g., Is the recommendation to release fish of certain lengths appropriate for Southeast Asian anglers fishing the Mississippi? How regularly do they catch such fish? Do they normally keep such fish? For what purpose? If they release these fish, what fish can they keep?

- How likely is it that the dissemination mechanisms being considered will reach the intended target audiences?

  e.g., To what extent do low-income women of childbearing age frequent the health care clinics we've targeted for distributing the advisory brochure? Where else might they obtain health advisory information?

- Does the proposed timing of the communication events correspond to the likely fish consumption episodes of target audiences?

  e.g., We have to wait until the summer fish tissue sample is processed to determine what the new fish consumption recommendations will be. This means we will have new advice available in February. Should we release the information then, or wait until the peak of the fishing season (e.g., June), or do both?

Taking the time during communication strategy design to answer such formative evaluation questions can prevent the selection and implementation of communication activities with little likelihood of achieving program objectives or meeting the needs of target audiences, and greatly improve the prospects for program success.

## 6.3 PROCESS EVALUATION

Process evaluation assesses the correspondence between activities planned and activities implemented. Process evaluation focuses on health advisory program implementation activities, such as to what extent health advisory messages were disseminated as planned, or if the anticipated risk communication budget was actually available to an agency. Process evaluation should be ongoing, in both new and established risk communication programs.

### 6.3.1 Match between implementation plans and reality

Typical questions in a process evaluation include whether health advisory communication activities are being conducted on the intended time schedule, with the intended dissemination mechanisms, within budget, and using the intended and available staff and other resources. Process evaluations can be conducted during the course of the communication program and used to modify the communication program during implementation. There is no need to wait until the end of a particular program to evaluate its implementation process. However, program

implementation should be sufficiently underway to be able to permit accurate monitoring of: timetable and budget management, appropriateness of staff and resource assignments, and the effectiveness of dissemination mechanisms/communication strategies.

Process evaluations conducted during the implementation of a communication program can be used to modify the program before too many resources (including time) have been expended. A process evaluation may determine that the content of a message is contrary to certain program objectives. This may stimulate a change in message content before the program is fully implemented. A process evaluation may show that the intended staff have not been committed to the communication program. Staff reassignments may be made to put the program back on its intended track.

### 6.3.2 Techniques: Process evaluation during communication strategy implementation

After the communication activities are underway, process evaluation focuses on monitoring and improving the implementation process. Process evaluations help assure that the communication program is progressing as planned.

Costs of process evaluations can be minimized if appropriate monitoring activities are built into the regular responsibilities of health advisory program staff. Proper record-keeping as activities are conducted will minimize the amount of additional effort required to produce process evaluation information. Minimal resources are required for routine recordkeeping; modest resources are required for ongoing comparisons of activities with program plans; and substantial resources are required for communication program audits conducted by external review teams (USDHHS 1993).

Problems in carrying out certain planned communication activities, or with the likely effectiveness of certain health advisory materials are also identified during process evaluation. Staff, target audiences, or partners in communication activities may be the source of process evaluation information. For example, if health care providers have been enlisted as partners to disseminate health advisory brochures targeted toward women, they should be asked how that process seems to be working. Did they receive the brochures in a timely manner? Have they run out? What comments do they hear from their clients? If problems are identified early in the implementation process, modifications may be made to ensure a good probability of program success.

Process evaluation activities may include:

- regular contacts with communication partners to determine if they are receiving their materials in a timely manner, and how receptive their clients are to the materials;

- review of distribution points for health advisory materials to ensure materials are being distributed and are still available (e.g., at fishing license sales offices);

- reviewing print media clips provided by a clipping service to determine how news releases and interviews with media staff are being published;

- monitoring the volume and frequency of requests for health advisory information (e.g., by mail, through "800" telephone number);

- monitoring the length of time taken to reply to information requests;

- conducting telephone interviews or focus groups with key members of target audiences to assess how well materials are reaching individuals and how they are being received.

Process evaluation is an important component of ongoing health advisory communication programs. Agencies may receive solicited or unsolicited feedback from individuals regarding how clearly an advisory message is stated, how easily accessible the information is, or questions that still remain regarding the safety of fish consumption.

Feedback may occur at any time, in any place. For example, health agency staff in Minnesota held a public meeting on remediation plans for a contaminated river. A member of the audience suggested the agency should give a better explanation of a certain phrase in the health advisory. Although the purpose of the public meeting was not to evaluate health advisory communication, valuable information about the advisory's effectiveness and clarity was gained. The health agency made the suggested change in the next iteration of the advisory (P. Shubat, MN Dept. of Health, personal communication).

## 6.4 SUMMATIVE EVALUATION

### 6.4.1 Purposes

Summative evaluation assesses the outcomes or impacts produced through the risk communication program (thus far). This type of evaluation measures the effects or impacts of the risk communication program on the target audiences. It provides a summation of program effects after program implementation. To what extent did the health advisory communication program achieved its objectives?

Typical outcomes that are assessed include changes in awareness, knowledge, behaviors, and beliefs and attitudes among target audiences. Outcomes may be intentional or unanticipated. Evaluation methods should be selected to allow assessment of both types, particularly when unanticipated outcomes may be very important relative to agency program objectives or to long-term program success. Ideally, the status of these factors prior to the health advisory communication program will be known, so before- and after-program comparisons may be made.

Summative evaluations are not reserved for programs that are "ending" in some way. Summative evaluations are key elements of ongoing risk communication programs. The time elements included in risk communication objectives (e.g., achieve by April, 1996) indicate when summative evaluations should occur. Summative evaluations help measure whether the outcomes specified in communication objectives were attained by the target date.

### 6.4.2 Indicators

The social-psychological model of human response to health advisories (Fig. 4.1) implies a variety of personal outcomes may be associated with health advisory

communication programs. The discussion below focuses on individual outcomes that may be assessed during summative evaluation.

In addition to individual outcomes, societal, cultural, and local or regional impacts are possible. Individual outcomes (e.g., reduced fishing activity) may contribute to regional impacts (e.g., weakened economies in areas dependent on recreational fishing and tourism). See Volume 3 in this series, Risk Management, for a discussion of the potential societal, cultural, and economic impacts associated with health advisory programs. Each of these impacts may be an important indicator to measure during summative evaluations.

### 6.4.2.1 Audience knowledge

Summative evaluations may assess the extent of awareness of health advisories within a target audience, and the extent of knowledge related to health advisories. Connelly et al. (1992) assessed knowledge in six areas related to health advisories. Those areas and specific knowledge items are listed in Example 6.1. Measurement of knowledge related to health advisories should focus on those concepts addressed in the program being evaluated.

### 6.4.2.2 Audience behaviors

Summative evaluations may compare the behaviors of target audiences with the desirable behaviors promoted through the health advisory communication program. Evaluations should measure: (1) awareness and adoption of behaviors promoted through the health advisory information; and (2) other behaviors that may be a response to health advisories, whether desirable or undesirable.

Behaviors assessed in a summative evaluation may include:

(1) frequency and amount of consumption of sport-caught fish with health advisory restrictions;

(2) frequency and amount of consumption of fish not restricted in health advisories, whether sport-caught or commercial;

(3) fish preparation methods including fish cleaning and cooking techniques, some of which may reduce exposure to some contaminants;

(4) extent of fishing activities, including frequency of fishing trips, species sought, locations fished; and

(5) frequency of use of health advisory information sources, and types used.

See Appendix C for examples of questions that may be used in summative evaluations to assess behavioral outcomes and impacts (see especially Knuth et al. 1993).

**EXAMPLE 6.1 Knowledge areas that may be evaluated during the summative evaluation process** (from Connelly et al. 1992, see Appendix C).

**Knowledge about effects of contaminants on fish:**

- Many chemical contaminants are found in greater amounts in fatty fish than in lean fish.

- Older fish generally have more contaminants in them then younger fish have.

- Fish contaminated with chemicals may not taste odd.

- Fish contaminated with chemicals may or may not behave normally.

**Knowledge about negative health effects of fish consumption:**

- Eating contaminated fish over many years increases my health risk.

- Eating contaminated fish can result in accumulation of chemicals in my body.

- Chemicals from fish can have a greater impact on developing organs in children or unborn babies than on organs in adults.

- Potential negative health effects from eating contaminated fish include nervous system disorders and cancer.

- Negative health effects from eating contaminated fish are mainly long term.

**Knowledge about positive health effects of fish consumption:**

- Increasing fish consumption reduces dietary fat and helps to control weight.

- Eating fish oils decreases the risk of coronary heart disease.

**Knowledge about specific advisory recommendations:**

- Maximum number of fish meals eaten from state's waters.

- Maximum number of fish meals women of childbearing age and children under 15 should eat if fish have elevated contaminant levels.

**Knowledge about the advisory process:**

- Who should be contacted if someone wanted to know more about health effects from exposure to chemical contaminants.

- Who should be contacted if someone wanted to know more about contaminant levels in fish.

- Method used to measure contaminant levels in fish (e.g., fillet with skin on).

(Continued on next page.)

**(Example 6.1 continued from previous page.)**

**Knowledge about other risk-reducing behaviors:**

- To reduce the levels of chemical contaminants in fish, you should do which of the following? (e.g., remove the belly fat, remove the skin, broil the fish, pan fry the fish).

### 6.4.2.3 Audience beliefs

Beliefs about fish consumption, fish contamination, and health advisory programs may greatly influence the behavior of potential fish consumers (see Fig. 4.1). Survey instrument examples of belief measures can be found in Appendix C.

One of the most important beliefs to measure may be the extent to which an individual believes he/she is adhering to the advisory recommendations. Research at Cornell University has demonstrated differences between such beliefs and actual fish consumption behaviors measured in mail-survey and angler-diary studies. In these studies, anglers were asked if they believed they were following the fish consumption advice in health advisories. Anglers were also asked to report their actual fish consumption. The two measures were compared. Actual fish consumption often exceeded health advisory recommendations, even for anglers who believed they were following the recommendations. Such a discrepancy indicates the need to reexamine the clarity and accessibility of health advisory recommendations for these audiences.

## 6.4.3 Techniques

Summative evaluation methods include those discussed in Section 4 on target audience assessment (e.g., focus groups, mail and telephone surveys). The major differences in studies conducted for audience assessment purposes vs. summative evaluation are timing and sample size considerations. A larger sample size is often needed for summative evaluation studies compared to audience assessments. Therefore, costs of conducting summative evaluation studies will be on the high end of those reported in Section 4.

Audience assessment studies are conducted prior to implementing a health advisory communication program. These data provide the baseline for later comparison in a summative evaluation study. Summative evaluation studies are conducted after the health advisory communication program has been implemented. The time frame included in program objectives (e.g., achieve by April, 1996) will indicate when the summative evaluation should be conducted.

The larger sample size required for summative evaluation is generally necessary if the program evaluators seek to measure statistically significant program outcomes and impact in large regions (e.g., statewide). Samples for audience assessment purposes may not have been selected to produce statistically valid predictions about the entire state population.

Planning for summative evaluation, therefore, is critical even at the early stages of the risk communication process. If a large sample size is required for a before-and-after study of health advisory communication effectiveness, the large "before"

sample should be identified and used during the audience assessment phase of the risk communication process.

Care must be taken to select a sufficient sample from among the audiences actually targeted by the communication program. For example, licensed anglers may constitute 10-40% of the general population in a state. A sample drawn from among the general public, therefore, would be expected to contain only 10-40% licensed anglers. If the health advisory communication program was targeted mainly toward licensed anglers, it would be unreasonable to expect to measure a communication program impact in the entire general public sample. Rather, data from licensed anglers should provide the main basis for summative evaluation. Data from the rest of the general public sample could provide an indication of unanticipated or unplanned outcomes of the health advisory communication program.

Methods in addition to those discussed in Section 4 may also be useful in summative evaluations. Interviews and groups discussions among agency staff provide data on staff perceptions about the outcome and effectiveness of the communication program and of their own efforts. See Example 6.2 for a sample of interagency focus group questions.

**EXAMPLE 6.2. Focus group questions for interagency evaluation of health advisory communication programs.**

What agency objectives did the health advisory materials seem to help achieve, or at least move us toward achieving?

What objectives haven't we begun to accomplish? So, what seems to be missing from the advisory communication strategy (e.g., content, format, dissemination plan)?

What positive reactions have you heard from or observed among target audiences? So what seems to be working in the advisory materials?

What negative reactions have you heard from or observed among target audiences? So what seems to need improvement in the advisory materials?

What changes do we need to make in our advisory communication program because of new information or new assumptions?

What other kinds of evaluation should we do?

What kinds of pretesting do we need for new information?

Cooperative ventures among agencies may be useful. For example, creel survey data collected by fishery management agencies provide an indication of fishing effort, fish harvest, and locations fished. Current creel survey data from an area subject to an advisory may be compared with historical creel data from the same area, or with current data from a similar area not subject to an advisory. These comparisons provide an assessment of the impact of health advisories on particular fisheries.

All aspects of summative evaluations need not be expensive, however. With a little creativity, evaluators can usually identify qualitative and quantitative methods that provide at least some indication of the outcomes and impacts produced by health advisory communication programs.

Some states (e.g., Minnesota) include a tear-out survey form within the health advisory brochure. Readers are asked to complete the survey and return it to the agency (see Appendix B). These questionnaires may include a few specific questions about the advisory materials (e.g., Does the fish advisory help you in choosing fishing locations?), and opportunity for open-ended comments about the advisory program. This approach is relatively low cost because multiple mailings and complex sampling schemes are not required. Comments are received from actual communication program clients. The major drawback of this approach is the uncertainty about who is submitting comments. Since a representative sample of program participants was not drawn, the agency cannot generalize the results back to the target audience population. Communication staff do not know if they are receiving only the most positive, most negative, or a fair distribution of responses to the health advisory program.

See Example 6.3 for a sample form for recording evaluation comments as they are received during the implementation of the communication program. Systematically recording comments received over the telephone, at public meetings, or in other public presentations can provide a low-cost yet rich source of summative evaluation information. (This information collected during program implementation can also be used to improve the communication process as it occurs.)

Without summative evaluation, communication programs are unlikely to improve through future efforts. Minimal resources are required for activity assessments that rely on routine recordkeeping (such as a record of the number of health advisory brochures distributed), or use document review as the main information sources; moderate to substantial resources are required for limited or extensive assessments of target audience knowledge gain or behavior change.

**EXAMPLE 6.3. Form for recording comments about health advisory materials that are received over the telephone or at public meetings and presentations.**

**Date:**

**Contact Type:** (e.g., public meeting on risk assessment; public meeting on Superfund sites; telephone inquiry about health advisory recommendations)

**Reason for Comment:** (What aspects of the health advisory prompted comment? Having a check-off list may be useful.)

_____ text in general
_____ tables
_____ maps or diagrams
_____ length
_____ quantitative information
_____ recommended frequencies of consumption

(Continued on next page.)

(Example 6.3 continued from previous page.)

_____ special recommendations for women of childbearing age and children
_____ recommendations for a specific waterbody
(list: _____)
_____ chemicals of concern and their effects
_____ help identifying what is safe to eat
_____ adverse health effects from eating fish
_____ health benefits of eating fish
_____ want to know if he/she should eat the fish
_____ want to know if I eat the fish
_____ comparison of sport- vs. commercial fish
_____ comparison of fish consumption with other risks
_____ fish cleaning or cooking techniques
_____ how information was distributed
_____ other (list:_____)

**Negative Comments:** (What did the individual or group dislike about the health advisory materials? Checklists may be useful to develop tailored to the types of comments an agency typically receives.)

_____ confusing (Probe: _____)
_____ hard to understand (Probe: _____)
_____ incomplete (Probe: _____)
_____ biased (Probe: _____)
_____ not useful (Probe: _____)
_____ inaccurate (Probe: _____)
_____ not interesting (Probe: _____)
_____ not informative (Probe: _____)

_____ did not help person choose fishing locations
_____ did not help person decide how much fish to eat
_____ did not help person learn how to clean and cook fish
_____ did not answer specific information needs about:
_____

**Positive Comments:** (What did the individual or group like about the health advisory materials? Checklists may be useful to develop tailored to the types of comments an agency typically receives.)

_____ very clear (Probe: _____)
_____ easy to understand (Probe: _____)
_____ complete (Probe: _____)
_____ unbiased (Probe: _____)
_____ very useful (Probe: _____)
_____ accurate (Probe: _____)
_____ very interesting (Probe: _____)
_____ very informative (Probe: _____)

(Continued on next page.)

(Example 6.3 continued from previous page.)

_____ helped person choose fishing locations
_____ helped person decide how much fish to eat
_____ helped person learn how to clean and cook fish
_____ answered specific information needs about:

_____

**Specific Comments:** (Transcribe comments that would be useful to keep on record.)

**Followup Required:**

- **For caller/informant:** (List any type of information to be sent to the person you talked with.)

- **For communication program:** (List any changes you should consider making in the communication program in response to these comments.)

- **Date Followup Completed:** (Provides a system for tracking whether communication followup activities are completed.)

## 6.5 SUMMARY CHECKLIST

1. Build an evaluation capacity into every element of the health advisory communication program.

2. Conduct a formative evaluation to assess the extent to which:

   a) the problem analysis is sufficient;

   b) adequate audience profiles have been prepared for all intended audiences; and

   c) a planned communication program is likely to achieve the communication program objectives, through pretesting and comparison of plans with program objectives and audience needs.

3. Conduct a process evaluation to assess the extent to which the communication program is being implemented as intended.

4. Conduct a summative evaluation to assess the outcomes of the health advisory communication program, considering original program objectives. Indicators may include:

   a) audience awareness and knowledge;

   b) audience behaviors; and

   c) audience beliefs.

5. Remember that evaluation of ongoing programs is continuous. Formative, process, and summative evaluations of the communication program should be a part of each cycle of health advisory program review and revision.

# SECTION 7

# RESPONDING TO INQUIRIES FROM THE PUBLIC

The objective of this section is to provide guidance related to the overall relationship of the risk communication agency with its clients, specifically geared to assisting the agency with responding to inquiries from its clients.

## 7.1 HOW PEOPLE MAY VIEW RISKS

### 7.1.1 General Perceptions of Risks and Implications for Health Advisory Communication Programs

Fish consumption recommendations in health advisories are based on calculation of risk, weighing the seriousness of the hazard posed by consumption of chemically-contaminated fish. The set of criteria used to judge the seriousness of the hazard, however, may differ considerably among experts and the public (Scherer, 1991). Risk experts tend to base their judgments of risk on criteria such as how likely an adverse effect is, and how severe that effect may be. The public, however, may use a much broader set of criteria in judging risk.

Sandman (1987) described a combination of more than twenty factors as the "outrage" associated with a risk by the public. These factors include the voluntariness and fairness of a risk, the degree of personal control one has over the risk, and the process by which risk-related decisions are made. Slovic et al. (1982), Slovic (1987), Covello (1989), and Merkhofer (1987) suggested risk perceptions are influenced by a variety of factors. For risks associated with eating contaminated fish, these may include:

(1) the perceived and actual likelihood that a person will become ill from eating contaminated fish;

(2) the severity, immediacy, and familiarity of the negative effects of fish consumption;

(3) the personal stake an individual has in fishing and/or eating fish;

(4) the potential impact on young or unborn children;

(5) the visibility of "victims" of fish consumption;

(6) scientific uncertainty about the seriousness of health risks;

(7) voluntariness and controllability of exposure to contaminants in fish;

(8) clarity of the benefits associated with fishing and fish consumption;

(9) sense of equity, or fairness of the distribution of costs and benefits associated with health advisory recommendations;

(10) trust in the institutions that manage public health, fisheries, and aquatic systems; and

(11) media and other coverage of fish contamination and consumption issues.

Baird (1986) found that denial of risks is closely associated with those most at risk. Health advisory communicators, therefore, may expect that those most involved in catching and eating fish may exhibit the greatest denial.

Douglas and Wildavsky (1982) explained that culture and societal values influence perception of risk. Relevant cultural factors for fish consumers may include (1) the importance of fishing activities to the local community, either economically or for the social network; (2) the importance of fish in the diet, either as a convenient and inexpensive protein source, or for religious or spiritual significance; (3) the relationship of the health advisory agencies within the target audience community, including the degree of trust and credibility placed in the agencies; and (4) the relationship of the polluter or chemicals of concern to the local community and economy.

For these reasons, health advisory communication programs may not achieve the outcomes risk managers seek. Health advisory communicators should try to: (1) understand the factors that influence perceptions and behaviors associated with the risks of fish consumption among the target audience; (2) develop communication strategies that respond to these factors; and (3) realize that limitations exist on what risk communication programs can accomplish. Health advisory communication programs, no matter how well designed and implemented, cannot guarantee that certain behaviors or beliefs will be adopted by the target audiences.

## 7.2 STRATEGIES FOR ESTABLISHING TRUST AND CREDIBILITY

Information sources perceived as credible are more likely to influence attitudes and behaviors of target audiences than those that are not perceived as such (Petty and Cacioppo, 1981; Miller, 1987). Credibility of information is related to many factors, including the communicating agency's reputation for honesty vs. deceit, and education vs. coercion, and the presence of contradictory information, particularly from similar types of information sources (National Research Council, 1989).

### 7.2.1 USEPA's Seven Cardinal Rules of Risk Communication

The U.S. Environmental Protection Agency developed and promotes actively "The Seven Cardinal Rules of Risk Communication" (USEPA, 1992). Each of the seven rules includes several specific elements aimed to foster an effective risk communication program. These rules, their specific elements, and their implications for health advisory programs are:

**(1) Accept and involve the public as a legitimate partner.**

a) Demonstrate respect for the public by involving the community early in the decision-making process.

b) Identify all parties that have an interest or stake in the issue or problem.

For health advisory programs, this rule implies that agencies will identify affected audiences, and include their perspectives in selection of the risk communication strategies. For example, agencies can show a respect for

and commitment to addressing the information needs of the target audiences by learning from the affected public whether it is enough to simply list recommended fish consumption limits, or rather, that health effects information should be included.

**(2) Plan carefully and evaluate your efforts.**

a) Establish clear and explicit risk communication objectives.

b) Classify and segment various groups among audiences.

c) Aim communications at specific subgroups in audience.

d) Provide sufficient information to discuss risks.

e) Train staff in communication skills.

f) Pretest messages.

g) Evaluate efforts.

The purpose of each of the preceding sections of this manual is to provide guidance to the health advisory risk communicator on each of these elements of health advisory communication planning and evaluation. See particularly Sections 3, 4, 5, and 6.

**(3) Listen to the public's concerns.**

a) Make no assumptions about what people know, think, or want done about risks.

b) Find out what people are thinking, using, for example, interviews and surveys.

c) Recognize people's emotions.

d) Recognize broader economic and political considerations.

See Section 3 and 4 in this manual regarding the application of these elements to health advisory communication programs. This cardinal rule underscores the importance of understanding your target audiences.

**(4) Be honest, frank, and open.**

a) Admit when you do not know an answer or are uncertain.

b) Get back to people with answers.

c) Do not minimize or exaggerate the level of risk.

d) Discuss data uncertainties, strengths, and weaknesses.

e) Identify worst-case estimates, and cite ranges of risk estimates when appropriate.

f) If in doubt, share more information rather than less.

Cardinal rule Four emphasizes the importance of including health advisory content addressing the assumptions and limitations of the risk assessment and risk management components of the overall health advisory program. See Section 5 in this manual.

**(5) Coordinate and collaborate with other credible sources.**

a) Coordinate interorganizational and intraorganizational communication.

b) Devote effort and resources to building bridges with other organizations.

c) Issue information jointly with other trustworthy sources.

Institutional support for health advisory risk communication programs is critical for program success. Health advisory programs often involve several agencies (e.g., health, environmental quality, fishery management) in the development and dissemination of fish consumption recommendations. Additionally, potential fish consumers (e.g., anglers, low income subsistence anglers, charter boat clients) are often likely to consult an agency or organization not directly involved with the establishment of the fish consumption recommendations with detailed questions about the health advisory. In these cases, it is important for the lead agency, often the health agency, to work closely with other government agencies and public or private organizations to ensure those agencies and organizations have available the best information possible regarding the health advisories.

For example, although the health agency may develop the fish consumption recommendations, sport anglers often turn to the fishery management agency for information and questions associated with health advisories. If fishery managers are not familiar with health advisory program information and cannot respond to information requests, a lack of trust in government by the angler may result. This lack of trust may lead to a lack of faith in the fish consumption recommendations.

Similarly, agencies issuing health advisories may benefit from working outside of similar government channels. For example, state health agencies may look beyond other state agencies for communication program assistance. Other organizations, such as Cooperative Extension (usually county-based), primary health care providers (local), and local or regional social or religious organizations may be key intermediaries for providing accurate health advisory information to specific target audiences. See Section 5 in this manual for discussion of health advisory dissemination.

Competing economic or philosophical interests may affect a health advisory risk communication program adversely. For example, businesses that stand to be hurt by negative attitudes associated with the healthfulness of fish (e.g., fishing charter boats) may question and actively undermine the health advisory program, attempting to portray a less risky fish consumption situation than that communicated by the agency. Advocacy organizations (e.g., environmental quality interest groups) may attempt to portray a more serious situation, either in the interest of greater protection of human health based on selection of more conservative acceptable risk criteria than those used by the agency, or in the interest of greater public attention to environmental cleanup activities that could be generated by

portraying a particular waterbody or fish population as being substantially contaminated. These situations may demand a more aggressive risk communication program, particularly with key audiences who may be more likely reached or influenced by these other forces.

**(6) Meet the needs of the media.**

a) Be open and accessible to the media.

b) Provide risk information tailored to the needs of each type of media.

c) Provide background material on complex risk issues.

d) Follow up on coverage with praise and criticism as warranted.

e) Establish long-term relationships with specific editors and reporters.

See Section 5 in this manual for insights about working with the media related to health advisory programs. Establishing long-term relationships is perhaps the most important element of Rule 6. Such relationships are fostered through interactions beyond health advisory programs -- providing sound information to media staff for a variety of issues, so they will be receptive to your health advisory information as well as other media-worthy information you seek to share.

**(7) Speak clearly and with compassion (or in the case of health advisories, speak and write in this manner).**

a) Use simple, non-technical language.

b) Use examples that make technical risk data come alive.

c) Avoid distant, abstract language about deaths and illnesses, and use risk comparisons to help put risk in perspective.

d) Include a set of actions that are underway or can be taken to reduce the risk.

Health advisory staff may benefit from developing a written set of responses to commonly asked questions. Such a list may be posted by the telephone or carried in a folder taken to public meetings. Responses should be in the words that would really be used on the telephone or in person. Scripts developed in advance help ensure important information is communicated each time a question is asked. See Section 5 for example inquiry topics agencies may receive.

In the case of health advisories, avoid risk comparisons that are not relevant to the target audience or to the risk involved. Comparisons of the risk of eating contaminated fish with a risk such as that of being struck by lightning may be irritating to your audience. Being struck by lightning can be viewed as an act of nature or of a superior power, a situation over which an individual has little control, and often resulting in a quick death. Consuming contaminated fish will not result in a quick death, nor is fish consumption normally out of a person's control. Comparing fish consumption risks with the risks of eating other protein sources, for example, may be much more meaningful and persuasive to the intended audiences.

See Section 5 in this manual (and Volume 3, Risk Management) for a discussion of risk comparisons, and Section 7.1 for discussion of the distinctions made by the public when evaluating risks.

Agencies following these cardinal rules in health advisory communication programs can only enhance the trust and credibility assigned by the public.

### 7.2.2 Addressing uncertainty

Communicating the limitations and uncertainties associated with health advisory fish consumption recommendations is a difficult issue to address. Very little empirical evidence exists to suggest how agencies should explain that recommended fish consumption limits are based on a process filled with interpretation and uncertainty. Similarly, empirical support for the notion that agencies should communicate uncertainty is also sparse.

Some public audiences perceive that fish consumption advice is scientific, infallible, logical, and based on clear, uncontrovertible data. Others, however, recognize that value judgments, human and technological error, and incomplete knowledge of potential health effects may all be present in health advisory programs.

To address the general issue of communicating uncertainties associated with health risks, a set of recommendations is scheduled to be developed by the Subcommittee on Risk Communication and Education of the Public Health Service Committee to Coordinate Environmental Health and Related Programs of the U.S. Department of Health and Human Services (USDHSS, 1993). Until those recommendations are available, however, health advisory program planners should consider the following ideas.

Hance et al. (1990) provided a series of guidelines to risk communicators working in communities concerned with environmental hazards. The guidelines were based on a series of interviews with academic experts, agency staff, and others knowledgeable about risk communication. Several of those recommendations are pertinent to health advisory communication:

(1) **Acknowledge uncertainty.** The authors suggest that admitting your uncertainty may enhance credibility and foster trust between the agency and target audiences. They suggest saying "I don't know" is one of the most important phrases a risk communicator can use.

(2) **Provide background information about scientific uncertainties, and stress the caution that is built into risk assessment and health advisory recommendations.** Background information may include explaining uncertainty in scientific approaches in general, then explaining the uncertainty in the methods used in the health advisory program. Jim Colquhoun, New York State Department of Conservation suggests:

> We should communicate the idea that science does not produce an immutable body of truth. Rather, science produces the best current description of what we see, and any unifying explanations that match our observations. When we deal with human health, scientific uncertainty is the reason for being careful. We can let the public hear that we are

being conservative. That we don't communicate thoroughly leads to a perpetuation of the myth that we know everything about everything and eventually to a loss of credibility when new information causes a change.

(3) **Acknowledge the policy disagreements and health advisory program changes that may arise from uncertainty.** Assumptions in the risk assessment and/or risk management components of health advisory programs may change over time (see Volumes 2 and 3 in this series), or vary among agencies. These changes may result in modified fish consumption recommendations, creating the need for changes in health advisory communication programs (see Example 7.1).

Communicators can explain why certain assumptions are needed in these programs, and why they have changed. For example, fish consumers should know if health advisory programs are designed to protect the individual at most or least risk from eating contaminated fish, or if worst-case or best-case assumptions were used. This information can help a fish consumer begin to understand that a range of risk values exists. The alternative is to encourage perceptions that point-estimates of risk are realistic and certain. Such perceptions lead to a loss of credibility when fish consumption recommendations must change.

**EXAMPLE 7.1 Statement acknowledging health advisory advice may change over time** (from Georgia 1994-1995 Sport Fishing Regulations guide).

Following are the current fish consumption advisories in Georgia freshwaters when this publication went to press (February 1994). As results of fish tissue sampling become available, fish consumption advisories may be changed. To learn more about fish consumption advisories, contact your nearest Fisheries Office.

There is no clear answer as to how much emphasis to place on explaining the uncertainty in health advisory recommendations. Target audience assessment and pretesting can help identify the potential effects of including this kind of information in health advisory communication programs.

### 7.2.3 Personal vs. Professional (agency) responses

Staff within agencies involved in issuing health advisories are often in somewhat regular contact with the public, and may be asked if they follow the consumption limits recommended in the health advisory. Affirmative responses may reaffirm the importance of the recommendations for the inquirer. Responses to the contrary, however, may have the effect of undermining the intentions of the health advisory program.

Agency staff can decline to answer questions about their personal behavior, but this may not satisfy a persistent inquirer. Rather, staff can choose to answer such questions honestly and completely. For example, if an individual eats more fish than is recommended in the health advisory, the reasons for doing so should be included in the answer (see Example 7.2).

**EXAMPLE 7.2 How do I answer the question "Do you eat fish in amounts recommended in the advisory?".**

I am more concerned about the risks of heart disease than of cancer, since heart disease runs in my family. Because of my family medical history, and because I like to fish, I choose to eat more fish than is recommended in the advisory. For me, it's more important to gain the health benefits from eating fish than to avoid the possible health risks of eating fish. For my children, though, I discourage them from eating more fish than the advisory recommends, since they'll be exposed to contaminants for many years to come. I feel it's best for them to minimize the health problems that could be associated with eating contaminated fish over a long lifetime.

The importance of this approach is acknowledging that every individual has the right to make their own decision about fish consumption, but that ideally that decision will be a well-informed one. It also acknowledges that health advisory recommendations are developed on the basis of protecting certain groups in the population, under certain assumptions.

Health advisory fish consumption recommendations may be modified if personal circumstances or behavior do not fit with the assumptions used to develop the recommendations. For example, some health advisories recommend that women of childbearing age refrain from eating fish caught in potentially contaminated waters. If, however, a woman is of childbearing age but not childbearing intention or ability, the advice to refrain from eating fish may be unwarranted, and she can safely consume fish within the general consumption recommendations.

## SECTION 8

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APPENDIX A

# Summary of Health Advisory Risk Communication Programs in the United States

Table A-1. Summary of origination of fish consumption health advisory programs in U.S. states.[a]

| State | First Advisory Issued | Chemicals of Concern at Origination Date |
|---|---|---|
| Alabama | prior to 1989 | -----[b] |
| Alaska | 1994 | P.S.P. |
| Arkansas | about 1978 | chlordane, dioxin, PCBs |
| California | ---- | mercury |
| Colorado | mid 1970's | selenium |
| Connecticut | prior to 1988 | ----- |
| Florida | 1988 | ----- |
| Georgia | 1976 | PCBs |
| Hawaii | late 1980's | lead |
| Illinois | 1977-78 | mercury, organochlorides, PCBs, pesticides |
| Indiana | 1985 | chlordane, PCBs |
| Iowa | 1985 | chlordane |
| Kansas | 1986 | chlordane |
| Kentucky | late 1980's | ----- |
| Louisiana | 1978 | pesticides |
| Maine | 1985 | dioxin |
| Maryland | 1986 | chlordane |
| Massachusetts | 1982 | ----- |
| Michigan | 1970 | mercury |
| Minnesota | 1975 | PCBs |
| Mississippi | 1977 | ----- |
| Missouri | 1980 | lead |
| Montana | 1994 | mercury |
| Nebraska | 1990 | chlordane, dieldrin, mercury, PCBs |
| Nevada | prior to 1989 | mercury |
| New Jersey | 1983 | dioxin, PCBs |
| New Mexico | 1970 | mercury |
| New York | 1977 | ----- |
| North Carolina | 1982 | mercury, selenium |
| Ohio | 1983 | ----- |
| Oklahoma | late 1970's | ----- |
| Oregon | 1987 | mercury |
| Pennsylvania | 1977 | ----- |
| Rhode Island | 1988 | PCBs |
| South Carolina | 1960's | mercury |
| Tennessee | 1982 | mercury |
| Texas | late 1970's | DDT, mercury, mirex, toxaphene |
| Utah | 1988 | selenium |
| Virginia | 1977 | ---- |
| Washington | 1990 | dioxin |

Table A-1. (continued).

| State | First Advisory Issued | Chemicals of Concern at Origination Date |
|---|---|---|
| West Virginia | 1980 | mercury, PCBs |
| Wisconsin | 1976 | PCBs |
| Wyoming | never | ----- |

[a]States include those participating in telephone interview, 1994.
[b]Dash indicates information not available.

Table A-2. Summary of audiences targeted with fish consumption health advisory information by U.S. states.

| Type of Audience Targeted | States | Contact Techniques Used |
|---|---|---|
| **Licensed sport anglers and/or all anglers** | Alabama | press releases; post signs at waterbody; brochures mailed by special request |
| | Alaska | press releases; brochures at state offices, ferry terminals, Chambers of Commerce, tourist attractions |
| | Arizona | press releases; signs at waterbody; brochures distributed at points of license sale |
| | Arkansas | fishing regulations guide; press releases |
| | California | fishing regulations guide; signs at waterbody |
| | Colorado | press releases; signs at waterbody |
| | Connecticut | press releases; fishing regulations guide, signs at waterbody |
| | Florida | press releases, brochures at points of license sale |
| | Georgia | press releases; fishing regulations guide; small-group meetings in local areas, especially for key communicators such as marina owners, bait and tackle shops, environmental groups; signs at waterbody |
| | Hawaii | English-language signs at waterbody |
| | Illinois | fishing regulations guide; brochures to local health departments and available by request; signs at waterbody; press releases about specific sites of concern |
| | Indiana | press releases; fishing journals; fishing regulations guide; brochures via county health departments; local environmental groups; conservation officers in field |
| | Iowa | press releases, signs at waterbody |
| | Kansas | press releases; signs at waterbody; fishing regulations guide; brochures via local health departments |

Table A-2. (continued)

| Type of Audience Targeted | States | Contact Techniques Used |
|---|---|---|
| | Kentucky | press releases; signs at waterbody |
| | Louisiana | press releases; signs at affected waterbodies; brochures at state offices and parish health units; information mailed by special requests; brochures distributed at bait shops; articles in fishing publications |
| | Maine | fishing regulations guide; press releases; brochures by special request and to parks for visitors |
| | Maryland | press releases; sportfishing guides |
| | Michigan | fishing regulations guide; Cooperative Extension Service pamphlets; press releases |
| | Minnesota | press releases; tourism industry brochures via charterboat operators; fishing regulations guide; advisory booklets direct mail and distributed to bait shops; fact sheets through Cooperative Extension Service |
| | Mississippi | press releases; signs at waterbody |
| | Missouri | press releases; fishing forecast newsletters at tackle shops; 800-number by telephone |
| | Nebraska | fishing regulations guide; press releases |
| | Nevada | signs at waterbody |
| | New Jersey | brochures distributed through local health departments, angler associations, sporting goods stores, bait and tackle shops; speakers at organization meetings; signs at waterbody |
| | New Mexico | advisory brochures at fishing stores and information outlets; press releases |
| | New York | fishing regulations guide; advisory brochures by request; tip strips for local areas; press releases; letters to local governments and community associations |

Table A-2. (continued)

| Type of Audience Targeted | States | Contact Techniques Used |
|---|---|---|
| | North Carolina | fishing regulations guide |
| | Ohio | press releases; brochures and fact sheets to local health departments; fishing regulations guide; site-specific fact sheets via mailing lists (e.g., Superfund sites) |
| | Oklahoma | press releases; brochures at entrances to parks, refuges; television programs on fish and wildlife |
| | Oregon | press releases; fishing regulations guide; signs at waterbody |
| | Pennsylvania | press releases; fishing regulations guide |
| | South Carolina | press releases; fact sheets to local health departments; closed circuit teleconferences; signs at waterbody |
| | Tennessee | press releases; brochures by request; fishing regulations guide; signs at waterbody; public meetings in local areas |
| | Texas | brochures by request; fishing regulations guide; signs at waterbody |
| | Utah | press releases; notices at fishing license outlets and sporting goods stores; signs at waterbody |
| | Virginia | press releases; fishing regulations guide |
| | Washington | press releases; signs at waterbody |
| | West Virginia | press releases; brochures by request |
| | Wisconsin | press releases; advisory booklets to local health departments, county clerks, libraries, charterboat captains |
| **Agency staff** | Massachusetts | letters, telephone calls to environmental protection and fish and wildlife management staffs; local Boards of Health |
| | Minnesota | brochures and training for parks staff, local health departments |

Table A-2. (continued)

| Type of Audience Targeted | States | Contact Techniques Used |
|---|---|---|
| **Children** | Arkansas | brochures distributed by county health departments |
| | Louisiana | meetings and brochures at local junior high schools; slide presentations |
| | Minnesota | brochures and fact sheets to schools and libraries, environmental education programs |
| | Montana | press releases |
| | New Jersey | brochures distributed at schools |
| | New York | tip strips directed toward Women, Infant, and Children federal/state aid programs; contacts and brochures with childbirth educators, medical professional associations |
| | Tennessee | public meetings in local areas; brochures to local health departments; signs at waterbody |
| | Texas | brochures and programs at specific sites |
| **Environmental groups** | Indiana | mailed materials; presentations at meetings |
| | Louisiana | press releases; articles in environmental publications; group presentations; brochures in state offices |
| | Minnesota | brochures and fact sheets |
| | New Jersey | brochures |
| **Ethnic anglers** | California | fishing groups; local neighborhood organizations |
| | Massachusetts | brochures in multilingual format via local health departments and local community groups |
| | Minnesota | brochures and meetings through social/cultural support organizations, Indian reservations; multilingual materials |
| | New Jersey | brochures translated and distributed by local churches |
| | Oregon | multilingual brochures and handouts to local health departments and clinics |

Table A-2. (continued)

| Type of Audience Targeted | States | Contact Techniques Used |
|---|---|---|
| | Rhode Island | information at fish markets; foreign language newspapers |
| | Washington | signs at waterbody in native language for population of concern |
| | Wisconsin | multilingual, targeted brochures and maps |
| **Families of anglers** | Connecticut | press releases; fishing regulations guide; signs at waterbody |
| | Kentucky | press releases; signs at waterbody |
| | Nevada | no method developed |
| **General public** | Arkansas | press releases |
| | Colorado | press releases |
| | Connecticut | press releases |
| | Hawaii | press releases |
| | Kentucky | signs at waterbody |
| | Louisiana | press releases; signs at waterbody; public meetings when advisory is issued; brochures distributed at public meetings and bait shops and by parish health departments |
| | Maryland | press releases |
| | Minnesota | press releases |
| | Missouri | press releases; *Missouri Conservationist*, 800-number by telephone |
| | Montana | press releases |
| | Nebraska | press releases |
| | New Jersey | brochures |
| | Pennsylvania | press releases |
| | Rhode Island | press releases |
| | Texas | brochures by request |
| | Utah | press releases |
| | Virginia | press releases |
| | Washington | press releases |
| | West Virginia | press releases |
| | Wisconsin | press releases |

Table A-2. (continued)

| Type of Audience Targeted | States | Contact Techniques Used |
|---|---|---|
| **Physicians** | Louisiana | articles in physician's magazines; direct mailings; training course in environmental health effects |
| **Subsistence anglers** | Alaska | press releases; brochures at state offices, ferry terminals, Chambers of Commerce, tourist attractions |
| | Arkansas | fishing regulations guide; press releases; target local areas and information |
| | California | fishing regulations guide; signs at waterbody |
| | Georgia | press releases; fishing regulations guide; small-group meetings in local areas, especially for key communicators such as marina owners, bait and tackle shops, environmental groups; signs at waterbody |
| | Illinois | fishing regulations guide; brochures to local health departments and available by request; signs at waterbody; press releases about specific sites of concern |
| | Louisiana | press releases; signs at waterbody; public meetings when advisory is issued; brochures distributed at public meetings and bait shops and by parish health departments |
| | Michigan | signs at waterbody; legislator's constituent newsletters; church newsletters |
| | Minnesota | brochures and fact sheets via local community support organizations |
| | Mississippi | press releases; signs at waterbody; brochures by special request |
| | New Jersey | brochures distributed by local health departments and community groups |
| | New Mexico | brochures at information outlets; town meetings in at-risk areas |

Table A-2. (continued)

| Type of Audience Targeted | States | Contact Techniques Used |
|---|---|---|
| | North Carolina | public service announcements; public meetings at advisory sites; simplified fact sheets; press releases |
| | South Carolina | press releases; closed circuit teleconferences; brochures to local health departments; signs at waterbody |
| | Tennessee | public meetings at local sites; signs at waterbody; brochures to local health departments |
| **Women of reproductive age** | Alabama | press releases; post signs at waterbody; brochures mailed at special request |
| | Arkansas | brochures distributed by county health departments to nursing mothers |
| | Connecticut | press releases; fishing regulations guide; post signs at waterbody |
| | Florida | press releases; brochures at point-of-license sale |
| | Georgia | press releases; fishing regulations guide; small-group meetings in local areas, especially for key communicators such as marina owners, bait and tackle shops, environmental groups; signs at waterbody |
| | Louisiana | press releases; signs at waterbody; public meetings when advisory is issued; brochures distributed at public meetings and bait shops and by parish health departments |
| | Michigan | fishing regulations guide; press releases; brochures at health clinics and Women, Infant, and Children federal/state aid programs; contacts and brochures with childbirth educators, medical professional associations. |

Table A-2. (continued)

| Type of Audience Targeted | States | Contact Techniques Used |
|---|---|---|
| | Minnesota | brochures through health informa- perinatal health care providers |
| | Montana | press releases |
| | New Jersey | brochures to expectant mothers by public health staff at prenatal clinics and programs |
| | New York | brochures by request; fishing regulations guide; press releases; tip strips to Women, Infant, and Children federal/state aid programs |
| | South Carolina | brochures and copies of press releases to Women, Infant, and Children federal/state aid programs |
| | Tennessee | brochures to local health depart- ments; fishing regulations guide; press releases; public meetings at local sites |
| | West Virginia | press releases |

Table A-3. Summary of state efforts to evaluate the effectiveness of fish consumption health advisory communication programs.

| State | Evaluation Efforts |
|---|---|
| Alabama | no formal program; Auburn University involved in a fish consumption study |
| Alaska | no formal program |
| Arizona | no formal program |
| Arkansas | no formal program |
| California | no formal program |
| Colorado | no formal program |
| Connecticut | no formal program; unsolicited telephone calls |
| Florida | no formal program |
| Georgia | focus group evaluation at beginning of new health advisory process |
| Hawaii | no formal program |
| Illinois | no formal program |
| Indiana | no formal program |
| Iowa | no formal program |
| Kansas | informal feedback |
| Kentucky | no formal program; Cornell University Ohio River Basin advisory communication study |
| Louisiana | no formal program; state university may conduct a risk communication and blood epidemiology study |
| Maine | no formal program |
| Maryland | no formal program |
| Massachusetts | no formal program; study completed on local (New Bedford) fish consumption |
| Michigan | Clean Water Action Survey by citizen's group; Cornell University study on Great Lakes Basin in-house staff regularly assess program; MI environmental science board has been involved; informal feedback |
| Minnesota | Advisory committee of public and expert members; focus groups; public meetings on related topics; tear-out sheet return form from health advisory booklet; informal feedback |
| Mississippi | no formal program |
| Missouri | informal feedback |
| Montana | no formal program |
| Nebraska | compare with other states; correspond with USEPA; no formal program; University medical school assessed human levels of contaminants |
| New Jersey | in-house survey of health officers and environmental organizations to determine which communication methods are successful |
| New Mexico | on-site visits with anglers; follow-up questionnaires |

Table A-3. (continued)

| State | Evaluation Efforts |
|---|---|
| New York | periodic assessment by consumer health information advisory council; Cornell University studies of advisory awareness and related behaviors |
| North Carolina | informal feedback |
| Ohio | no formal program; Cornell University study on Ohio River Basin advisory awareness |
| Oklahoma | no formal program |
| Oregon | informal feedback |
| Pennsylvania | no formal program |
| Rhode Island | no formal program |
| South Carolina | no formal program; wildlife management department has assessed advisory knowledge when creel surveys are conducted |
| Tennessee | no formal program |
| Texas | no formal program |
| Utah | no formal program |
| Virginia | no formal program |
| Washington | no formal program |
| West Virginia | survey appropriate constituencies |
| Wisconsin | advisory awareness has been assessed |

**APPENDIX B**

**Examples of Health Advisory Risk Communication Program Documents, with appendix page number.**

**NOTE: These items are included as examples only. Inclusion of these materials does not constitute an endorsement of the content by the U.S. Environmental Protection Agency.**

1. Example ***communication strategy*** for health advisory program, Michigan Department of Public Health, 1990. (B-4)

2. Anderson et al., 1993, September; Draft Uniform Advisory Protocol for the Great Lakes (see especially for ***fish cleaning diagram, tables of consumption recommendations, description of how to use the advisory***). (B-8)

3. New York State Health Advisory, 1994-1995 (see especially for ***list of advice on many ways to reduce exposure to contaminants from fish, feedback form, and descriptions of contaminants in fish***). (B-13)

4. Oregon Health Division Mercury Fact Sheet, 1994. (see for ***description of contaminant and health effects***). (B-28)

5. Black-and-white version of a color map used by Wisconsin with the Hmong community (see for ***minimal use of written word*** to convey fish consumption message). (B-30)

6. Excerpt from Georgia 1994-1995 Sport Fishing Regulations guide, illustrating the health advisory (see especially for ***direct list of tips on how to reduce your health risk***). (B-31)

7. Minnesota Department of Health health advisory program materials, 1991 - 1994.

    a) Fish Facts: Contaminants in Minnesota Fish (see especially for ***comparison of Minnesota with other states***). (B-33)

    b) Fish Facts: Eating Minnesota Fish: Health Risks and Benefits (see especially for ***description of health risks and health benefits*** of fish consumption). (B-35)

    c) Fish Facts: Methylmercury in Fish (see as an example of ***special fact sheet on a specific contaminant***). (B-37)

    d) Fish Facts: Mercury in the Environment (see as an example of a ***fact sheet intended for professionals*** in health, environment, and natural resources, as well as the interested public). (B-39)

    e) Fish Facts: Contaminants in Lake Superior Fish (see especially for ***use of graphics to depict contamination levels***). (B-41)

    f) Lake Superior Fish Advisory (see especially for ***special advice for special risk groups, and cleaning and cooking advice***). (B-43)

g) An Expectant Mother's Guide to Eating Minnesota Fish. What You Should Know if You Are Pregnant, Planning to be Pregnant, Nursing a Baby (see for ***advice for women of childbearing age***). (B-47)

h) Which Fish Are Safe To Eat? (targeted for anglers fishing in ***urban areas***; see for use of ***simplified English and line drawings of fish***). (B-51)

i) Cov Ntses Twg Thiaj Zoo Noj? (***Hmong version*** of "Which Fish Are Safe To Eat?"). (B-53)

j) Do You Like To Fish? (for anglers in ***metropolitan area, in simplified English***). (B-55)

k) Koj Puas Nyiam Nuv Ntses? (***Hmong version*** of "Do You Like To Fish?"). (B-56)

l) Eating Minnesota Fish: A Guide To Your Health (***tourism-oriented brochure*** for the angler fishing anywhere in Minnesota). (B-57)

m) Are You Eating Safe Fish? (***poster*** in Hmong, Cambodian, Vietnamese, Laotian, and English ***used in health care clinics serving immigrant populations***). (B-59)

n) Fish And Your Health. Environmental Exposure To PCBs In Fish. Are Your Patients At Risk? (flyer targeted to ***health care professionals***). (B-60)

o) Fish And Your Health. Fishing In Minneapolis and St. Paul (see for ***simplified English, description of safe vs. unsafe fish to eat, use of diagrams of fish, and fish-cleaning diagram***). (B-62)

p) Fish And Your Health (***Cambodian*** version). (B-64)

q) ***Tear-out survey*** from health advisory brochure to provide ***evaluation*** data. (B-66)

8. Excerpt from 1994 Minnesota Fishing Regulations, fish consumption advisory (see especially ***description of chemicals of concern, tips on reducing risk***). (B-68)

9. Draft Guidelines for Eating Fish From Georgia Waters, 1994. (see especially for description of ***benefits of fishing and eating fish***, discussion of ***state programs on fish contamination***, description of ***health risks, comparison of Georgia waters with other states, and fish consumption charts***). (B-69)

10. A Fishing Advisory for Arkansas, 1993 (see especially for ***use of map with advisory locations, and table advising consumption of predators and non-predators***). (B-76)

11. Press release from Kansas Department of Health and Environment (see especially for ***background information included with short news release***). (B-77)

12. News release, Missouri Department of Health (see especially for ***use of map showing health advisory locations***). (B-85)

13. ***Posted warning*** from the Alabama Department of Public Health, 1993. (B-89)

14. Example of ***posted notice*** allowing catch and release fishing on a local pond, Kansas (Johnson County Park and Recreation District). (B-90)

15. Example of ***posted health warning***, Michigan Department of Public Health. (B-91)

16. Example ***posted health warning***, Kentucky Department for Environmental Protection, 1993. (B-92)

17. ***Posted multilingual*** fish consumption warning, Massachusetts Department of Public Health, 1993. (B-93)

18. ***Posted warning***, Oregon Health Division, English and Spanish versions (see especially for ***clear advice to special risk groups, and cooperation with local health department***). (B-94)

19. Example ***outdoors magazine article***, "Should You Eat Your Michigan Sport Fish?", Michigan Out of Doors, 1990. (B-96)

20. Example ***outdoors magazine article***, "Are there toxic chemicals in the fish you're eating?", Louisiana Sportsman, 1994 (B-98).

21. Example ***local advisory brochure***, "Should My Family Eat Fish Caught in Local Waters?", New York, 1994. (B-100)

22. Example ***advisory information cards for local waters***, South Carolina, 1994. (B-102)

# COMMUNICATION STRATEGY FOR 1991 SPORTS FISH CONSUMPTION ADVISORY

Interagency Center on Health and Environmental Quality
Michigan Department of Public Health
November, 1990

## RATIONALE

In previous years, the Michigan Department of Public Health (DPH) has relied almost exclusively on the Department of Natural Resources (DNR) Michigan Fishing Guide publication to convey its message on fish consumption advice. The brochure is typically given out at the time a fishing license is purchased.

Both internal and external advisors to the Michigan Department of Public Health agree that the state may not be reaching all intended audiences and; that the format, length and style of past advisories is not one accessible to the general public. Furthermore, MDPH is not recognized as the source of the message.

There is a need to revise the format, to target subgroups of the population at greatest potential risk from eating Michigan sports fish and to make the advisory more easily read. The State Health Director has approved a new approach and ICHEQ is now embarking on a pilot project for 1991, with hopes of expanding the program in 1992 and beyond, with joint efforts from the Center for Health Promotion and the Office of Minority Health.

## OBJECTIVES

(1) To increase the level of awareness of the existence of Michigan's Sports Fish Consumption Advisories.
(2) To raise the level of awareness of the hazards and benefits of eating Great Lakes fish and inland lakes fish.
(3) To communicate the fish consumption advice in an easily understood manner to those people who eat sports fish from Michigan.
(4) To promote awareness of the proper methods of preparing and cooking fish to reduce certain contaminants.
(5) To target those subgroups of the population at the greatest risk from exposure to contaminants in sports fish in Michigan contrary to the advisory.
(6) To continue to provide information to the fish license buying public.

## TARGET GROUPS

(1) Women of child-bearing age and young children
(2) Minority Groups (Detroit area, selected for pilot effort)
(3) School age children; K-8th grade
(4) Traditional anglers

ACTION PLAN

I. Reaching women of child-bearing age and young children

(1) Create a pamphlet to highlight message that there is special concern for this population group when consuming sports fish in certain Michigan waters and that precautions need to be taken. Should have attractive graphics/pictures. (50,000 copies: approximate cost $2,250.00)
(2) Distribution points: look to established networks to distribute pamphlets
   a. State-wide child birthing organizations
   b. Local health departments
   c. MSMS
   d. Saginaw child birthing class (pilot) (3,000)
   e. Use UAW locals/magazine to distribute pamphlets and message.
   f. Reach child birthing educators with information and perhaps a poster: incorporate fish eating advice into classes.
   g. WIC Clinics

II. Reaching Minority Groups

(1) Develop pamphlet to target the Detroit area, lower-income, minority population (50,000 copies: approximate cost $2,250.00)
(2) Place "Healthy Choices" articles in MUCC publications and the Michigan Chronicle; perhaps they would run advisory information in a later edition.
(3) Work through Detroit area legislators to distribute information and pamphlets on fish eating advice through their newsletters and meetings in the District.
(4) Coordinate with the project underway in Southwest Detroit (Bunyan Bryant) to disseminate pamphlets
(5) Try to contact umbrella church groups to disseminate information within their network
(6) Work with WIC program
(7) Distribute posters to grocery chains in Detroit area for posting in entry way, e.g. Farmer Jacks, Great Scott (approximate cost for posters: $200 for 500 copies)
(8) Local Health Departments

III. Reaching School Age Children

(1) Work through existing curriculum in Michigan Model, K-8th grade, target 5th grade.
   a. provide information packets and posters for teachers
   b. provide activity sheet for students to take home to parents and to interact with them at no cost to ICHEQ.

IV. Reaching Traditional Anglers

(1) Continue to use the Michigan Fishing Guide

a. reduce to 3/4 page ($1,000.00)
b. negotiate for placement on inside cover
c. enlarge print
d. easy to follow format, deleting listing of specific waterbodies
e. provide toll-free number for more detailed information
f. develop actual fishing guide language

(2) Pre-recorded tape to tie into 800 number
a. tie into existing 800 number, investigate options for pre-recorded message and personal answering
b. three-minute tape, gives Great Lakes advisory in detail and specific inland lake advisories; provides 24-hour coverage (cost unknown)

(3) Develop pamphlet that will be sent after 800 call contacts, this will be the broadest based pamphlet of those being proposed, similar to what was done in 1987. Language will be modified to reduce reading level of information. (50,000 copies: approximate cost $2,250.00)

(4) Develop a fishing license sticker/stamp to alert people to the existence of a fish consumption advisory. Either piggyback on the printing that the DNR is doing, or work through a major license outlet such as Meijer which prints its own jacket for the license. (cost unknown)

(5) Press releases to all major news media, statewide and solicit coverage in sports magazine.

PROPOSED TIMELINE

12/14:(Friday): Deadline for text copy to DNR (will hit sports shows in January)
Beginning of February: Finalize pamphlet for general distribution
Beginning of March: Finalize pamphlets for targeted populations
Finalize posters
First of March: Licenses become available at outlets
First of April: Kick-off of fishing season with steelhead season
End of April: Fishing season gets into full swing

MATERIALS & INFORMATION DEVELOPMENT

Three pamphlets

a. general, broad-based
b. women
c. minorities

Posters (only one to be used in connection with all four target groups)

Fishing guide language

Press release

Activity Sheet

Pre-recorded tape for 800 line

Emblem/stamp for fishing licenses

Magazine articles on Healthy Choices

PROGRAM MEASUREMENT

1. Monitor hotline calls for detailed pamphlet or tape recording

2. Pre- and post- surveying of a small group: e.g. as Wendy Silverman did in her thesis, walk up and down an urban river and ask people who are fishing there (perhaps graduate student project)

3. Work with child birth classes to survey their participants.

4. Get fishing license list-random sample

5. Michigan model survey

# Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory

**Great Lakes Fish Advisory Task Force**
**Protocol Drafting Committee**

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**September 1993**

# A Guide to Your Health

Fish are nutritious and good to eat. But some fish may take in contaminants from the water they live in and the food they eat. Some of these contaminants build up in the fish - and you - over time. These contaminants could harm the people who eat them, so it is important to keep your exposure to these contaminants as low as possible. This advisory helps you plan what fish to keep as well as how often and how much sport fish to eat. This advisory is not intended to discourage you from eating fish, but should be used as a guide to eating fish low in contaminants.

## Health Benefits

When properly prepared, fish provide a diet high in protein and low in saturated fats. Many doctors suggest that eating a half-pound of fish each week is helpful in preventing heart disease. Almost any kind of fish may have real health benefits when it replaces a high-fat source of protein in the diet. You can get the health benefits of fish and reduce unwanted contaminants by following this advisory.

## Contaminants in Fish

Long lasting contaminants such as PCBs, DDT, and mercury build up in your body over time. It may take months or years of regularly eating contaminated fish to build up amounts which are a health concern. Health problems which may result from the contaminants found in fish range from small changes in health that are hard to detect to birth defects and cancer. Mothers who eat highly contaminated fish for many years before becoming pregnant may have children who are slower to develop and learn. The meal advice in this advisory is intended to protect children from these potential developmental problems. Adults are less likely to have health problems at the low levels that affect children.

Although this advisory is primarily based on effects other than cancer, some contaminants cause cancer in animals. Your risk of cancer from eating contaminated fish cannot be predicted with certainty. Cancer currently affects about one in every four people by the age of 70; primarily due to smoking, diet and hereditary risk factors. Exposure to contaminants in the fish you eat may not increase your cancer risk at all. If you follow this advisory over your lifetime, you will minimize your exposure and reduce whatever cancer risk is associated with those contaminants. At worst, using Environmental Protection Agency (EPA) methods, it is estimated that approximately one additional cancer case may develop in 10,000 people eating contaminated fish over their lifetime.

## How to Use This Advisory

Measure your fish from the tip of the nose to the end of the tail. Find the location, species and size of fish you've caught in the tables that follow. The tables show each kind of fish which has been tested for contaminants. If a species is not listed, it has not been tested.

At the top of the tables, find the meal advice for the size fish you've caught. "No Restrictions" means you can eat as many meals as you like. "Do Not Eat" means no one should eat those fish because of very high contamination. The other three groups ("One Meal a Week", "One Meal a Month", "One Meal Every Two Months") are advice for how often to eat a fish meal. The amount of contaminants in a fish listed in the "One Meal a Month" group is four times higher than the amount of contaminants in a fish listed in the "One Meal a Week" group.

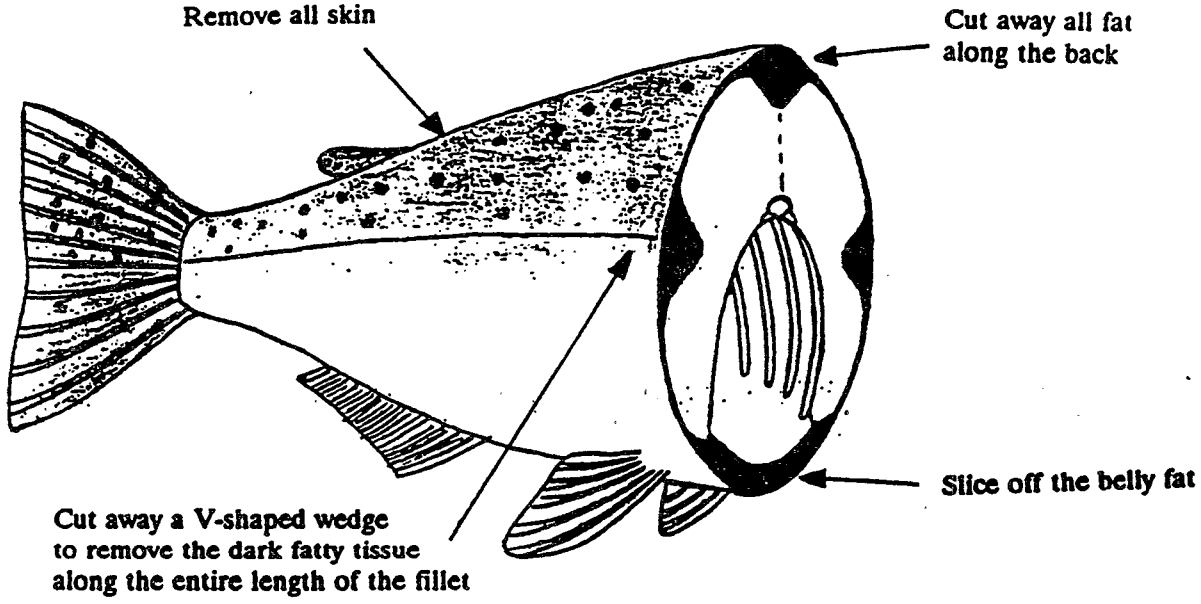
People who regularly eat sport fish, women of childbearing age, and children, are particularly susceptible to contaminants that build up over time. If you fall into one of these categories, you should be especially careful to space fish meals out according to the advisory table that follows. Your body can get rid of some contaminants, such as mercury, over time. Spacing the meals out helps prevent the contaminants from building up to harmful levels in the body. For example, if the fish you eat is in the "One Meal a Month Group", wait a month before eating another meal of fish from any restricted category.

Women beyond their childbearing years and men face fewer health risks from contaminants such as mercury. However, if you are in this group you should also follow the advisory to reduce your total exposure to contaminants. For these groups, it is the total number of meals that you eat during the year that becomes important and many of those meals can be eaten during a few months of the year. If most of the fish you eat are from the "One Meal a Week" category, you should not exceed 52 meals per year, likewise, if most of the fish you eat are in the "One Meal a Month" category, you should not exceed 12 meals per year. Remember, eating one meal of fish from the "One Meal a Month" group is comparable to eating four fish meals from the "One Meal a Week Group".

One meal is assumed to be one-half pound of fish (weight before cooking) for a 150 pound person. This meal advice is equally protective for larger people who eat larger meals, and smaller people who eat smaller meals.

## Cleaning and Cooking Your Fish

Many contaminants are found at higher levels in the fat of fish. You can reduce the amount of these contaminants in a fish meal by properly trimming, skinning, and cooking your catch. Remove the skin and trim all the fat from the areas shown on the diagram below: the belly flap, the line along the sides of the fish, fat along the back, and under the skin.




**Cooking does not destroy contaminants in fish,** but heat from cooking melts some of the fat in fish and allows some of the contaminated fat to drip away. Broil, grill, or bake the trimmed, skinned fish on a rack so the fat drips away. Do not use the drippings to prepare sauces or gravies.

**These precautions will not reduce the amount of mercury or other metals. Mercury is distributed throughout a fish's muscle tissue (the part you eat) rather than in the fat and skin. Therefore, the only way to reduce mercury intake is to reduce the amount of contaminated fish you eat.**

**IMPORTANT: You must follow these cleaning and cooking directions. The meal advice that follows is for eating trimmed and skinned fish.**

Task Force Proposed
Meal Advice for Eating Sport Fish from Lake Huron

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| Fish | No Restrictions | One Meal a Week (52 meals/year) | One Meal a Month (12 meals/year) | One Meal every 2 Months (6 meals/year) | Do NOT Eat |
|---|---|---|---|---|---|
| Chinook Salmon | | | < 32" | > 32" | |
| Coho Salmon | | | All Sizes | | |
| Brown Trout | | | < 22" | > 22" | |
| Lake Trout | | | < 25" | > 25" | |
| Rainbow Trout | | | All Sizes | | |
| Burbot | | < 20" | > 20" | | |
| Walleye | | <21" | > 21" | | |
| Saginaw Bay (also follow Lake Huron advisories for species not listed below) | | | | | |
| Carp | | | | < 23" | > 23" |
| Catfish | | | < 15" | 15 - 21" | > 21" |
| Walleye | | < 16" | > 16" | | |
| Yellow Perch | < 8" | > 8" | | | |
| White Sucker | | < 15" | > 15" | | |
| Thunder Bay (also follow Lake Huron advisories for species not listed below) | | | | | |
| Carp | | | | | All Sizes |

NOTE: This is a DRAFT advisory table proposed by the Task Force. Categories for specific fish are subject to change as new data becomes available.

# Health Advisory

# CHEMICALS IN SPORTFISH AND GAME

***1994 – 1995***

STATE OF NEW YORK
DEPARTMENT OF HEALTH

Center for Environmental Health 2 University Place Albany, New York 12203-3399

# 1994-1995 Health Advisories: Chemicals in Sportfish or Game

## Summary

The New York State Department of Environmental Conservation (DEC) routinely monitors contaminant levels in fish and wildlife. The New York State Department of Health (DOH) issues advisories on eating sportfish and wildlife because some of these foods contain chemicals at levels which may be harmful to your health. The health advisories are: (1) general advice on sportfish taken from waters in New York State; (2) advice on sportfish from specific waterbodies; and (3) advice on wildlife. The advisories are developed and updated yearly.

## Background

Fish and wildlife are nutritious and good to eat. But some fish may take in contaminants from the water they live in and the food they eat. Wildlife, too, may take in contaminants from their food and water. Some of these contaminants build up in fish and wildlife--and you--over time. These contaminants could harm people, so it is important to keep your exposure to these contaminants as low as possible. This advisory helps you plan what fish and wildlife to keep as well as how often and how much to eat. This advisory is not intended to discourage you from eating fish or wildlife, but should be used as a guide to minimize your exposure to contaminants.

## Health Benefits

When properly prepared, fish provide a diet high in protein and low in saturated fats. Almost any kind of fish may have real health benefits when it replaces a high-fat source of protein in the diet. You can get the health benefits of fish and reduce unwanted contaminants by following this advisory.

## Contaminants in Fish and Wildlife

Long-lasting contaminants, such as PCBs, DDT and mercury, build up in your body over time. It may take months or years of regularly eating contaminated fish to build up amounts which are a health concern. Health problems which may result from the contaminants found in fish range from small changes in health that are hard to detect to birth defects and cancer. Mothers who eat highly contaminated fish and wildlife for many years before becoming pregnant may have children who are slower to develop and learn. The meal advice in this advisory is intended to protect children from these potential developmental problems. Adults are less likely to have health problems at the low levels that affect children.

Some contaminants cause cancer in animals. Your risk of cancer from eating contaminated fish and wildlife cannot be predicted with certainty. Cancer currently affects about one in every three people; primarily due to smoking, diet and hereditary risk factors. Exposure to contaminants in the fish and wildlife you eat may not increase your cancer risk at all. If you follow this advisory over your lifetime, you will minimize your exposure and reduce whatever cancer risk is associated with these contaminants.

The federal government establishes standards for chemical residues in food. When establishing these standards for fish, the federal government assumes that people eat about one-half pound of fish each month. The contaminant levels are measured in a skin-on fillet which has not been trimmed; this sample is used in determining whether or not the fish exceeds standards. Fish and wildlife cannot be legally sold if they contain a contaminant at a level greater than its standard. When sportfish from a waterbody contain contaminants at levels greater than the federal standards, the DOH issues a specific advisory.

## General Advisory

The general health advisory for sportfish is that you eat no more than one meal (one-half pound) per week of fish taken from the state's

freshwaters, the Hudson River estuary, or the New York City harbor area (the New York waters of the Hudson River including Upper and Lower Bays, Arthur Kill, Kill Van Kull, Harlem River, and the East River to the Throgs Neck Bridge). This general advisory is to protect against eating large amounts of fish that haven't been tested or contain unidentified contaminants. The general advisory does not apply to fish taken from marine waters. Ocean fish, although less tested, are generally less contaminated than freshwater fish. In addition, fish that live further out from shore may be less contaminated than those that live close to the shore.

## Specific Freshwater Advisories

Over 50 waterbodies in New York have fish with contaminant levels that are greater than federal standards and have their own advisories. The DOH recommendations suggest either limiting or avoiding eating a specific kind of fish from a particular body of water. In some cases, enough information is available to issue advisories based on the length of the fish. Older (larger) fish are often more contaminated than younger (smaller) fish.

Health advice is also given for infants, children under the age of fifteen and women of childbearing age. The DOH recommends that they not eat any fish species from the specific waterbodies listed in the advisory. The reason for this specific advice is that chemicals may have a greater impact on developing organs in young children or in the fetus. They also build up in women's bodies and are often passed on in mother's milk. Waters which have specific advisories have at least one species of fish with an elevated contaminant level, which means that a contamination source is in or near the water.

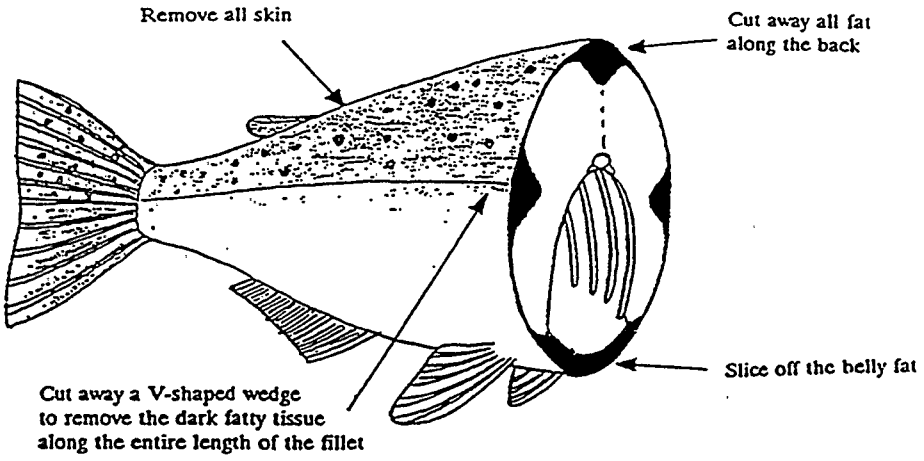
People who regularly eat sportfish, women of childbearing age and children, are particularly susceptible to contaminants that build up over time. If you fall into one of these categories, you should consider if you need to space fish meals out according to the advisory table that follows. Your body can get rid of some contaminants, such as mercury, over time. Spacing the meals out helps prevent some of the contaminants from building up to harmful levels in the body.

Women beyond their childbearing years and men face fewer health risks from contaminants such as mercury. However, if you are in this group you should also follow the advisory to reduce your total exposure to contaminants. For these groups, it is the **total** number of meals that you eat during the year that becomes important and many of those meals can be eaten during a few months of the year. If most of the fish you eat are from the "One Meal a Week" category, you should not exceed 52 meals per year. Likewise, if most of the fish you eat are in the "One Meal a Month" category, you should not exceed 12 meals per year. Remember, eating one meal of fish from the "One Meal a Month" group is comparable to eating four meals from the "One Meal a Week" group.

The primary contaminants (mercury, cadmium, PCBs, chlordane, dioxin, DDT and mirex) are listed next to each advisory. You should review the advisories together if you eat fish from more than one waterbody. For example, if you eat a meal of Saw Mill River carp, you should not eat American eel from Kinderhook Lake for the rest of that month since both of these fish species have eat no more than one meal per month advisories and both are based on PCB contamination.

## Marine Waters

The DOH issues specific advisories for marine waters. These apply to striped bass, bluefish, and American eels and are the only marine fish advisories in effect. Striped bass, bluefish, and eels have specific habits or characteristics which make them more likely to have contaminants than other marine species.




An advisory has been issued for striped bass because of PCB contamination. Saltwater fish are generally less contaminated than freshwater fish. However, fish like striped bass which spend time in Hudson River waters can be contaminated at levels above food standards. The advisory for striped bass is divided into three geographical areas. For striped bass taken from the Hudson River from the Federal Dam at Troy south to the bridge at Catskill, the DOH recommends against any consumption. For striped bass from the Hudson River from the bridge at Catskill south to and including the lower New York Harbor and Long Island Sound west of Wading River, the advisory is to eat no more than one meal per month. The general advisory applies to striped bass from eastern Long Island Sound, the Peconic/Gardiners Bays and Long Island South Shore waters. Women of childbearing age, infants and children under fifteen should not eat striped bass from the Hudson River, lower New York Harbor, or western Long Island Sound.

The DOH has extended the general advisory to bluefish and American eels. They are contaminated with PCBs, although to a lesser extent than striped bass from the Hudson River, New York Harbor, and western Long Island Sound. The recommendation for bluefish and American eels caught in New York State's marine waters is to eat no more than one meal (one-half pound) per week, with additional recommendations to not eat American eels from the Harlem or East Rivers and eat no more than one meal per month of American eels from the Hudson River or New York City harbor area.

## Cleaning and Cooking Your Fish

Many contaminants are found at higher levels in the fat of fish. You can reduce the amount of these contaminants in a fish meal by properly trimming, skinning and cooking your catch. Remove the skin and trim all the fat from the areas shown on the DIAGRAM ABOVE: the belly flap, the line along the sides, the fat along the back and under the skin.

**Cooking does not destroy contaminants in fish,** but heat from cooking melts some of the fat in fish and allows some of the contaminated fat to drip away. Broil, grill or bake the trimmed, skinned fish on a rack so that the fat drips away. Do not use drippings to prepare sauces or gravies.

These precautions will not reduce the amount of mercury or other metals. Mercury is distributed throughout a fish's muscle tissue (the part you eat), rather than in the fat and skin. Therefore, the only way to reduce mercury intake is to reduce the amount of contaminated fish you eat.

## Other Advisories

The DOH also issues special advisories for crabs in the Hudson River due to cadmium and PCB contamination and for snapping turtles and waterfowl statewide because they contain PCBs and other contaminants. Cooking methods are recommended that minimize the

amount of contaminants which would be eaten. The complete advisory is at the end of this brochure.

The health implications of eating deformed or cancerous fish are unknown. Any obviously diseased fish (marked by tumors, lesions or other abnormal condition of the fish skin, meat or internal organs) should be discarded.

## Shellfish

All foods of animal origin, such as meat, poultry, seafood and dairy products, should be thoroughly cooked before eaten. The DOH specifically recommends that the public not eat raw or partially cooked clams or oysters. This advice is not because of chemical contamination. Raw or partially cooked shellfish illegally harvested from waters contaminated with sewage have been linked to gastrointestinal illness and hepatitis A, caused by bacteria or viruses.

## Should I Be Concerned About Medical-type Waste and Garbage Affecting Fish?

The wash-up of medical-type waste and garbage on New York and Long Island beaches has not affected the sanitary condition of marine fish, lobster and crabs. Furthermore, fish do not carry the AIDS virus. Consumers need not worry about eating these foods because of these problems. Good sanitary practices should be followed when preparing any fish. Fish should be kept iced or refrigerated until cleaned and filleted and then refrigerated until cooked. Hands, utensils, and work surfaces should be washed before and after handling any raw food, including fish. Seafood should be cooked to an internal temperature of 140°F.

## What Can I Do To Reduce My Exposure To Chemical Contaminants From Fish?

Fish is an important source of protein and is low in saturated fat. Naturally-occurring fish oils lower plasma cholesterol and triglycerides, thereby decreasing the risk of coronary heart disease. Increasing fish consumption is useful in reducing dietary fat and controlling weight. By eating a diet which includes food from a variety of protein sources, an individual is more likely to have a diet which is adequate in all nutrients.

Although eating fish has some health benefits, fish with high contaminant levels should be avoided. When deciding whether or not to eat fish which may be contaminated, the benefits of eating those fish can be weighed against the risks. For young women, eating contaminated fish is a health concern not only for herself but also to any unborn or nursing child, since the chemicals may reach the fetus and can be passed on in breastmilk. For an older person with heart disease the risks, especially of long-term health effects, may not be as great a concern when compared to the benefits of reducing the risks of heart disease.

Everyone can benefit from eating the fish they catch and can minimize their contaminant intake by following these general recommendations:

1. Choose uncontaminated species from waterbodies which are not listed in the DOH advisories.

2. Use a method of filleting the fish which will reduce the skin, fatty material and dark meat. These parts of the fish contain many of the contaminants.

3. Choose smaller fish, consistent with DEC regulations, within a species since they may have lower contaminant levels. Older (larger) fish within a species may be more contaminated because they have had more time to accumulate contaminants in their bodies.

4. For shellfish, such as crab and lobster, do not eat the soft green substance found in the body section (mustard, tomalley, liver or hepatopancreas). This part of the shellfish has been found to contain high levels of chemical contaminants, including PCBs and heavy metals.

5. Cooking methods such as broiling, poaching, boiling and baking, which allow contaminants from the fatty portions of fish to drain out, are preferable. Pan frying is not recommended. The cooking liquids of fish from contaminated waters should be avoided since these liquids may retain contaminants.

# 1994-1995 Health Advisories

The following recommendations are based on contaminant levels in fish and wildlife. To minimize potential adverse health impacts, the DOH recommends:

- **Eat no more than one meal (one-half pound) per week** of fish from the state's freshwaters, the Hudson River estuary, or the New York City harbor area including Upper and Lower Bays, Arthur Kill, Kill Van Kull, East River to the Throgs Neck Bridge and Harlem River, except as recommended below.
- **Women of childbearing age, infants and children under the age of 15 should not eat** any fish species from waters listed below.
- **Follow trimming and cooking advice.**
- Observe the following restrictions on eating fish from these waters and their tributaries to the first barrier impassable by fish.

| Water (County) | Species | Recommendations | Chemical(s) of Concern |
|---|---|---|---|
| **Barge Canal:** Tonawanda Creek, Lockport to Niagara River (Erie & Niagara) [ 5 ] | Carp | Eat no more than one meal per month | PCB |
| **Belmont Lake** (Suffolk) [ 52 ] | Carp | Eat no more than one meal per month | Chlordane, PCB |
| **Big Moose Lake** (Herkimer) [ 30 ] | Yellow perch | Eat no more than one meal per month. | Mercury |
| **Buffalo River and Harbor** (Erie) [ 7 ] | Carp | Eat none | PCB |
| **Canadice Lake** (Ontario) [ 10 ] | Lake or brown trout over 21" | Eat none | PCB |
| **Canandaigua Lake** (Ontario & Yates) [ 12 ] | Lake trout over 24" | Eat no more than one meal per month | PCB |
| **Carry Falls Reservoir** (St. Lawrence) [ 21 ] | Walleye | Eat no more than one meal per month | Mercury |
| **Cayuga Creek** (Niagara) [ 3 ] | All species | Eat none | Dioxin |
| **Delaware Park Lake** (Erie) [ 6 ] | Carp | Eat no more than one meal per month | PCB |
| **East River** (NYC) [ 46 ] | American eel | Eat none | PCB |
| **Eighteen Mile Creek** (Niagara) [ 4 ] | All species | Eat none | PCB |

Waters with changes from the 1993-94 Health Advisories are **underlined.**
Numbers in brackets refer to map on page 10.

| Water (County) | Species | Recommendations | Chemical(s) of Concern |
|---|---|---|---|
| **Ferris Lake** [ 33 ] (Hamilton) | Yellow perch over 12" | Eat none | Mercury |
| | Smaller yellow perch | Eat no more than one meal per month | Mercury |
| **Fourth Lake** (Herkimer & Hamilton) [ 32 ] | Lake trout | Eat none | DDT |
| **Francis Lake** (Lewis) [ 24 ] | Yellow perch | Eat no more than one meal per month | Mercury |
| **Gill Creek**: Mouth to Hyde Park Lake Dam (Niagara) [ 2 ] | All species | Eat none | PCB, Dioxin |
| **Grasse River**: Mouth to Massena Power Canal (St. Lawrence) [ 37 ] | All species | Eat none | PCB |
| **Halfmoon Lake** (Lewis) [ 23 ] | Yellow perch | Eat no more than one meal per month | Mercury |
| **Hall's Pond** (Nassau) [ 48 ] | Carp, goldfish | Eat none | Chlordane |
| **Harlem River** (NYC) [ 44 ] | American eel | Eat none | PCB |
| **Hoosic River** (Rensselaer) [ 38 ] | Brown and rainbow trout | Eat no more than one meal per month | PCB |
| **Hudson River**: [ 42 ] | | | |
| Hudson Falls to Troy Dam | All species | No fishing | PCB |
| Troy Dam south to bridge at Catskill | All species except American shad | Eat none | PCB |
| Bridge at Catskill south to and including the New York Harbor area | All species except American shad, blueback herring, bluegill, pumpkinseed, and yellow perch | Eat no more than one meal per month | PCB |
| | Blue crab | Eat no more than 6 crabs per week | Cadmium, PCB |
| | --hepatopancreas (mustard, tomalley, or liver) | Eat none | Cadmium, PCB |
| | --cooking liquid | Discard | Cadmium, PCB |

Waters with changes from the 1993-94 Health Advisories are **underlined.**
Numbers in brackets refer to map on page 10.

| Water (County) | Species | Recommendations | Chemical(s) of Concern |
|---|---|---|---|
| **Indian Lake** (Lewis) [ 18 ] | All species | Eat no more than one meal per month | Mercury |
| **Irondequoit Bay** [ 9 ] | Carp | Eat none | PCB, Mirex |
| **Keuka Lake** (Yates & Steuben) [ 16 ] | Lake trout over 25" | Eat no more than one meal per month | DDT |
| **Kinderhook Lake** (Columbia) [ 41 ] | American eel | Eat no more than one meal per month | PCB |
| **Koppers Pond** (Chemung) [ 11 ] | Carp | Eat no more than one meal per month | PCB |
| **Lake Champlain:** [ 35 ] | | | |
| Whole Lake | Lake trout over 25", Walleye over 19" | Eat no more than one meal per month | PCB, Mercury |
| Bay within Cumberland Head to Valcour Island | American eel, brown bullhead | Eat no more than one meal per month | PCB |
| **Lake Ontario & Niagara River** Below the falls [ 8 ] | American eel, channel catfish, carp, lake trout, chinook salmon, coho salmon over 21", rainbow trout over 25", brown trout over 20" | Eat none | PCB, Mirex, Dioxin |
| | White sucker, smaller coho salmon, rainbow and brown trout | Eat no more than one meal per month | PCB, Mirex, Dioxin |
| West of Point Breeze | White perch | Eat none | PCB, Mirex, Dioxin |
| East of Point Breeze | White perch | Eat no more than one meal per month | PCB, Mirex, Dioxin |
| **Loft's Pond** (Nassau) [ 50 ] | Carp, goldfish | Eat no more than one meal per month | Chlordane |
| **Long Pond** (Lewis) [ 22 ] | Splake over 12" | Eat none | Mercury |
| **Upper Massapequa Reservoir** (Nassau) [ 51 ] | White perch | Eat no more than one meal per month | Chlordane |
| **Massena Power Canal** (St. Lawrence) [ 31 ] | Smallmouth bass | Eat no more than one meal per month | PCB |

Waters with changes from the 1993-94 Health Advisories are **underlined.**
Numbers in brackets refer to map on page 10.

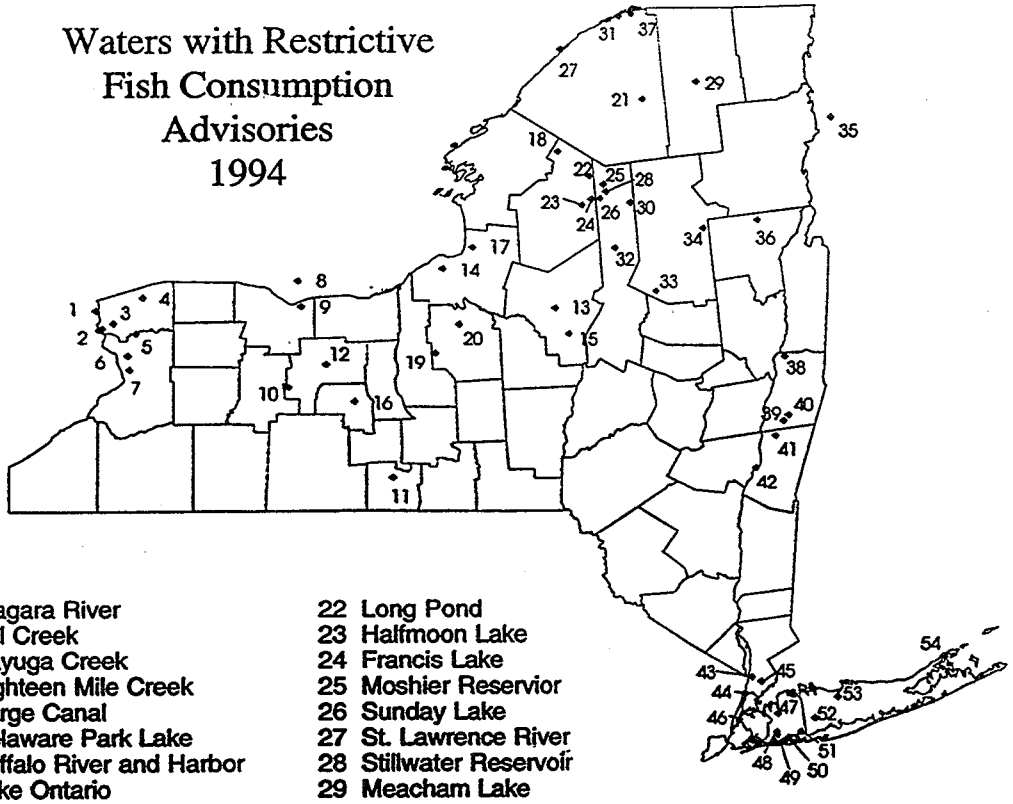
| Water (County) | Species | Recommendations | Chemical(s) of Concern |
|---|---|---|---|
| **Meacham Lake** (Franklin) [ 29 ] | Yellow perch over 12" | Eat none | Mercury |
| | Smaller yellow perch | Eat no more than one meal per month | Mercury |
| **Mohawk River**: Between Oriskany and West Canada Creeks [ 15 ] | Carp | Eat none | PCB |
| **Moshier Reservoir** (Herkimer) [ 25 ] | Yellow perch | Eat no more than one meal per month | Mercury |
| **Nassau Lake** (Rensselaer) [ 39 ] | All species | Eat none | PCB |
| **Niagara River:** [ 1 ] | | | |
| Above the falls | Carp | Eat no more than one meal per month | PCB |
| Below the falls (also see Lake Ontario) | White Perch | Eat none | PCB, Mirex, Dioxin |
| | Smallmouth bass | Eat no more than one meal per month | PCB, Mirex, Dioxin |
| **Onondaga Lake** (Onondaga) [ 20 ] | All species | Eat none | Mercury |
| **Oswego River:** Oswego power dam to upper dam at Fulton (Oswego) [ 14 ] | Channel catfish | Eat no more than one meal per month | PCB |
| **Round Pond:** Town of Long Lake (Hamilton) [ 34 ] | Yellow perch over 12" | Eat no more than one meal per month | Mercury |
| **St. James Pond** (Suffolk) [ 53 ] | All species | Eat no more than one meal per month | Chlordane, DDT |
| **St. Lawrence River:** [ 27 ] | | | |
| Whole River | American eel, channel catfish, lake trout, carp, chinook salmon, coho salmon over 21", rainbow trout over 25", brown trout over 20" | Eat none | PCB, Mirex, Dioxin |
| | White perch, smaller Coho salmon, rainbow and brown trout | Eat no more than one meal per month | PCB, Mirex, Dioxin |

Waters with changes from the 1993-94 Health Advisories are **underlined.**
Numbers in brackets refer to map on page 10.

| Water (County) | Species | Recommendations | Chemical(s) of Concern |
|---|---|---|---|
| **St. Lawrence River - con't.** Bay at St. Lawrence - Franklin Co. line | All species | Eat none | PCB |
| **Salmon River:** Mouth to Salmon Reservoir (Oswego) (also see Lake Ontario) [ 17 ] | Smallmouth bass | Eat none | PCB |
| **Saw Mill River** [ 43 ] | American eel | Eat no more than one meal per month | PCB |
| **Schroon Lake** (Warren & Essex) [ 36 ] | Lake trout over 27" | Eat no more than one meal per month | PCB |
| **Sheldrake River** (Westchester) [ 45 ] | American eel | Eat none | Chlordane, PCB |
| **Skaneateles Creek:** From dam at Skaneateles to Seneca River (Onondaga) [ 19 ] | Brown trout over 10" | Eat no more than one meal per month | PCB |
| **Smith Pond-Roosevelt Park** (Nassau) [ 49 ] | American eel | Eat none | Chlordane |
| | Carp, goldfish | Eat no more than one meal per month | Chlordane |
| **Spring Pond** (Suffolk) [ 54 ] | Carp, goldfish | Eat none | Chlordane |
| **Stillwater Reservoir** (Herkimer) [ 28 ] | Splake | Eat no more than one meal per month | Mercury |
| **Sunday Lake** (Herkimer) [ 26 ] | Yellow perch | Eat no more than one meal per month | Mercury |
| **Threemile Creek** (Oneida) [ 13 ] | White sucker | Eat no more than one meal per month | PCB |
| **Valatie Kill:** Between County Rt. 18 and Nassau Lake (Rensselaer) [ 40 ] | All species | Eat none | PCB |
| **Whitney Park Pond** (Nassau) [ 47 ] | Carp, goldfish | Eat no more than one meal per month | PCB |

Waters with changes from the 1993-94 Health Advisories are **underlined**
Numbers in brackets refer to map on page 10.

# Waters with Restrictive Fish Consumption Advisories 1994



1 Niagara River
2 Gill Creek
3 Cayuga Creek
4 Eighteen Mile Creek
5 Barge Canal
6 Delaware Park Lake
7 Buffalo River and Harbor
8 Lake Ontario
9 Irondequoit Bay
10 Canadice Lake
11 Koppers Pond
12 Canandaigua Lake
13 Threemile Creek
14 Oswego River
15 Mohawk River
16 Keuka Lake
17 Salmon River
18 Indian Lake
19 Skaneateles Creek
20 Onondaga Lake
21 Carry Falls Reservoir
22 Long Pond
23 Halfmoon Lake
24 Francis Lake
25 Moshier Reservior
26 Sunday Lake
27 St. Lawrence River
28 Stillwater Reservoir
29 Meacham Lake
30 Big Moose Lake
31 Massena Power Canal
32 Fourth Lake
33 Ferris Lake
34 Round Pond
35 Lake Champlain
36 Schroon Lake
37 Grasse River
38 Hoosic River
39 Nassau Lake
40 Valatie Kill
41 Kinderhook Lake
42 Hudson River
43 Saw Mill River
44 Harlem River
45 Sheldrake River
46 East River
47 Whitney Park Pond
48 Hall's Pond
49 Smith Pond (Roosevelt Park)
50 Loft's Pond
51 Upper Massapequa Reservoir
52 Belmont Lake
53 St. James Pond
54 Spring Pond

## Additional Advice

**Marine Waters** - The general advisory (eat no more than one meal per week) applies to bluefish and American eels but not to other fish from Long Island Sound, Peconic/Gardiners Bays, Jamaica Bay and other Long Island South Shore waters. (Contaminant of concern--PCB)

**Marine Striped Bass** - Eat no more than one meal (one-half pound) per month of striped bass taken from New York Harbor or Long Island Sound west of Wading River. Eat no more than one meal (one-half pound) per week of striped bass taken from Eastern Long Island Sound, the Peconic/Gardiners Bays and Long Island South Shore waters. The legal minimum length of marine striped bass is 36". (Contaminant of concern--PCB)

**Marine Crabs and Lobsters** - The hepatopancreas (mustard, tomalley or liver) of crabs and lobsters should not be eaten because it has high contaminant levels. (Contaminants of concern--cadmium, PCB)

**Hudson River Shad** - The advisory for women of childbearing age, infants, and children under the age of 15 is EAT NONE for all fish (including American shad) from the lower Hudson River because of PCB contamination. However, shad have lower PCB levels than other species. A few meals of Hudson River shad meat and roe, especially using cooking and trimming methods that minimize PCB content, would not pose an unacceptable health risk for women of childbearing age and children assuming this is their only significant exposure to PCBs.

**Snapping turtles** - Snapping turtles retain contaminants in their fat, liver, eggs and, to a lesser extent, muscle. If you choose to consume snapping turtles, carefully trim away all fat and discard the fat, liver and eggs prior to cooking the meat or preparing soup to reduce exposure. Women of childbearing age, infants, and children under the age of 15 should avoid eating snapping turtles or soups made with their meat. (Contaminant of concern--PCB)

**Waterfowl** - Mergansers are the most heavily contaminated waterfowl species and should not be eaten. Other waterfowl should be skinned and all fat removed before cooking; stuffing should be discarded after cooking; limit eating to two meals per month. Monitoring data indicate that wood ducks and Canada geese are less contaminated than other waterfowl species with dabbler ducks and then diving ducks having increasingly higher contaminant levels. (Contaminants of concern--PCB, mirex, chlordane, DDT)

# Additional Information

## New York State Department of Health

For more information on **health effects** from exposure to chemical contaminants. contact:

Environmental Health Information: 1-800-458-1158 (toll-free from New York State telephones). These calls are taken from 8:00-4:30, and after hours callers can record a message. Out of state callers should dial 518/458-6409.

## New York State Department of Environmental Conservation

For more information on **fishing**, contact:

**Regional Offices**

**Region 1**
SUNY Campus, Bldg. 40
Stony Brook, NY 11794
(516) 444-0441

**Region 2**
47-40 21st St.
Long Island City, NY 11101
(718) 482-4922

**Region 3**
21 South Putt Corners Rd.
New Paltz, NY 12561
(914) 255-5453

**Region 4**
2176 Guilderland Ave.
Schenectady, NY 12306
(518) 382-0680

**Region 5**
Route 86
Ray Brook, NY 12977
(518) 891-1370

**Region 6**
State Office Bldg.
Watertown, NY 13601
(315) 785-2513

**Region 7**
615 Erie Blvd. West
Syracuse, NY 13204
(315) 426-7400

**Region 8**
Routes 5 and 20
Avon, NY 14414
(716) 226-2466

**Region 9**
600 Delaware Ave.
Buffalo, NY 14202
(716) 851-7000

For information on **contaminant levels**, contact:

Bureau of Environmental Protection
50 Wolf Road
Albany, NY 12233
(518) 457-6178

Prepared by:
New York State Department of Health
Division of Environmental Health Assessment
#40820042
Revised April 28, 1994

## Health Advisory
## Chemicals in Sportfish and Game

We always look for ways to improve our environmental risk communication, and we value your suggestions. Please mail this form back to us if you have any comments.

Was the advisory helpful in explaining:

- the problem?

- the risk and benefits of eating sportfish?

Was anything missing? If so, what?

Was it understandable?

Suggestions for improvement:

Thank you for your suggestions.

Please fold this page in thirds, staple and mail to:

New York State Department of Health
Bureau of Toxic Substance Assessment
2 University Place, Room 240
Albany, New York 12203-3399

New York State Department of Health
Bureau of Toxic Substance Assessment
2 University Place, Room 240
Albany, New York 12203-3399

(503)731-4015
FAX (503)731-4077
TDD-Nonvoice (503) 731-4031

Oregon

DEPARTMENT OF HUMAN RESOURCES

HEALTH DIVISION

# OHD FACT SHEET: MERCURY

**Where does mercury come from?**

Mercury is a chemical that occurs naturally in the environment in several forms; in the metallic or elemental form and combined with other elements to form mercury compounds such as methyl-mercury. All forms of mercury are potentially hazardous. It is believed the greatest source of elemental mercury in Oregon is in the soils, rocks, and sediments. This natural source of mercury is due to past volcanic activity.

Although elemental mercury found in soils and rock poses little hazard, through erosion and bacterial action, the mercury can become hazardous through a process known as methylation. Bodies of water in volcanic areas may contain enough mercury to result in dangerous levels in organisms which live in the water including plankton, and edible fish and shellfish.

In addition to natural sources, human activities can contribute to mercury found in the environment. Sources of contamination include the burning of petroleum fuels (especially coal), mining operations and mineral extraction, smelting, and other industrial discharges.

**How does mercury get into the fish?**

Naturally occurring bacteria that live in sediment or near the bottom of bodies of water can convert mercury into an organic form known as methylmercury. Methylmercury is absorbed directly by aquatic organisms, and it is also taken in through the food they eat.

Fish eliminate mercury from their bodies at a very slow rate, so concentrations can gradually build up. Therefore, the longer a fish lives in mercury-contaminated water, the greater the accumulation there will be in its tissues.

**Which fish contain the most mercury?**

Generally, mercury levels are related to age, size and species of fish, and the amount of mercury in the water and sediments. The mercury a fish absorbs is stored throughout its body, especially in its muscle tissue, the edible portion, and in its internal organs. Cleaning or cooking mercury-contaminated fish, discarding parts, or removing fat will <u>not</u> lower mercury content dependably.

**How does mercury affect human health?**

Like many substances, mercury is toxic and acts as a poison

Barbara Roberts
Governor

800 NE Oregon Street #
Portland, OR 97232-21
(503) 731-4030 Emerg
(503) 252-7978 TDD
Emergency

when it reaches certain concentrations in the body. Methylmercury is the most important form of mercury in terms of toxicity, and health effects from environmental exposures. The central nervous system appears to be most sensitive to organic mercury toxicity. Current research shows that human fetuses are much more sensitive to mercury than adults. Pregnant women are about twice as sensitive to mercury as other adults, because mercury takes longer to leave their bodies. Children are at greater risk, because they eat more food than adults in proportion to their body weight. These groups are likewise at increased risk of adverse neurological effects from methylmercury.

**How is the public protected from consuming mercury-contaminated fish?**

Two federal agencies have responsibility in protecting humans from exposure to harmful levels of mercury. The U.S. Food and Drug Administration (FDA) is responsible for setting the standards for tolerable levels of mercury in fish sold via interstate commerce. Currently, the FDA allowable level of mercury in fish is 1.0 ppm. The FDA periodically tests fish typically sold in markets to determine the levels of mercury and other contaminants and when necessary, confiscates contaminated products.

Another agency that regulates mercury is the U.S. Environmental Protection Agency (EPA). Recently, the EPA has developed a recommended fish tissue guideline of 0.6 ppm. Based upon this EPA standard, the Oregon Health Division (OHD) issues fish advisories when levels of 0.6 ppm or greater are found in a substantial portion of fish tested from a particular body of water.

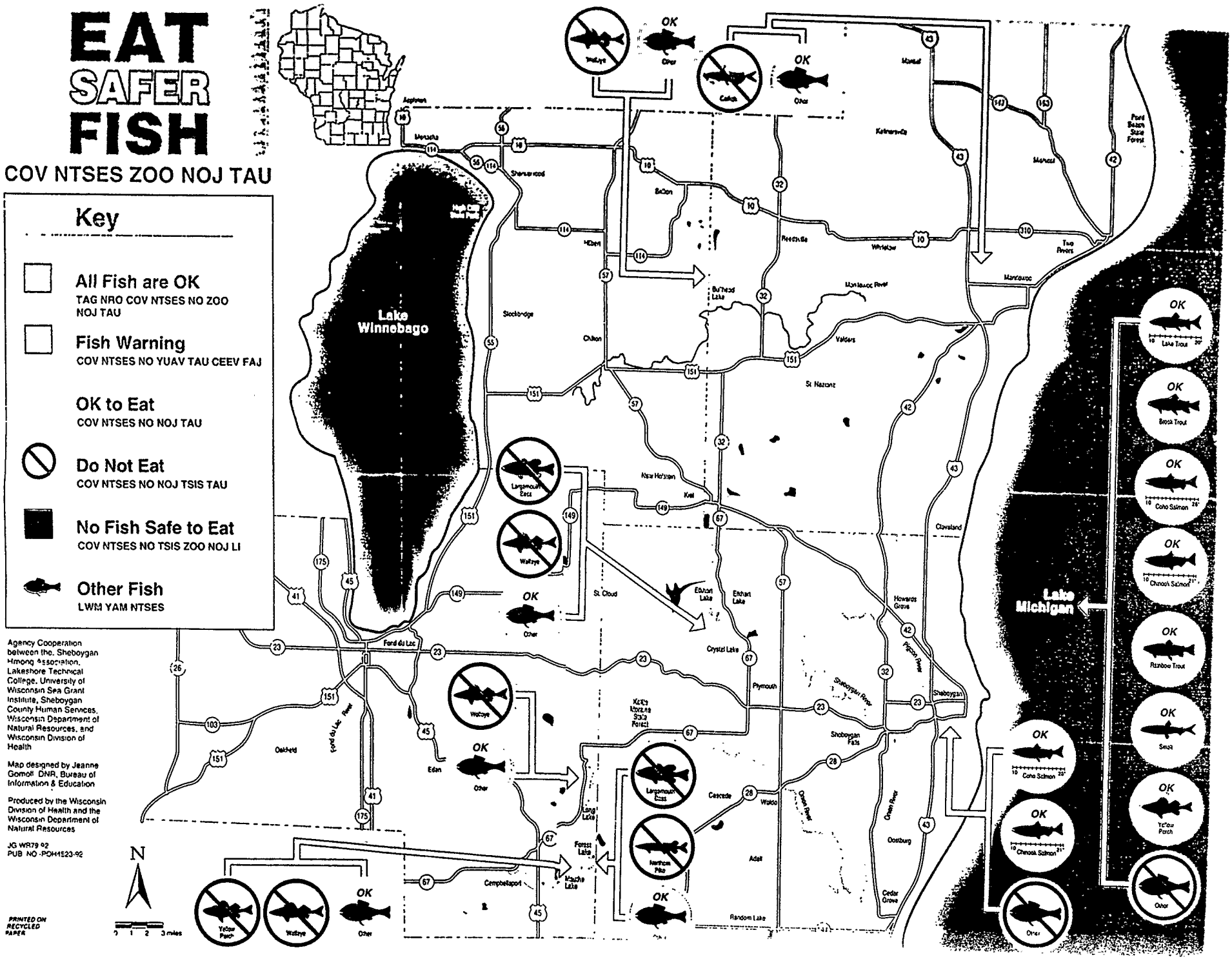
**Are there ways one can reduce exposure to mercury via fish?**

Because mercury bioaccumulates in edible fish tissue the only way to limit exposure is to reduce the amount of fish eaten from contaminated waterways. Therefore, the OHD warns that pregnant women, nursing women, and children up to six years of age should not consume any amount of fish from bodies of water where levels of mercury in fish exceed 0.6 ppm. Likewise, children older than six years and healthy adults should limit their consumption of fish in accordance with amounts recommended for that particular body of water.

**For Additional Information Contact:**
Catherine Neumann, Ph.D., or Ken Kauffman, R.S. Environmental Services and Consultation, Oregon Health Division (503)-731-4015.

# EAT SAFER FISH

## COV NTSES ZOO NOJ TAU




Agency Cooperation between the, Sheboygan Hmong Association, Lakeshore Technical College, University of Wisconsin Sea Grant Institute, Sheboygan County Human Services, Wisconsin Department of Natural Resources, and Wisconsin Division of Health

Map designed by Jeanne Gomoll DNR, Bureau of Information & Education

Produced by the Wisconsin Division of Health and the Wisconsin Department of Natural Resources

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PRINTED ON RECYCLED PAPER

## Advisories for Eating Fish From Georgia Waters

Fishing is a popular pastime in Georgia. Whether you go alone to relax and enjoy nature, with your friends to enjoy camaraderie and "fish tales", or with your family to pass on a sport you learned as a child, fishing is a fun and rewarding sport enjoyed by many people. Not only does fishing give people an excuse to get away from the hustle and bustle of daily life, but it can also put a healthy, satisfying meal on the table. Fish are low in saturated fat, high in protein, and can have substantial benefits when eaten in place of other high-fat foods. The quality of sport fish caught in Georgia is very good; however, polychlorinated biphenyls (PCBs), chlordane, and mercury have been found in some fish from a few bodies of water. In most cases, the levels of these chemicals are low. However, to ensure the good health of Georgia anglers, the Georgia Department of Natural Resources has issued advisories for certain species of fish from some waters. These advisories are determined using standards set by the Food and Drug Administration (FDA). These advisories are not intended to cause panic or to discourage people from eating fish, but anglers should use them as a guide for choosing to eat fish from Georgia waters.

### How to Reduce Your Health Risk

**Keep smaller fish for eating.** As a general rule, larger, older fish may be more contaminated than younger, smaller fish. You can minimize your health risk by eating smaller fish that are within legal size limits and releasing the larger fish to be caught again.

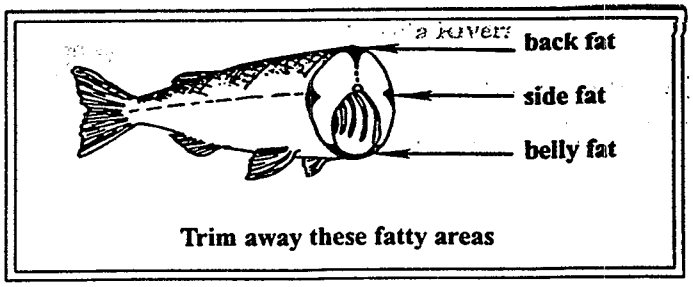
**Vary the kinds of fish you eat.** Contaminants build up in large predators and bottom-feeding fish, like bass and catfish, more rapidly than in other species. By substituting a few meals with panfish, such as perch, sunfish and crappie, you can reduce your risk.

**Eat smaller meals when you eat big fish and eat them less often.** If you catch a big fish, freeze part of the catch and space the meals from this fish out over a period of time.

**Clean and cook your fish properly.** How you clean and cook your fish can reduce the level of contaminants by as much as half in some fish. Some chemicals have a tendency to concentrate in the fatty tissues of fish. By removing the fish's skin and trimming fillets according to the following diagram, you can reduce the level of chemicals substantially. Mercury is bound to the meat of the fish, so these precautions will not help reduce this contaminant.

**Remove the skin from fillets or steaks.** The internal organs (intestines, liver, and so forth) and skin are often high in fat and contaminants.

**Trim off the fatty areas shown in black on the drawing.** These include the belly fat, side fat, and the flesh along the top of the back. Careful trimming can reduce some contaminants by 25 to 50%.



Trim away these fatty areas

**Cook fish so fat drips away.** Broil, bake or grill fish and do not use the drippings. Deep-fat frying removes some contaminants, but you should discard the oil once you have cooked the fish. Pan frying removes few, if any, contaminants.

### How does DNR determine what waters are tested?

Georgia has more than 71,000 miles of rivers and streams and more than 421,000 acres of lakes. It will not be possible for DNR to sample every stream and lake in the state. However, high priority has been placed on the 26 major reservoirs, which make up more than 90% of the total lake acreage. Waterways listed in this guide will continue to be sampled as part of a five year rotating schedule to track any trends in fish contaminant levels. The Department has also made sampling fish in rivers and streams downstream of urban and/or industrial areas a high priority. In addition, DNR will focus attention on areas which are frequented by a large number of anglers.

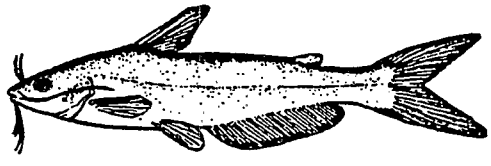
The Department of Natural Resources (DNR) is committed to protecting Georgia's rivers, streams, lakes and other waters. Both PCBs and chlordane have been banned, and, over time, the levels of these chemicals are expected to decrease.

### What are the health benefits of eating fish?

Fish provide a high protein, low fat diet which is low in saturated fats. Many scientists suggest that eating a half-pound of fish a week can help prevent heart disease. Fish may have substantial health benefits when they replace a high fat source of protein in the diet.

### What are the health risks of eating contaminated fish?

These advisories were designed to protect you from experiencing health problems associated with eating contaminated fish. PCBs, chlordane, and methylmercury build up in your body over time. It may take months or years of regularly eating contaminated fish to accumulate levels which would affect your health.



## Guidelines for Georgia Rivers

The Georgia Department of Natural Resources (DNR) routinely tests the tissue of fish collected from freshwater lakes, rivers and streams throughout Georgia. Based on the test results, DNR periodically issues fish consumption advisories to inform anglers of health risks associated with eating certain types of fish from some bodies of water. High risk groups such as pregnant women, nursing mothers, women who are planning a pregnancy and children should avoid consumption of contaminated fish. This advisory provides general guidance to the angler to help reduce their risk.

Following are the current fish consumption advisories in Georgia freshwaters when this publication went to press (February 1994) . As results of fish tissue sampling become available, fish consumption advisories may be changed. To learn more about fish consumption advisories, contact your nearest Fisheries Office.

### Chattahoochee River and West Point Reservoir:

Because the level of chlordane in fish tissue has been found to exceed the Food and Drug Administration's (FDA) standards:

A) Do not eat largemouth bass taken from the Chattahoochee River in the vicinity of Ga. Hwy. 92.

B) Do not eat carp, hybrid bass, and catfish taken from the Chattahoochee River in the vicinity of Ga. Hwy.92 downstream through West Point Reservoir to the dam.

### Coosa, Etowah, and Oostanaula Rivers:

Because the level of PCBs in fish tissue has been found to exceed FDA standards:

A) Do not eat any fish taken from the Coosa River from the confluence of the Oostanaula and Etowah Rivers in Rome to the Alabama-Georgia border; from the Etowah River downstream of U.S. Hwy. 411; and from the Oostanaula River downstream of Ga. Hwy. 56.

B) Commercial fishing from these river sections is banned.

### Alapaha, Suwanee, and Withlacoochee Rivers:

Because the levels of mercury in fish tissue has been found to exceed FDA standards:

A) Adults should not eat mixed species of fish taken from these rivers more than once per week.

B) Pregnant mothers, nursing mothers, females contemplating pregnancy, and children under 15 years of age should not eat mixed fish species more than once per month.

C) Eating largemouth bass exclusively should be avoided.

### Lake Oliver

Because the levels of chlordane has been found to exceed FDA standards:

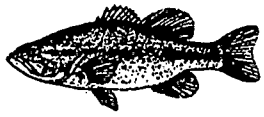
A) Do not eat channel catfish taken from Lake Oliver.

### Lake Hartwell

Because the level of PCBs has been found to exceed FDA standards:

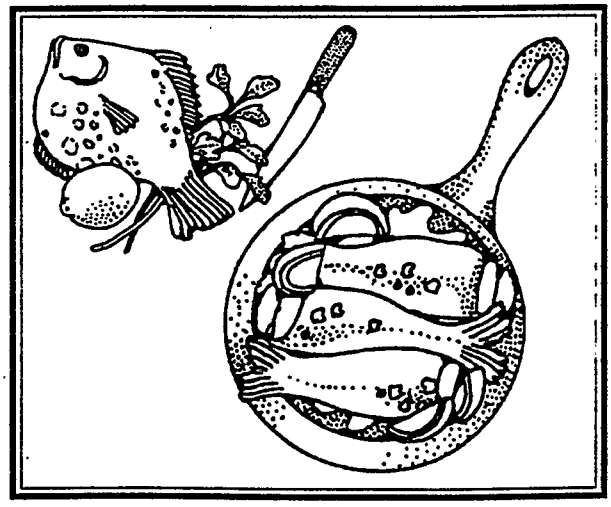
A) Do not eat hybrid bass weighing over 3 pounds taken from Lake Hartwell.

## For more information



For more information on eating fish from Georgia's rivers or on consumption guidelines in any Georgia waters, contact the Georgia Department of Natural Resources.

Department of Natural Resources
Environmental Protection Division
205 Butler Street, S.E., Suite 1152
Atlanta, GA 30334
(404) 656-4713
or
Department of Natural Resources
Wildlife Resources Division
2123 U.S. Hwy. 278, S.E.
Social Circle, GA 30279
(404) 918-6418



# Fish Facts

## Contaminants in Minnesota Fish

The quality of sport fish taken in Minnesota is among the highest in the Great Lakes region. However, chemicals like mercury, polychlorinated biphenyls (PCBs), and dioxin have been found in fish from certain waters. The levels found are usually low and in Minnesota there are no known cases of illness from these contaminants. This fact sheet describes these contaminants.

To minimize exposures to these contaminants and ensure the continued good health of Minnesota anglers, the Minnesota Department of Health has guidelines for how often contaminated fish can be safely eaten. This advice is published in the Minnesota Fish Consumption Advisory. The booklet lists meal advice for more than 500 locations in Minnesota. You can get an advisory booklet by writing to "Fish Advisory", Minnesota Department of Health, 925 S.E. Delaware Street, P.O. Box 59040, Minneapolis, Minnesota 55459-0040, or by calling 627-5423 or 1-800-657-3908.

### What contaminants are found in Minnesota fish?

Fish in Minnesota lakes and rivers accumulate **mercury**. Mercury recycles between land, water, and air and enters plant and animal tissue. Although mercury is a naturally occurring metal, most of the mercury which enters Minnesota waters comes from household and industrial wastes during incineration, from latex paints, and from burning coal and other fossil fuels. Mercury levels are slowly increasing in lakes in the northern part of the state.

Fish in some lakes and nearly half of the rivers which have been sampled for the advisory program contain **PCBs**. These synthetic oils had many uses and are found in electrical transformers, cutting oils, and carbonless paper. Although they were banned in 1976, they do not decompose easily and remain in the water and lake sediments for years. PCB levels in Minnesota's waters are slowly decreasing.

Fish from only a few areas in Minnesota (St. Louis Bay, Rainy River, and one site on the Mississippi River in the area of Little Falls) may be contaminated with **dioxin**. This chemical is an unwanted by-product of incineration and some industrial processes that use chlorine.

Contaminants can reach rivers and lakes from local sources such as improperly stored wastes and abandoned dumps. If a local source is identified, it may be possible to clean it up and decrease the contamination of the lake or river. However, contaminants can reach remote and pristine lakes from the atmosphere. The sources for much of the contamination which concern us today are not known and may be from beyond Minnesota's borders.

### How do contaminants get into fish?

Once in a lake, mercury is converted to methylmercury by bacteria and other processes. Fish absorb methylmercury from their food and from water as it passes over their gills. Mercury is tightly bound to proteins in all fish tissue including muscle. There is no method of cooking or cleaning fish which will reduce the amount of mercury in a meal.

Fish absorb PCBs and dioxin from water, suspended sediments, and food. PCBs and dioxin concentrate in the fat of fish and in fatty fish such as carp and catfish. Cleaning and cooking a fish to remove fat will lower the amount of PCBs or dioxin in a fish meal. Larger, older fish and fish which eat other fish accumulate more contaminants than smaller, younger fish which eat less contaminated prey. Contaminants are not usually detected in panfish such as bluegill and crappies.

## How do Minnesota's fish compare with other states?

Minnesota has one of the most extensive fish monitoring programs in the United States. Not because Minnesota has some of the most contaminated fish; rather, Minnesota has more lakes and miles of river to be concerned about than most states. All of the Great Lakes states and Ontario face many of the same problems of mercury, PCB and dioxin contamination and all issue fish consumption advisories. However, Lake Superior is the least contaminated of the Great Lakes. Mercury contamination in Wisconsin and Ontario's inland lakes is comparable to that in Minnesota. Advisories that states issue for interstate border waters may differ because of differences in how health risks are interpreted. A health advisory for people who eat sport fish from Wisconsin waters is available by writing "Fish Advisory", Wisconsin Department of Natural Resources, P.O. Box 7921, Madison, WI 53707 (608-267-7610). The "Guide to eating Ontario sport fish" is available from the Public Information Centre, Environment and Energy Ontario, 135 St. Clair Ave. West, Toronto, Ontario M4V 1P5 (416-314-7886).

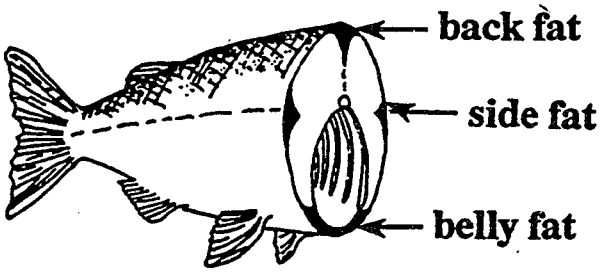
## Guidelines to Reduce Your Health Risk

**Keep smaller fish for eating.** Selective catch-and-release, keeping only smaller fish for the table, can keep you and the fishery healthy. In addition to tasting better, younger, smaller fish are less contaminated than older, larger fish.

**Eat fish that are less contaminated.** Substitute a few panfish meals for the walleye or northern pike you might otherwise eat. Contaminants such as mercury and PCBs build up in large predator fish. Their prey, including panfish such as perch, sunfish and crappie, have less contaminants.

**Eat smaller meals when you eat big fish and eat them less often.** Freeze part of your catch to space the meals out over time.

**Clean and cook your fish properly.** Chemicals such as PCBs and dioxin concentrate in fatty tissues, so removing the skin of fish and trimming the fillets to remove the fatty areas shown in the following diagram can reduce levels of these chemicals by 20 to 50 percent. Broiling, baking or grilling fish so that the fat drips away reduces PCB and dioxin levels even further. Poaching and deep-fat frying removes some contaminants--but discard the broth or oil. If you eat turtle meat, remove as much of the fat as possible before cooking. **Mercury is bound to the meat of fish and these precautions will not reduce the amount of mercury in a meal of fish.**




*Courtesy of Wisconsin Sea Grant*

## For more information:

On the health risks of contaminants, or for additional fact sheets and brochures on fish contaminants:

Minnesota Department of Health
(612) 627-5047

On the sources of contaminants in Minnesota's environment:

Minnesota Pollution Control Agency
(612) 296-6300

On collecting and testing fish:

Minnesota Department of Natural Resources
(612) 296-2835

Or to request this document in another format, call (612) 627-5100. TDD: Minn. Relay Service 297-5353 or Toll Free 1-800-627-3529 (Greater Minnesota).

# Fish Facts

## Eating Minnesota fish: Health risks and benefits

Angling is great in Minnesota and so are the fish. Fish are low in fat, high in protein, and may have substantial health benefits when eaten in place of high-fat foods. While the quality of sport fish taken in Minnesota is among the highest in the Great Lakes region, chemicals like mercury, polychlorinated biphenyls (PCBs), and dioxin have been found in some fish from certain waters. The levels found are usually low and in Minnesota there are no known cases of illness from these contaminants. This fact sheet describes the health effects of these contaminants.

To ensure the continued good health of Minnesota anglers, the Minnesota Department of Health has guidelines for how often these fish can be safely eaten. This advice is published in the Minnesota Fish Consumption Advisory. The booklet lists meal advice for more than 500 locations in Minnesota. This advisory is not intended to discourage anglers from eating fish, but should be used as a guide to choosing fish which are low in contaminants. You can get an advisory booklet by writing to "Fish Advisory", Minnesota Department of Health, 925 S.E. Delaware Street, P.O. Box 59040, Minneapolis, Minnesota 55459-0040, or by calling 627-5423 or 1-800-657-3908.

### What are the health risks of eating contaminated fish?

PCBs, dioxin and methylmercury build up in your body over time. It may take months or years of regularly eating contaminated fish to accumulate levels which are a health concern. As you follow the fish advisory, the amount of **methylmercury** you take into your body is safely eliminated between meals. Larger amounts of may harm the nervous system. The fetus is especially sensitive to mercury poisoning. Delays in infant development have occurred following high maternal exposures to methylmercury. The first symptoms of adult poisoning include incoordination and a burning or tingling sensation in the fingers and toes. As mercury levels increase, your ability to walk, talk, see, and hear may all be affected in subtle ways. Fish consumption advice offered by the Minnesota Department of Health is intended to keep the mercury in your body below levels that damage the nervous system.

Exposure to **PCBs** is linked to infant development problems in children whose mothers were exposed to PCBs before becoming pregnant. Meal advice for PCB-contaminated fish is intended to protect children from developmental problems. PCBs also cause changes in human blood, liver and immune function of adults. In addition, PCBs cause cancer in laboratory animals and may cause cancer in humans. Fish in a few rivers are contaminated with **dioxin**, a chemical that may cause cancer in people. Meal advice for dioxin-contaminated fish is based on the PCBs or mercury found in the fish. However, following meal guidelines fpr these contaminants will reduce your exposure to dioxin.

Currently, cancer will affect about one in every two people in Minnesota, primarily due to smoking, diet, and hereditary risk factors. If you follow the advisory over your lifetime, the PCBs or dioxin in the fish you eat may not increase your cancer risk at all. At worst, using Environmental Protection Agency methods to calculate risk from a lifetime of eating contaminated fish, it is estimated that approximately one additional cancer case may develop in one of 2,500 to 10,000 people eating contaminated fish according to the advisory. Eating fewer meals of contaminated fish will further decrease your cancer risk.

### What about the health benefits of eating fish?

Fish provide a high protein, low fat diet which is low in saturated fats. Many researchers suggest that a half-pound of fish a week in the diet is beneficial in preventing heart disease. The health benefits of fatty fish rich in omega-3 fatty acids are not clear. What is clear, is that fish of almost any species--lean or fat--may have substantial health benefits when they replace a high fat source of protein in the diet.

Nutritionists recommend eating three to four ounces of fish in a meal. The meal guidelines are based on an eight ounce serving (weight before cooking) for a 150-pound person. The meal per week or month suggested in the advisory guidelines can be eaten as two or three smaller meals over the same time period.

## What about commercially available fish?

Fish from oceans, estuaries and inland waters may contain small amounts of mercury and PCBs as well as other contaminants. The amounts of contaminants that may be present in commercially available fish can add to what you are already taking in from sport fish. Fish available in food stores and restaurants are subject to inspection and regulation. Nationwide, fish with levels of contaminants above Food and Drug Administration levels of concern are not allowed on the market. However, it is possible that commercially available fish will meet federal standards for food safety, yet not meet Minnesota Department of Health guidelines for fish that can be eaten in unlimited quantities. The Minnesota Department of Health and Minnesota Department of Agriculture support increased analysis of contaminants in fish from all sources.

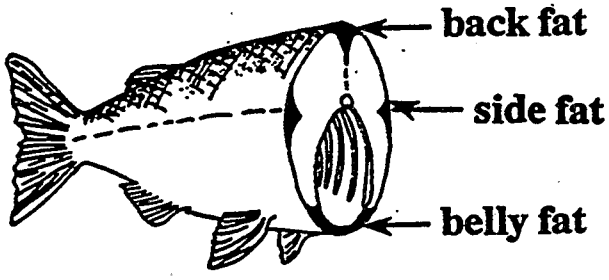
## Guidelines to Reduce Your Health Risk

**Keep smaller fish for eating.** Selective catch-and-release, keeping only smaller fish for the table, can keep you and the fishery healthy. In addition to tasting better, younger, smaller fish are less contaminated than older, larger fish.

**Eat fish that are less contaminated.** Substitute a few panfish meals for the walleye or northern pike you might otherwise eat. Contaminants such as mercury and PCBs build up in large predator fish. Their prey, including panfish such as perch, sunfish and crappie, have less contaminants.

**Eat smaller meals when you eat big fish and eat them less often.** Freeze part of your catch to space the meals out over time.

**Clean and cook your fish properly.** Chemicals such as PCBs and dioxin concentrate in fatty tissues, so removing the skin of fish and trimming the fillets to remove the fatty areas shown in the following diagram can reduce levels of these chemicals by 20 to 50 percent. Broiling, baking or grilling fish so that the fat drips away reduces PCB and dioxin levels even further. Poaching and deep-fat frying removes some contaminants--but discard the broth or oil. If you eat turtle meat, remove as much of the fat as possible before cooking. **Mercury is bound to the meat of fish and these precautions will not reduce the amount of mercury in a meal of fish.**




*Courtesy of Wisconsin Sea Grant*

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# Fish Facts

## Methylmercury in Fish

### What is methylmercury?

Mercury is a naturally occurring element found in rocks, soils, water and air. Mercury is released into the air naturally, but also from burning household and industrial wastes and especially from burning coal and other fossil fuels. Mercury in the air condenses on particulates and returns to the earth in rain and snow. Once in a lake, mercury is converted to methylmercury by bacteria or by chemical reactions. Methylmercury is simply a form of mercury produced when a carbon and three hydrogen molecules are attached to the element mercury.

### How does methylmercury get into fish?

Fish and the small animals that fish eat absorb methylmercury from water as it as it passes over their gills. Fish also absorb methylmercury from the prey they eat. Methylmercury is easily absorbed by fish--and by people when we eat fish. Almost all of the mercury in fish is in the form of methylmercury. Mercury is tightly bound to proteins in all fish tissue, including muscle. There is no method of cooking or cleaning fish which will reduce the amount of mercury in a meal.

### Are all fish contaminated with methylmercury?

Fish absorb methylmercury from the water throughout their life. The older a fish is the more contaminated it could be. In addition, fish absorb methylmercury from their food, so predatory fish such as walleye or northern pike will be more contaminated than fish such as bluegills or crappies. Fish at the top of a food chain in any system--lake, river, or ocean--will have the greatest exposure to methylmercury.

It is likely that all fish contain small amounts of methylmercury because mercury is a naturally occurring element. However, we do know that in Minnesota levels of methylmercury in fish have been increasing. This increase is most likely due to more mercury entering the environment from human activities.

### What are the health risks of eating fish contaminated with methylmercury?

Methylmercury builds up in your body over time. It may take months or years of regularly eating contaminated fish to accumulate levels which are a health concern. Small amounts of methylmercury can be safely eliminated but larger amounts may damage the nervous system. The fetus is more sensitive to mercury poisoning because of its developing nervous system. In adults, the first symptoms of poisoning include incoordination and a burning or tingling sensation in the fingers and toes. As mercury levels increase, your ability to walk, talk, see, and hear may all be affected in subtle ways.

## What levels are harmful?

Although we know what levels of methylmercury in the blood are associated with health problems, we do not know exactly what levels protect against subtle damage which is only now being researched. The Minnesota Department of Health and the United States Food and Drug Administration take this uncertainty into account in setting levels for regulation or advice. The Food and Drug Administration action level of 1 ppm protects the average fish consumer, young children, and a significant number of consumers exceeding a daily dose which is considered safe by the Food and Drug Administration. The Department of Health gives advice over a range of contaminant levels which will help people choose how much and which fish they want to eat.

Meal guidelines from the Minnesota Department of Health help people space meals of methylmercury contaminated fish out over time. These guidelines are intended to protect sport anglers from the first symptoms of mercury toxicity. Guidelines are specific for people who eat sport fish only a few times a year, people who regularly eat contaminated sport fish, and there are specific guidelines for women who may have children in the next few years, pregnant women, nursing mothers and young children. For some of these groups, the Department of Health begins giving advice to limit meals of mercury contaminated fish when mercury levels are close to 0.2 ppm (parts per million).

## For more information:

On the health risks of contaminants, or for copies of the **Minnesota Fish Consumption Advisory,**
Minnesota Department of Health - (612) 627-5046

On the sources of contaminants in Minnesota's environment,
Minnesota Pollution Control Agency - (612) 296-6300

On collecting and testing Minnesota sport fish,
Minnesota Department of Natural Resources - (612) 296-2835

On collecting and testing commercially available fish,
Minnesota Department of Agriculture - (612) 296-2627

# Fish Facts

## Mercury in the Environment

### Mercury Pollution

Mercury (Hg in the table of elements) is a naturally-occurring metal which is present at very low levels in bedrock, soil, and water throughout Minnesota. Mercury evaporates from rock, soil, and water into the air. Mercury then returns to earth attached to small airborne particles or as a water-soluble form washed out of the air by rain or snow.

The Minnesota Pollution Control Agency estimates that 25 percent of the mercury that reaches Minnesota's land and lakes is natural in origin, coming from rocks or volcanic activity. The remaining 75 percent of newly deposited mercury comes from human activities. Major sources of this airborne mercury include fungicides in latex paints (a practice that is no longer legal), burning of coal and other fossil fuels, and burning of municipal solid waste. In addition, mercury can be released into surface water as waste, as has been the case with past mercury pollution of the Minnesota and Mississippi Rivers. In some countries, mercury compounds containing phenyl- or methylmercury may still be used as fungicides.

Studies of sediment cores from Minnesota and Wisconsin lake beds show mercury concentrations in lake sediments significantly increased around 1850 and again between 1920 and 1950. Mercury reached these study lakes from the atmosphere. The rate of increase of mercury deposition in these lakes has been about 1.7 percent per year over the 140 years since 1850. National and international efforts to prevent air pollution are needed to reduce mercury contamination of lakes and rivers.

### Mercury Chemistry

Elemental mercury, the silver metal in thermometers, is poorly absorbed from the gut (less than 0.01% is absorbed). Very large amounts would need to be swallowed to cause toxicity. When elemental mercury is heated it evaporates. Mercury vapor is easily absorbed by the lung and is a potential health threat to people who breathe it. The toxicity of mercury vapor is a known occupational hazard.

In lakes and rivers, elemental mercury can be transformed to methylmercury ($CH_3Hg^+$) by chemical processes and by the action of bacteria. In contrast to elemental mercury, methylmercury is almost completely absorbed by the gut and is toxic to people.

### Mercury in Fish

Methylmercury in lakes and rivers is absorbed by tiny aquatic organisms. Methylmercury builds up in the food chain, accumulating in larger and larger amounts as small invertebrates are eaten by small fish, which in turn are eaten by large fish. Methylmercury builds up to high levels in predatory fish that are at the top of the aquatic food chain. Methylmercury accumulates in fish at much higher concentrations than in the surrounding water. For example, water contaminated with 2 parts per trillion mercury ($2 \times 10^{-12}$ grams Hg/ml water) can produce levels of 450 parts per billion methylmercury in a northern pike ($450 \times 10^{-9}$ grams Hg/g fish). This is a 225,000-fold bioaccumulation of mercury. Bioaccumulation produces high concentrations of methylmercury in the fish people eat. Methylmercury attaches to the protein of fish and cannot be removed by cooking or cleaning the fish.

### Mercury Toxicity

Scientists don't know if methylmercury harms the fish in Minnesota lakes, but they do know that methylmercury could harm humans and wildlife that eat methylmercury-contaminated fish. Methylmercury's toxicity to humans is an environmental hazard recognized since the late 1950s when an industry released mercury and methylmercury into waters near Minamata Bay, Japan. Residents of fishing villages were poisoned by eating highly contaminated fish from Minamata Bay.

Methylmercury is neurotoxic; it affects the brain and spinal cord. Methylmercury is almost completely absorbed from the gut into the blood, is distributed throughout the body, and passes into the brain to reach nerve cells. In the brain, methylmercury interferes with the way nerve cells function.

### Symptoms of Toxicity

The earliest obvious signs of methylmercury poisoning in adult humans include tremor of the hands and paresthesias (abnormal sensations of the lips, tongue, fingers or toes). At higher levels, walking is affected, followed by blurred vision and decreased peripheral vision. Severely-affected patients have speech and hearing problems. If methylmercury exposure continues, a person can become paralyzed and die. Over 400 people in Iraq died in the

early 1970s from eating bread made from methylmercury-treated wheat that was intended for planting.

Fetuses are especially susceptible to methylmercury. At high levels of exposure methylmercury interferes with the way nerve cells move into position as the brain develops. As a result, the brain cannot develop normally. During the Iraq poisoning, researchers found children exposed in utero showed delayed development in walking and talking when the level of mercury in their mothers' body was four- or five-fold lower than levels known to cause symptoms of poisoning in adults. In both the Japan and Iraq disasters, some mothers who showed few symptoms of mercury poisoning gave birth to children with severe mental and physical retardation.

## The Dose Makes the Poison

Methylmercury toxicity is related to the dose (the amount taken into the body) and the duration of exposure. While fish seem to accumulate methylmercury throughout their lives, humans can eliminate methylmercury from their bodies over a period of months. When the amount of methylmercury taken into the body exceeds the amount that can be eliminated, methylmercury builds up in the body. Methylmercury is attracted to sulfur atoms on cells and attaches to sulfur-rich proteins, such as those in muscle, throughout the body. At a certain level in the blood, methylmercury harms the cells of the body.

Data relating clinical symptoms of poisoning to mercury levels in blood and hair come from studies of methylmercury poisoning in Iraq. Paresthesias occured at blood levels around 200 nanograms mercury per milliliter of blood (200 ng/ml), which is equivalent to a daily methylmercury intake of 0.3 milligrams methylmercury per 70 kilogram body weight per day. A maternal blood level four- or five-fold lower is associated with developmental delays in fetuses.

The Minnesota Department of Health uses a "safe" level of mercury in the blood 10-fold lower than the blood levels associated with the first symptoms of toxicity to calculate meal advice for mercury-contaminated fish. Advice on spacing meals out over time is based on information about the length of time it takes to eliminate methylmercury. By following the advisory, blood levels of mercury would be kept to less than 20 ng/ml (adult) and 4.7 ng/ml (women of childbearing age).

## Health Studies in Minnesota

In 1977, the Minnesota Department of Health conducted a study of methylmercury blood levels in vacationers and residents of the Crane Lake area of northern Minnesota. The most highly exposed individuals ate more than one meal of fish per week during the spring and summer for the two years preceding the study. Fish from lakes in the study area had methylmercury levels ranging from 0.11 to 2.9 parts per million (0.11 - 2.9 $\mu$g/g). In comparison, fish from Minamata Bay, Japan, had levels of around 10 parts per million mercury. People in the Crane Lake area who ate fish had an average blood mercury level of 29 parts per billion (29 ng/ml) mercury while non-fish eaters had an average of 19 parts per billion mercury.

More recently, the federal Agency for Toxic Substances and Disease Registry measured methylmercury in the blood of bandmembers of the Fond du Lac Band of Chippewa Indians near Duluth, Minnesota. The highest level detected was 20 parts per billion in the blood of an individual who ate fish one or more times per week. That level declined to 9 parts per billion during the winter months when the individual reported eating fish less frequently. The majority of those surveyed (75%) ate fish less than once a week. A mercury level of 5 parts per billion in blood is considered normal for the general, worldwide population. Only 27% of the study participants had mercury levels above 5 parts per billion.

Neither of the above studies included a physical examination of the participants. However, clinical studies conducted elsewhere suggest that the advice used in the fish advisory is protective of people's health.

## The Fish Consumption Advisory

Mercury levels of less than 0.16, 0.16 to 0.65, 0.66 to 2.8, and more than 2.8 parts per million in fish correspond to meal advice categories of unlimited meals, one meal a week, one meal a month, and do not eat, respectively. This advice protects the average, non-pregnant adult who eats fish all year round. Levels of less than 0.16, 0.16 to 0.65, and more than 0.66 parts per million correspond to meal advice categories of one meal a week, one meal a month, and do not eat for women of reproductive age and young children who eat fish year round. The Minnesota Fish Consumption Advisory provides less restrictive advice for people who eat fish only a few months or weeks of the year.

For a copy of the current Minnesota Fish Consumption Advisory, write "Fish Advisory," Minnesota Department of Health, P.O. Box 59040, Minneapolis, MN 55459-0040 or call 612-627-5423 (the toll free number for calls from outstate Minnesota is 1-800-657-3908).

To request this fact sheet in another format, call 612-627-5100. TDD: Minn. Relay Service 297-5353 or toll free 1-800-627-3529.

# Fish Facts

## Contaminants in Lake Superior Fish

PCBs and mercury are present in many fish collected from Minnesota waters of Lake Superior. Data are available for fish collected since 1982 from the lake near French River, Split Rock, Beaver Bay, Terrace Point, Grand Marais and Hat Point (Grand Portage). Currently, researchers are finding out if there are differences in contaminant levels in fish collected at major areas along the north shore of Lake Superior and how contaminant levels have changed through the years. Contaminants in both game fish and their prey, forage fish, are being studied.

### Where do contaminants come from?

Mercury is a naturally occurring metal which recycles between land, water, and air and enters plant and animal tissue. Scientists think that most mercury now reaching Minnesota waters was originally released into the air from the burning of fuels and household and industrial wastes. PCBs are synthetic oils once widely used in a variety of products and industries. Although they were never intended as food, they enter food chains because they are easily absorbed by animals. They do not decompose easily and remain in lake sediments and the bodies of animals and humans for years. Some of the Great Lakes have fish advisories based on pesticides, but in fish taken from Minnesota waters of Lake Superior, these contaminants are not normally detected or are present in very low levels. While scientists know something about how contaminants reach Lake Superior, little is known about how far they have traveled before reaching the lake.

### How do contaminants get into fish?

Once in the lake, mercury is converted to methylmercury by bacteria. Fish readily absorb methylmercury from their food and from water as it passes over their gills. Methylmercury binds tightly to the protein in the muscle of fish. Fish also absorb PCBs from water and food. PCBs concentrate in the fatty portions of fish and in fatty fish such as siscowet and lake trout. Older fish and predatory fish accumulate more PCBs and mercury than younger fish which eat less contaminated food. Although fish also eliminate contaminants from their bodies, it is a long slow process. In fact, humans appear to eliminate mercury and PCBs faster than fish can.

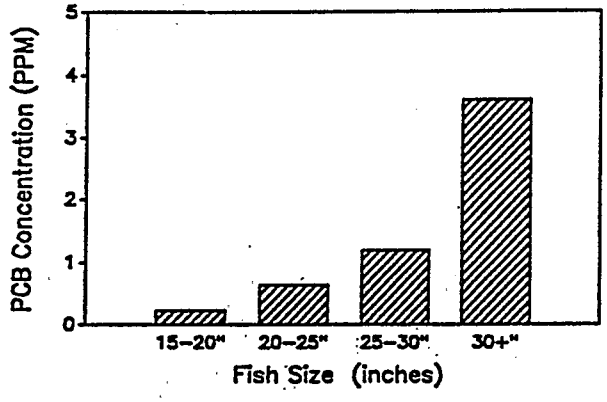
### How contaminated are Lake Superior fish?

Although very little data on mercury has been collected, Lake Superior fish have low levels of mercury. Recent data show that less than 5% of the fish tested had mercury levels of 1 ppm or more (1 ppm is the U.S. Food and Drug Administration level for food safety for commercially caught fish). In contrast, 14% of the fish tested exceeded the Food and Drug safety level of 2 ppm PCBs. The Minnesota Department of Health begins issuing advisories to limit consumption of sport fish at levels well below that of the Food and Drug Administration. In contrast to sport fish that may be eaten in quantity by just one family, commercially caught fish enter a large market and large numbers of contaminated fish are not available to a small group of consumers.

MINNESOTA DEPARTMENT OF HEALTH • SECTION OF HEALTH RISK ASSESSMENT • 925 S.E. DELAWARE ST., MINNEAPOLIS, MN 55414 • 612/627-5046

Lake trout make up most of the Lake Superior fishery and are the most studied fish in Lake Superior. The data show that as fish increase in size, PCB levels also increase (see graph). Researchers believe this is because the older a fish is, the longer it has been absorbing PCBs from the water and from its diet. And larger, older fish are able to eat larger, and therefore more contaminated, prey.

PCBs in Lake Trout fillets increase with fish size




Siscowet and lake trout are the most contaminated fish in Minnesota waters of Lake Superior. These fish have a higher fat content than rainbow trout (steelhead), coho, or chinook salmon. PCBs concentrate in fat, and the leaner and younger a fish is, the less PCBs it contains. Smelt have extremely low levels of PCBs compared to other small but fatty fish such as lake herring.

## Are fish and wildlife harmed by these contaminants?

There are few data on the effects of mercury or PCBs on fish health. Water concentrations of these contaminants are very low; fish are exposed to greater levels through the food they eat. Laboratory studies show that fish are not obviously harmed by these low levels in water. But studies have not been done to determine the effects of long exposure to low levels of these contaminants. Wildlife that eat fish--cormorants, loons, otter, and mink--accumulate mercury and PCBs as well as pesticides present in other Great Lakes. Studies of wildlife populations show that reproduction problems, birth deformities, tumors and behavioral changes occur in some Great Lakes wildlife that eat contaminated fish. This association between contaminants and toxicity is under active investigation by researchers throughout the Great Lakes, including Minnesota.

## Fish and your health

Based on the presence of contaminants in many of the fatty species of sport fish, anglers are advised to limit consumption of most Lake Superior fish. Information on this advisory appears in the "Minnesota Fish Consumption Advisory" available from the Minnesota Department of Health.

## For More Information:

All fish that have been tested from Minnesota lakes and rivers are listed in the current **Minnesota Fish Consumption Advisory** booklet published by the Minnesota Department of Health. Call **612-627-5423** (toll free 1-800-657-3908) to request a free copy or write:

**"Fish Advisory"**
**Minnesota Department of Health**
**P.O. Box 59040**
**Minneapolis, MN 55459-0040**

For questions concerning the sources of contaminants in Minnesota's environment, call the Minnesota Pollution Control Agency, (612) 296-6300.

For questions concerning collecting and testing fish, call the Minnesota Department of Natural Resources, (612) 464-1247.

To request this information in another format, call 612-627-5100. TDD: Minnesota Relay Service 297-5353 or toll free 1-800-627-3529.

**Special thanks** to the Great Lakes Sport Fish Advisory Task Force, Council of Great Lakes Governors, for information used in this advisory and to Jim Amrhein, Wisconsin Department of Natural Resources, for use of the drawings.

Minnesota Department of Health
925 Delaware St. SE
Minneapolis, MN 55414

March, 1994

# Lake Superior Fish Advisory:

## *A Guide to Your Health*

***A sport fish consumption guide to Minnesota waters of Lake Superior***

Minnesota Department of Health
Minnesota Fish Consumption Advisory

# Using this advisory

Measure your fish from the tip of the nose to the end of the tail. Find the species and size of fish you've caught in the table that follows. The table shows each kind of fish which has been tested for contaminants. If a species is not listed, it has not been tested.

At the top of the table, find the meal advice for the size fish you've caught.

- **No Restriction** means you can eat as many meals as you like.
- **One Meal a Week** (52 meals per year), **One Meal a Month** (12 meals per year), and **One Meal Every Two Months** (6 meals per year) is advice for how long to wait before eating your next meal of sport fish.
- **Do Not Eat** means no one should eat those fish because of very high contamination.

Note that the amount of contaminants in a fish listed in the "One Meal a Month" group is four times higher than the amount of contaminants in a fish listed in the "One Meal a Week" group.

## Meal Advice for Eating Sport Fish from Lake Superior

One meal is assumed to be one-half pound of fish (weight before cooking) for a 150-pound person. This meal advice is equally protective for larger people who eat larger meals and smaller people who eat smaller meals. Follow cleaning and cooking directions to prepare fish.

**The meal advice that follows is for eating trimmed and skinned fish.**

| Fish Species | No Restriction | One Meal a Week | One Meal a Month | One Meal Every Two Months | Do Not Eat |
|---|---|---|---|---|---|
| Lake Trout | | <20 inches | 20-27 inches | >27 inches | |
| Siscowet | | | | <20 inches | >20 inches |
| Chinook Salmon | | | All Sizes | | |
| Coho Salmon | | All Sizes | | | |
| Lake Whitefish | | All Sizes | | | |
| Lake Herring | | All Sizes | | | |
| Rainbow Trout | | All Sizes | | | |
| Brown Trout | | | All Sizes | | |
| Smelt* | All Sizes | | | | |

"<" means less than the length shown and ">" means greater than the length shown. "All sizes" means fish of any length.
* No restrictions on untrimmed smelt cooked with the skin on.

# A Guide to Your Health

*Fish are nutritious and good to eat. But some fish may take in contaminants from the water they live in and the food they eat. Some of these contaminants build up in the fish--and in you--over time. These contaminants could harm the people who eat them, so it is important to keep your exposure to these contaminants as low as possible. This advisory helps you plan what fish to keep as well as how often and how much sport fish to eat. This advisory is not intended to discourage you from eating fish, but should be used as a guide to eating fish low in contaminants.*

## Health Benefits

When properly prepared, fish provide a diet high in protein and low in saturated fats. Many doctors suggest that eating a half pound of fish each week is helpful in preventing heart disease. Almost any kind of fish may have real health benefits when it replaces a high-fat source of protein in the diet. You can get the health benefits of fish and reduce unwanted contaminants by following this advisory.

## Contaminants in Fish

Long-lasting contaminants such as PCBs, DDT, and mercury build up in fish in amounts which are a health concern. Health problems which may result from the contaminants found in fish range from small changes in health that are hard to detect to birth defects and cancer. Women who eat highly contaminated fish for many years before becoming pregnant may have children who are slower to develop and learn. The meal advice in this advisory is intended to protect children from these potential developmental problems. Adults are less likely to have health problems at the same low levels of exposure that affect children.

Although this advisory is primarily based on effects other than cancer, some contaminants cause cancer in animals. Your risk of cancer from eating contaminated fish cannot be predicted with certainty. Cancer currently affects about one in every four people by the age of 70, primarily due to smoking, diet and hereditary risk factors. Exposure to contaminants in the fish you eat may not increase your cancer risk at all. If you follow this advisory over your lifetime, you will minimize your exposure and reduce whatever cancer risk is associated with contaminants. At worst, using Environmental Protection Agency methods to calculate risk, it is estimated that approximately one additional cancer case may develop in 10,000 people who eat fish according to this advisory over their lifetime.

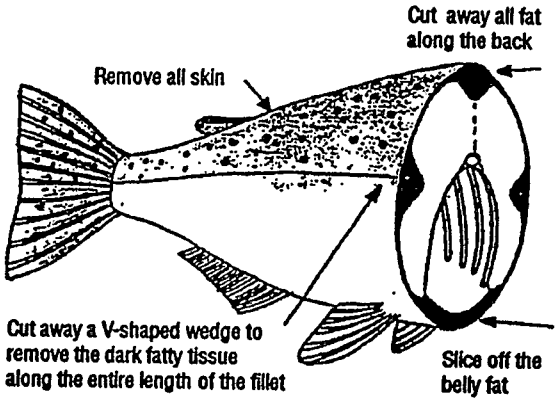
**Special Risk Groups:** People who regularly eat sport fish, women of childbearing age, and children under six years of age are particularly susceptible to contaminants that build up over time. If you fall into one of these categories, you should be especially careful to space fish meals out according to the advisory table that follows. Your body can get rid of some contaminants, such as mercury, over time. Spacing the meals out helps prevent the contaminants from building up to harmful levels in the body. For example, if you eat a fish from the "One Meal a Month" group, wait a month before eating another meal of fish from **any** restricted category.

**Others:** Women beyond their childbearing years and men face fewer health risks from contaminants such as mercury and PCBs. However, if you are in this group you should also follow the advisory to reduce your total exposure to contaminants. For these groups, it is the **total** number of meals that you eat during the year that becomes important and many of those meals can be eaten during a few months of the year. If most of the fish you eat are from the "One Meal a Week" category, you should not exceed 52 meals per year. Likewise, if most of the fish you eat are in the "One Meal a Month" category, you should not exceed 12 meals per year. Remember, eating one meal of fish from the "One Meal a Month" group is comparable to eating four fish meals from the "One Meal a Week" group.

# Cleaning and Cooking

Many contaminants are found at higher levels in the fat of fish. You can reduce the amount of these contaminants in a fish meal by properly trimming, skinning, and cooking your catch. Remove the skin and trim all the fat from the areas shown below:

- the belly flap,
- the line along the sides of the fish,
- fat along the back, and
- under the skin.




**Cooking does not destroy contaminants in fish,** but heat from cooking melts some of the fat in fish and allows some of the contaminated fat to drip away. Broil, grill, or bake the trimmed, skinned fish on a rack so the fat drips away. Do not use the drippings to prepare broth, sauce, chowder or soup.

These cleaning and cooking precautions will not reduce the amount of mercury or other metals. Mercury is distributed throughout a fish's muscle tissue (the part you eat) rather than in the fat and skin. Therefore, the only way to reduce mercury intake is to reduce the amount of contaminated fish you eat.

**Important:** You must follow these cleaning and cooking directions.
**The Lake Superior meal advice is for eating trimmed and skinned fish.**

# An Expectant Mother's Guide to Eating Minnesota Fish

*What You Should Know If You Are:*

~

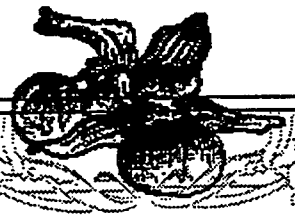
Pregnant

~

Planning to Be Pregnant

~

Nursing a Baby



**DRAFT**

*Did you know there are harmful contaminants in some fish? This is a special concern if you are pregnant, planning to be pregnant, or nursing a baby. Contaminated fish may not look, smell, or taste different. But they can still harm you — and your baby.*

*Don't stop eating fish — it is a good source of protein, and low in saturated fat. You can still get the benefits of eating fish by wisely choosing - safer types of fish - safer places to catch fish - safer ways to prepare fish, and - moderation in how often you eat fish and how much you eat.*

## What Contaminants Are in Fish?

Exposure to low levels of some contaminants in the environment may have long-lasting health effects on people. Two of these contaminants — mercury and polychlorinated biphenyls (PCBs) —are the major contaminants in Minnesota fish.

Mercury is a naturally-occurring metal which does not break down, but recycles between land, water, and air. Some mercury reaching Minnesota waters occurs naturally. Mercury is also released from coal-burning power plants, and from burning household and industrial waste.

*PCBs* are synthetic oils once widely used in industrial processes and products. PCBs break down very slowly in the environment.

*PCBs* and mercury collect in the soil, water, sediment, and in microscopic animals. They build up in fish, especially those that eat other fish.

## Mercury and PCBs: A Hazard for Babies and Small Children.

You can build up harmful levels of PCBs and mercury in your body without being aware of it. They can especially harm a developing child during pregnancy. The mother can pass these contaminants on to the baby during pregnancy and breastfeeding.

Mercury damages the nervous system.
In high amounts, mercury can cause severe mental and physical retardation in a baby. Lower amounts can delay walking and talking, and can cause other effects, such as learning deficits.

Babies exposed to PCBs in pregnancy have lower birth weights, smaller head size, and delayed physical development. As a result, these babies can develop problems that are hard to detect until later years— like learning deficits and memory problems. Exposure to PCBs may also cause cancer.

A woman's exposure before pregnancy matters, too. Women should follow the fish consumption advice given to pregnant and nursing women for several years before becoming pregnant. It takes up to six years or more for the body to get rid of PCBs, and up to one year to get rid of mercury.

Men may also have cause for concern. Animal studies show that mercury can damage sperm.

*Contaminants In Fish Can:*

- *Affect your baby more than they affect you*
- *Be difficult to detect*
- *Cause problems many years after consumption.*
- *It is best to prevent exposure to fish contaminants in the first place.*

## *Reducing Your Exposure to Contaminants: The Four Factors to Consider*

### *Choosing the Type of Fish*

Fish build up contaminants from the water they live in and the food they eat. Older or bigger fish have had more time to build up contaminants in their bodies.

Fish that eat other fish also build up more contaminants. Walleye and northern pike, for example, tend to have high levels of mercury.

Fatty fish, such as carp and catfish, tend to have more PCBs. They have more fatty flesh in which to store the contaminant.

### *Choosing Where to Fish*

While all Minnesota fish have some mercury, the highest levels are found in fish from northern Minnesota lakes. PCBs are found in all major river systems in Minnesota and some metro-area lakes. Both mercury and PCB levels may be higher around cities.

You can protect yourself by fishing in less contaminated waters. Find out which lakes and rivers have been tested for contaminants by ordering a copy of the "Minnesota Fish Consumption Advisory." This free booklet gives advice on eating fish from over 400 Minnesota lakes and rivers. To order, call (612) 627-5423 or 1 (800) 657-3908.

You will know more about the safety of fish from tested lakes and rivers than those that have not been tested. If you don't know the safety of fish in the lake or river you are fishing, a safer choice may be to release your catch.

### *Choosing Moderation in How Often You Eat Fish and How Much Fish You Eat*

Over time, your body can rid itself of some contaminants. You can help this process by eating smaller amounts of fish, and eating fish less often.

Some fish in Minnesota lakes and rivers are not safe for pregnant or nursing women or children under age six to eat. You can safely eat 7 ounces of bluegill, sunfish, or crappie each month from Minnesota lakes and rivers. If you eat more than 7 ounces of these or other fish in a month, consult the "Minnesota Fish Consumption Advisory" to find fish types and locations that are safe.

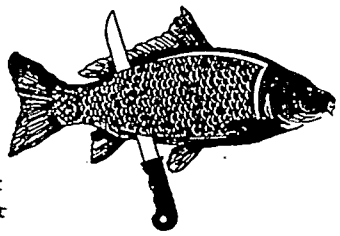
Remember, women who may become pregnant within six years are advised to eat fish the same as pregnant or nursing women.

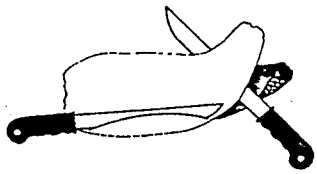
### *Cleaning and Cooking Fish*

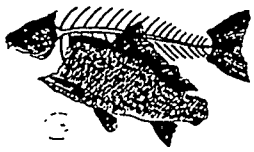
Mercury cannot be removed from fish. However, the way you clean and cook fish can make a difference in the amount of PCBs you eat.

Clean the fish to remove fatty parts (see diagram, next page.) Broil, grill, roast or steam fish. Frying breaded fish is not recommended for larger, fatty fish. Throw away drippings. Do not make soup with the liquid.

## How to Clean Fish to Reduce Your Exposure to PCBs:







Cut along the bone to get just the meat and skin.

Fat is under the skin. You cannot see fat in the meat. Cut off the skin with the fat and fat meat on the stomach of fish.

Use only the meat. Throw away all other parts of the fish.

## What About Store-Bought Fish?

The fish or shellfish you buy from your grocery store or fish market can also contain contaminants. Although there are laws to limit these contaminants, not all commercial fish are tested.

Pregnant or nursing women should not eat swordfish or shark. Canned tuna have mercury levels comparable to many Minnesota-caught fish. It is safe for a pregnant woman to eat up to 7 ounces of tuna each week — if it is the only source of mercury-contaminated fish including sport-caught fish, eaten that week.

Most commercial ocean fish, such as shellfish, flounder, pollack, and cod, are low in PCBs. A pregnant or nursing woman can safely eat these once a week.

Remember to consider ALL sources of fish you eat when making your choices.

## Steps You Can Take to Protect Yourself and Your Baby:

- Discuss the fish you eat with your health care provider.
- Carefully choose the fish you eat while you are pregnant or nursing—and for several years before that.
- Make changes in how you eat fish: what kind, from where, how much, how often, and how you prepare them.

*Get more information from:*

Minnesota Department of Health
925 SE Delaware Street
P.O. Box 59040
Minneapolis MN 55459-0040
(612) 627-5047

*Enjoy fishing and eating good fish!*

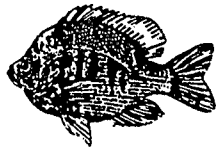
To request this document in another format, call (612) 627-5100.

TDD: MN Relay Service 297-5353
or Toll Free 1/800-627-3529.

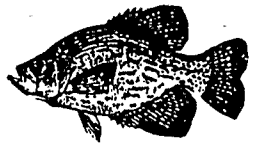
DRAFT

*2. Eat fish which have no chemicals.* The fish in the picture below have very few chemicals in them and are safe to eat. You can eat these fish every day.

**SAFE**



*bluegills*



*crappies*

*rock bass*

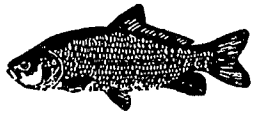
*perch*

*3. Eat fish with harmful chemicals less often.* The fish in the next picture have the most chemicals in them and it is not safe to eat these fish every day.

You will not have health problems if you eat these fish only one time each month. Eat only the smallest and youngest of these fish.

**NOT SAFE**

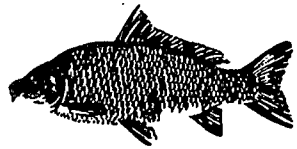
*white bass*



*buffalo*

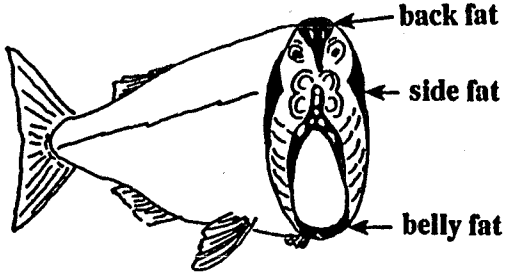
*sucker*

*catfish*

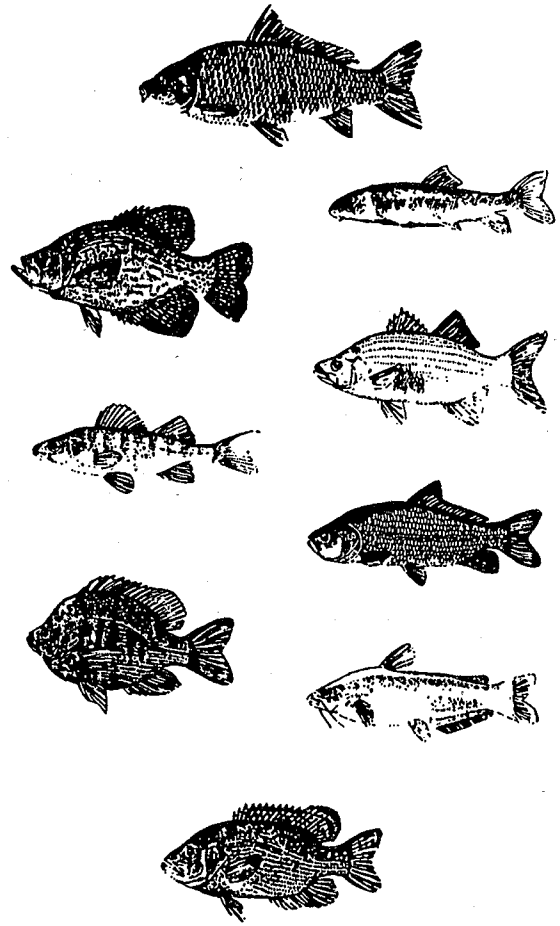


*carp*

*Do not eat the fat parts of these fish.* Cut off the fat parts of the fish (look at the picture below) before you cook the fish. Throw away the fat or water that fish have been cooked in. Do not make fish soup.




# WHICH FISH ARE SAFE TO EAT?



**Minnesota Department of Health**
**Minnesota Fish Consumption Advisory**
**627-5046**

## WHICH FISH ARE SAFE TO EAT?

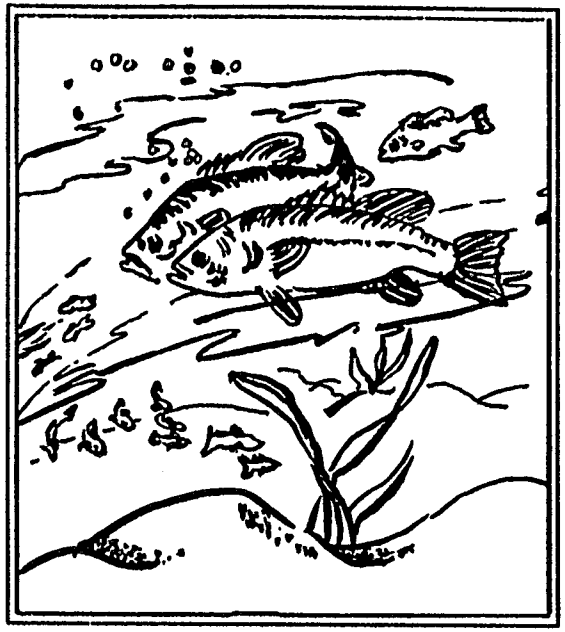
Fish are good food and are good for you. But some fish from lakes and rivers in Minnesota may have harmful chemicals in them. The fish do not taste, smell or look bad; but the chemicals in the fish may make a person sick after many months or years of eating too many fish which have harmful chemicals.

Protect yourself! Eat fish from lakes or rivers which do not have harmful chemicals in them. Eat only the safe parts of a fish.

## CHEMICALS IN FISH

Some lakes and rivers may have harmful chemicals like mercury and PCBs. Mercury comes from rocks and soils. Mercury is also in the smoke that comes from factories and cars. PCBs are in oil used by industries. PCBs enter the air and water from burning or because the chemicals were not stored safely.

There are laws now that say these chemicals must be stored safely, but some chemicals are already in the water and on the bottoms of the lakes and rivers of Minnesota and other states.



These chemicals move into fish as they swim in the water. The chemicals are also in the food fish eat. These chemicals stay in the fat and meat of fish. More and more chemicals stay in a fish the longer a fish lives in water with chemicals. Big and old fish have the most chemicals in their bodies.

## CHEMICALS IN YOU

Mercury and PCBs also stay in <u>your</u> body when you eat fish. Large amounts of chemicals may make health problems for you. Large amounts of mercury can change the way you walk, talk, see, and hear. Both mercury and PCBs can hurt a baby before it is born. The baby may not grow or learn well. Women who are going to have a baby should be careful not to eat too many fish with chemicals. A doctor can do a test to see if you have health problems from mercury or PCBs.

## PROTECT YOURSELF

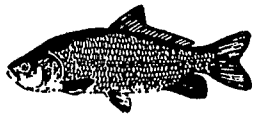
*1. Eat fish from lakes and rivers which do not have chemicals.* Fish in many parts of the Mississippi, Minnesota, and St. Croix Rivers are not safe to eat more than once a month.

Fish in most lakes near Minneapolis and St. Paul <u>are</u> safe to eat. Call the Minnesota Department of Health (627-5046) and ask for the free fish book called the "Minnesota Fish Consumption Advisory." You will get a book in the mail that will help you choose a safe place to fish.

***3. Noj cov ntses uas muaj tshuaj (Chemical) no kom tsawg me ntsis.***
Cov ntses ua muaj duab nyob hauv qab no muaj tshuaj nyob hauv lawv lub cev ntau thiab tsis zoo rau nej yuav niaj hnub noj.

Koj kuj yuav tsis muaj mob teebmeem ab tsi yog koj noj cov ntses no li ib hlis ib zaug xwb. Noj cov tses me me thiab mos mos xwb.

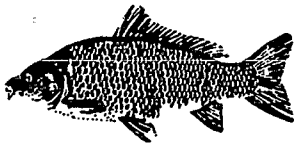
## NOT SAFE


*buffalo*


*white bass*

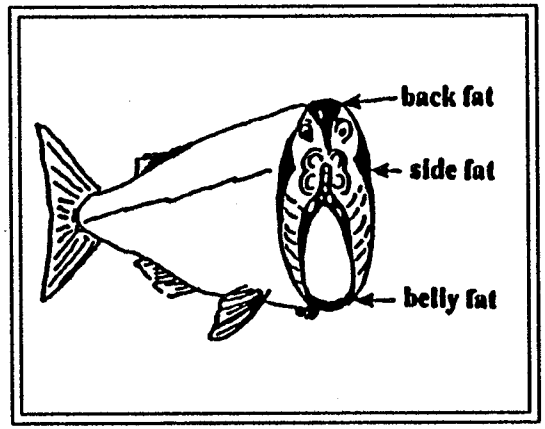

*sucker*


*catfish*


*carp*

***Tsis txhob noj tej qhov muaj roj ntawm cov ntsev no.***

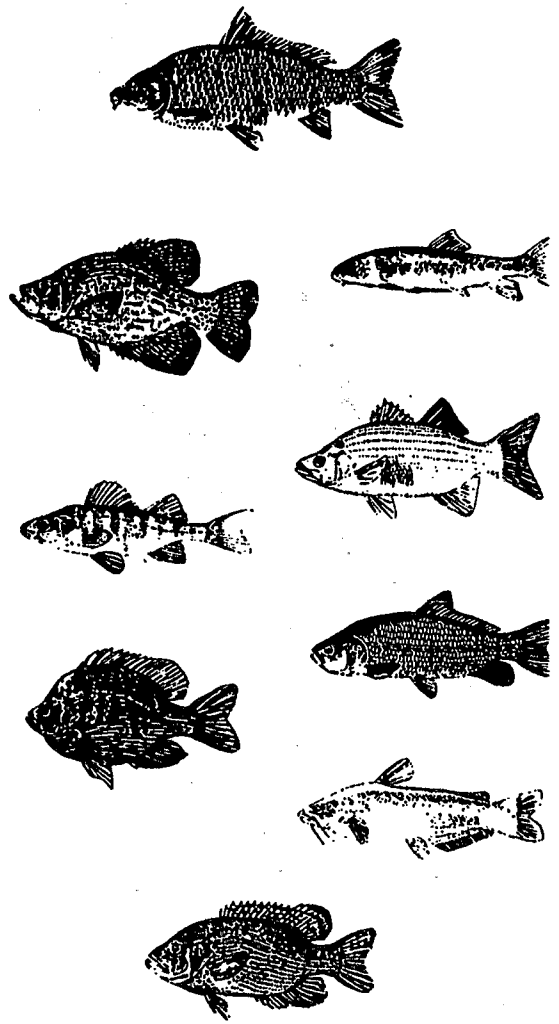
Muab tus ntses txiav tej qhov muaj muaj roj tawm (saib raws li daim duab hauv no) ua ntej nej yuav muab nej tus ntses ua noj. Muab cov nqaib ntses muaj roj thiab cov kua nej hau ntses hliv pom tseg. Txob muab cov kua no los haus.




Tej co ntses nyob rau hauv cov pas dej hauv hauv Minnesota no nej yuav noj ib as thiv ib zaug los kuj tau. Hu xov tooj rau Minnesota Department of Health (627-5047) nug txog phau ntawv qhia txogntses hu ua"Minnesota Fish Consumption Advisory." Lawm mam xa phau ntawv no tuaj rau koj kom tuaj pab qhia koj txog cov ntses nyob qhov twg thiaj zoo nuv coj los noj. Los yog sau ntawv mus rau: Fish Advisory, Minnesota Department of Health, P.O. Box 59040, Minneapolis, Minn. 55459-0040 nug txog "Fish Advisory".

*Special thanks to Laurie Allmann, Carpenter Nature Center; and Touh Xing Yang and Duoa Yang, Hastings Senior High School.*

# COV NTSES TWG THIAJ ZOO NOJ?



**Minnesota Department of Health**
**Minnesota Fish Consumption Advisory**
**627-5047**

## COV NTSES TWG THIAJ YUAV ZOO NOJ?

Ntses yog khoom noj zoo thiab zoo rau neeg lub cev. Tab sis muaj tej co ntses los ntawm tej lub pas dej thiab tej tus dej nyob hauv Minnesota no yuav tsis zoo noj vim muaj tshuaj (chemical) ub no nyob rau hauv lawv lub cev. Cov ntses uas muaj tshuaj(chemical) ub no nyob rau hauv lawv lub cev yuav tsis tsw phem los yog zoo txawv lwm yam tsev thiab yuav noj tsis qab li cas. Tab sis cov tshuaj (chemical) ub no hauv ntses lub cev yuav ua kom neeg muaj mob ntau hli los ntau xyoo tuaj tom qab nej noj cov ntses no.

Txuag koj lub cev. Noj cov ntses uas los ntawm cov pas dej thiab tej dej uas tsis muaj tshuaj (chemical) hauv lawv lub cev. Noj tej qhov uas zoo noj xwb.

## COV TSHUAJ (CHEMICAL) HAUV TSES LUB CEV.

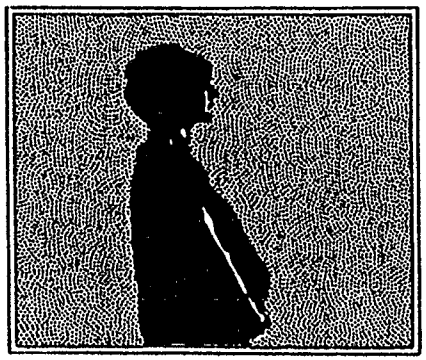
Ib co pas dej thiab dej muaj cov tshuaj (Chemical) hu ua "mercury" thiab PCB. "Mercury" muaj los ntawm tej pob zeb thiab av los. Ib co "mercury" kuj los ntawm tej pa tawv ntawm cov tsev ua haujlwm ub no thiab los ntawv lub fais los. PCB nyob rau hauv cov roj uas lawv siv nyob rau hauv tsev ua haujlwm loj ub no. Cov PCB no nkag mus rau ntawm tej huab cua thiab dej los tawm kev hlawv cov PCB no los yog los ntawv tej kev khawv cov tshuaj no cia tsis zoo.

Tam sim no kuj muaj ib cov kev cai hais kom neeg khaws cov tshuaj (chemical) no cia kom zoo, tab si cov tshuaj no twb muaj nyob rau hauv tej qab thu dej thiab qab pas dej nyob rau hauv Minnesota thiab lwm lub xeev los lawm.

Cov tshuaj (chemical) no nkag mus rau hauv cov ntses thaum lawv ua luam dej thiab nyob rau hauv cov zaub mov ntses noj. Cov tshuaj no nyob rau ntawm ntses cov roj thiab nqaij. Cov tshuaj (chemical) no nyob rau hauv ntses lub cev ntev tshaj tus ntses muaj coj sia nyob rau hauv cov dej uas muaj cov tshuaj no. Cov ntses loj thiab tses laus muaj cov tshuaj no nyob rau hauv lawv cov cev ntau.

## COV TSHUAJ (CHEMICAL) HAUJ KOJ LUB CEV

Cov tshuaj (chemical) mercury thiab PCB nkag nyob rau koj lub cev thaum koj noj ntses. Muaj tshuaj (chemical) ntau nyob rau hauv koj lub cev yuav ua kom koj muaj mob ub no. Yog muaj cov tshuaj mercury no ntau nyob rau koj lub cev, tej zaum koj kev mus kev, kev hais lus, kev pom thiab hnov ub no yuav txawv. Cov tshuaj (chemical) mercury thiab PCB no yuav ua kom muaj teebmeem rau cov menyuam tseem nyob hauv plab ua ntej lawv yug. Thaum tus menyuam yug los tej zaum nws yuav tsis loj zoo thiab kawm ub kawm no tau tsis tshua zoo. Cov poj niam muaj menyuam hauv plab txhob noj cov ntses muaj tshuaj (chemical) no ntau ntau. Kws khomob muaj cuab kav kuaj tau yog koj koj lub cev muaj teebmeem vim muaj cov tshuaj mercury thiab PCB no ntau.

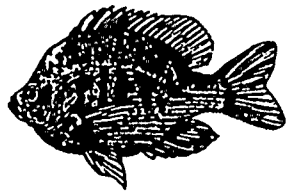


**TXUAG KOJ LUB CEV.**

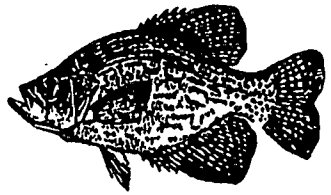
***1. Noj cov ntses los ntawm cov pas dej thiab dej uas tsis muaj cov tshuaj no.*** Cov ntses nyob hauv tus dej Mississippi, tu dej Minnesota, tus dej St. Louis thiab tus dej St. Croix no mas yuav tsis zoo noj ntau tshaj ib hlis ib zaug.

***2. Noj cov ntses uas tsis muaj tshuaj (chemical) hauvlawvlub cev.*** Cov ntses uas muaj duab nyob hauv qab no muaj tshuaj me me nyob hauv lawv lub cev xwb thiab noj yuav tsis muaj teebmeem ab tsi. Cov ntses no nej niaj hnub noj los tau.

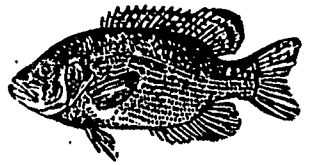
**SAFE**



***bluegills***



***crappies***



***rock bass***

***perch***

# DO YOU LIKE TO FISH?

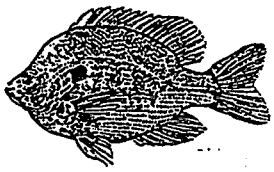
B-55

Good! Fishing is fun! But, be careful. Some fish in Minneapolis/St. Paul lakes have poisons that make the fish unsafe for you to eat. The fish may not taste, smell or look bad, but the poisons in the fish may make you or your child sick after eating them for a long time.

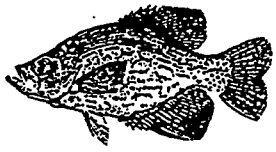
## Learn how to protect yourself!

**1. Eat fish that are SAFE.**

These fish have very few poisons in them and are safe to eat. Most people can eat one meal of these fish 1 time a week. But pregnant or nursing women and children under age 6 should eat these fish no more than once a month.



bluegill



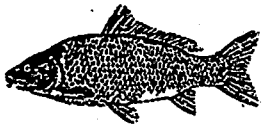
crappie

rock bass

perch

**2. Eat fish that are NOT SAFE less often.**

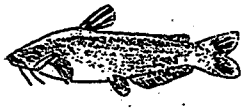
These fish have the most poisons in them. Pregnant or nursing mothers and children under age 6 should never eat these fish. Others should eat these fish once a month or less. It is best to eat the smallest and youngest of these fish.



carp

sucker

white bass

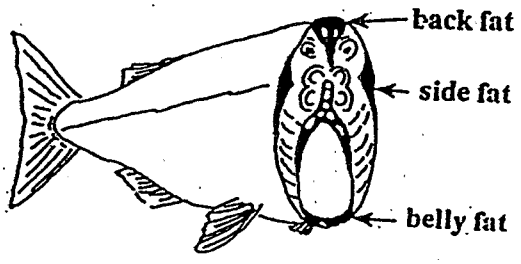


catfish

buffalo

**3. Do not eat the fatty parts of fish.**

Some poisons build up in the fatty parts of fish. It is best if you cut off the fatty parts before you cook the fish. Throw away the water that fish have been cooked in. Do not make fish soup.




**4. Eat fish from safe lakes.**

**A. Bluegill, sunfish and crappie from these lakes are SAFE to eat every day.**

Big Carnelian (May Township)
Byllesby Reservoir (Randolph Township)
Coon (Columbus Township)
Elmo (Lake Elmo)
Forest (Forest Lake)
Long (New Brighton)
Minnetonka (Minnetonka)
Parley (Laketown)
Rebecca (Hastings)
Snelling (Fort Snelling State Park)
Wasserman (Laketown)
Wirth (Minneapolis)
Big Marine (New Scandia)
Christmas (Shorewood)
Crystal (Burnsville)
East Vadnais (Vadnais Heights)
Harriet (Minneapolis)
Medicine (Plymouth)
O'Dowd (Shakopee)
Pickerel (Lilydale)
Rebecca (Greenfield)
Waconia (Waconia)
White Bear (White Bear Lake)

**B. Bluegill, sunfish, crappie, pike and small walleye (less than 20 inches) from these lakes are SAFE to eat every day.**

Big Carnelian (May Township)
Big Marine (New Scandia)
Byllesby Reservoir (Randolph Township)
Christmas (Shorewood)
Coon (Columbus Township)
Crystal (Burnsville)
Elmo (Lake Elmo)
Harriet (Minneapolis)
Long (Long Lake)
Pickerel (Lilydale)
Snelling (Fort Snelling State Park)
Wasserman (Laketown)
White Bear (White Bear Lake)

Most fish from the Mississippi, Minnesota and St. Croix Rivers in the Minneapolis/St. Paul area, are **NOT SAFE** to eat.

9/9

MINNESOTA DEPARTMENT OF HEALTH • SECTION OF HEALTH RISK ASSESSMENT • 925 S.E. DELAWARE ST., MINNEAPOLIS, MN 55414 • 612/627-5046

# KOJ PUAS NYIAM NUV NTSES?

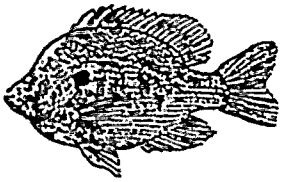


Zoo heev! Nuv ntses yeej lom zem kawg! Tiamsis, yuav tsum xyuam xim nawb. Muaj tej co ntses nyob hauv cov pas dej nyob rau thaj tsam Minneapolis/St. Paul uas muaj TSHUAJ LOM NEEG nyob hauv cov ntses no ua rau cov ntses tsis huv rau sawv daws noj. Tej zaum cov ntses no mas kuj tsis tsw phem, tiamsis cov tshuaj lom neeg nyob hauv cov ntses no yuav ua rau koj, los yog koj cov minyuam muaj mob yog hais tias nej tau noj cov ntses no ntau zaug thiab noj tau ntev los lawm.

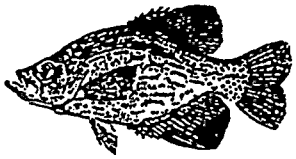
**Kawm kom koj paub tiv thaiv koj tus kheej!**

**1. Noj cov ntses uas <u>ZOO NOJ</u> xwb.**

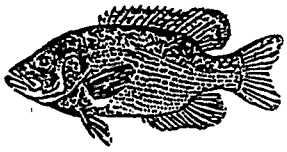
Cov ntses no tsuas muaj tshuaj lom neeg mi ntsis xwb mas thiab li zoo noj. Sawv daws feem coob tsuas noj tau cov ntses no 1 zaug toj ib as thiv xwb. Tiamsis, cov poj niam muaj minyuam hauv plab los yog cov poj niam nyob nruab hlis, thiab cov minyuam 6 xyoo rov hauv, yuav tsum tsis txhob noj cov ntses no ntau tshaj 1 zaug toj ib hlis.



bluegill



crappie



rock bass

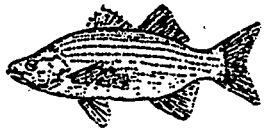
perch

**2. Txhob noj cov ntses uas <u>TSIS ZOO NOJ</u> heev-heev.**

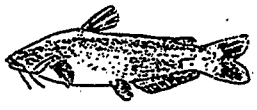
Cov ntses no muaj tshuaj lom neeg ntau heev. Cov poj niam muaj minyuam hauv plab los yog cov poj niam nyob nruab hlis thiab cov minyuam 6 xyoo rov hauv yuav tsum tsis txhob noj cov ntses no li. Lwm cov neeg tsuas noj tau cov ntses no 1 zaug toj ib hlis xwb los yog tsawg tshaj 1 zaug toj ib hlis. Tsis tas li, cov ntses no mas yuav tsum noj cov ntses me-me xwb thiaj zoo noj mi ntsis.

carp

sucker



white bass

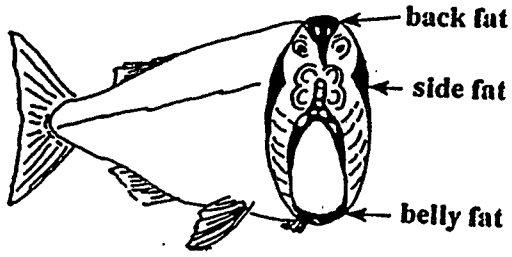


catfish

buffalo

**3. Tsis txhob noj tej NQAIJ NTSES ROG.**

Muaj tshuaj lom neeg ntau nyob rau hauv cov nqaij ntses rog. Koj yuav tsum muab tej qho nqaij ntses rog hlais pov tseg tag ua ntej koj muab coj los ua noj. Cov kua ntses mas yuav tsum muab pov tseg. Tsis txhob ua kua ntses hauv li.




**4. Noj cov ntses uas nyob hauv cov PAS DEJ HUV-HUV xwb.**

**Cov ntses muaj npe hu ua bluegill, sunfish thiab crappie uas nyob hauv cov PAS DEJ npe hu raws li nram no thiaj li ZOO NOJ.**

Big Camelian (May Township)
Christmas (Shorewood)
Elmo (Lake Elmo)
Harriet (Minneapolis)
Minnetonka (Minnetonka)
Pickerel (Lilydale)
Snelling (Fort Snelling)
White Bear (White Bear Lake)
Big Marine (New Scandia)
Coon (Columbus Township)
East Vadnais (Vadnais Heights)
Long (New Brighton)
O'Dowd (Shakopee)
Rebecca (Hastings)
Waconia (Waconia)
Wirth (Minneapolis)
Byllesby Reservoir (Randolph Township)
Crystal (Burnsville)
Forest (Forest Lake)
Medicine (Plymouth)
Parley (Laketown)
Rebecca (Greenfield)
Wasserman (Laketown)

Feem coob cov ntses uas nyob rau hauv 3 tug dej loj npe hu ua Mississippi, Minnesota thiab St. Croix Rivers nyob rau thaj tsam Minneapolis/St. Paul no mas **TSIS ZOO NOJ** li.

MINNESOTA DEPARTMENT OF HEALTH • SECTION OF HEALTH RISK ASSESSMENT • 925 S.E. DELAWARE ST., MINNEAPOLIS, MN 55414 • 612/627-5046 9/93

Printed on Recycled Paper

The only way to know if there is any reason to be concerned about contaminants in your favorite fishing hole is to look up the location in the **Minnesota Fish Consumption Advisory.** Fish from over 300 Minnesota lakes and rivers have been tested for mercury, PCBs and other chemicals--and all are in the booklet.

The **Minnesota Fish Consumption Advisory** has advice for how often you can safely eat fish. The booklet shows the species and the sizes of fish tested. The booklet lists meal guidelines for vacationers, lake residents, avid anglers and women in their child-bearing years. Women who may become pregnant, pregnant women, nursing mothers, and young children are especially vulnerable to the harmful effects of fish contaminants. These individuals should be sure to consult a copy of the **Advisory.**

You can get your free copy of the **Advisory** by writing or calling the Minnesota Department of Health, 925 S.E. Delaware Street, Minneapolis, Minnesota 55459-0040, (612)627-5047. Ask for the "Fish Advisory".

This brochure was produced by the Minnesota Department of Health in cooperation with the Minnesota Office of Tourism and the Minnesota Department of Natural Resources.

Feb 1991

# Eating Minnesota Fish:

## *A guide to your health*

**Minnesota Department of Health**
**Minnesota Fish Consumption Advisory**

B-57

# A Guide to Your Health

Minnesota offers some of the best sport fishing in the Great Lakes region. Fish are a low fat source of protein which may have real benefits - especially if your concern is heart disease.

But some fish in Minnesota, Ontario, and all the Great Lakes states store small amounts of contaminants. Although the levels found are usually low, large amounts may be harmful. It's a good idea to follow a few precautions in consuming fish, particularly if you eat fish often.

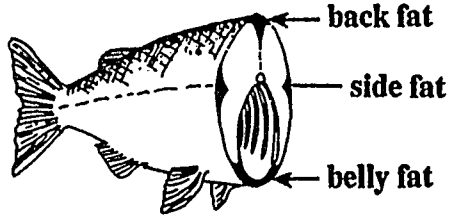
- Selective catch - and - release--keeping only smaller fish for the table, and returning bigger ones to water-- is good for your health as well as the health of the fishery resource. In addition to tasting better, smaller fish are relatively free of contaminants.

- Substitute a few panfish meals for the walleye or northern pike you might otherwise eat during a long vacation. Contaminants such as mercury and PCBs build up in large predatory fish. Their prey, including panfish such as perch, sunfish, or crappies, are always less contaminated.

- Eat smaller meals of big fish, and eat them less often. Take home part of your catch to space the meals out over time.

- Methods of cleaning fish can reduce the level of chemicals in some fish by 20 to 50%. Organic contaminants such as PCBs and dioxins concentrate in fat, so skinning and trimming fish to remove the fatty areas shown in the diagram below will reduce levels of these chemicals. Mercury does not concentrate in fat and these precautions will not reduce the amount of mercury in a meal of fish.

- Broiling, baking or grilling so fat drips off reduces PCB and dioxin levels even further. Poaching and deep-fat frying removes some contaminants--but discard the broth or oil. Pan frying removes few contaminants.




*Wisconsin Sea Grant*

* Trim away these fatty areas.

Some Minnesota fish should be eaten in moderation. Exactly how much fish you should eat depends on how often you eat fish and the level of fish contamination.

A person who only eats fish during a one-week vacation has little to worry about compared to the person who eats fish every week during the summer. We eliminate contaminants from our bodies, and we do it more efficiently than fish do. But it is a process that takes time. You can help that process by simply spacing meals of more contaminated fish out over time.

## Koj Puas Yog Noj Cov Ntses Uas Nej Tau?

Cov ntses hauv qee lub pas dej thiab dej hauv Minnesota no muaj ntsuaj thiab qias neeg.

Noj cov ntses no yuav ua rau koj mob.

Koj yuav tsum nug koj tus kws kho mob saib yam ntses twg noj tau.

## តើអ្នកទទួលទានត្រីមានរោគឬទេ?

ត្រីខ្លះនៅក្នុងបឹងនិងស្ទឹងនៅរដ្ឋមិនីសូតាមានមេរោគ.

ទទួលទានត្រីទាំងនោះអាចមានគ្រោះថ្នាក់ដល់អ្នក.

សូមស៊ើគ្រូពេទ្យប្រចាំគ្រួសាររបស់អ្នកថា តើត្រីកន្លែងណាខ្លះដែលមិនមានមេរោគ.

## Cá Bạn Dùng Có An Toàn Không?

Cá từ những sông, hồ tại Minnesota có khi bị nhiễm độc.

Nếu bạn dùng cá đã bị nhiễm độc có thể làm hại đến sức khoẻ của bạn.

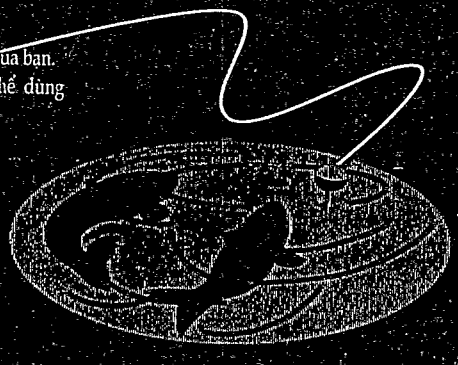
Xin liên lạc bác sĩ của gia đình bạn để biết rõ loại cá nào bạn có thể dùng mà không sợ bị nhiễm độc.

## ปาที่ท่านกำลังกินอยู่นี้ปลอดโพดิ่?

ปาจากบางหมองในมินนิโซต้ามีการปะเปื้อนพลาย.

การกินปาจำพวกนี้อาจเป็นโพต่สุขภาบของท่าน.

ให้ปึกสาท่านหมอประจำ ถอบถือท่านว่าถวนจะกินปาชนิดใดจึงปอดโพ.



## Are You Eating Safe Fish?

Fish from some Minnesota lakes and rivers are contaminated. Eating these fish can harm you.

Ask your family doctor about which fish are safe to eat.

This information provided by:
The Minnesota Department of Health:
612/627-5047.

Provided by the Minnesota Department of Health and supported by funds from the Comprehensive Environmental Response, Compensation and Liability Act Trust Fund through a cooperative agreement with the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services.

# FISH AND YOUR HEALTH

## ENVIRONMENTAL EXPOSURE TO PCBS IN FISH

## ARE YOUR PATIENTS AT RISK?

■ With two million licensed anglers in Minnesota, as many as half of your patients may be eating sport-caught fish. Some of these anglers could be at risk of developing cancer, or giving birth to children with developmental problems because of the fish they eat.

■ There are many benefits of eating fish. Fish is a good source of protein, is low in fat, and is rich in the omega 3 fatty acids beneficial in the prevention of heart disease. However, fish in some Minnesota lakes and rivers pose a health risk because they contain PCBs. The health of special populations who subsist on fish is a growing concern.

■ This fact sheet is for health care providers who see patients that may be at high risk for long-term adverse health effects from eating PCB contaminated fish.

*Provided by the Minnesota Department of Health and supported by funds from the Comprehensive Environmental Response, Compensation and Liability Act Trust Fund through a cooperative agreement with Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services.*

### PCBs:

Polychlorinated biphenyls (PCBs) are a group of 209 synthetic chemicals having varying toxicity. PCBs are stable, fat-soluble substances that are poorly excreted from the body. PCBs were used widely as coolants and lubricants in transformers, capacitors, and other electrical equipment. In 1976, PCB production was banned in the U.S. due to evidence that PCBs accumulating in the environment pose a threat to humans and wildlife. Although no longer manufactured, these chemicals remain in the environment due to their stability and resistance to biodegradation.

### Exposure Route:

Humans are exposed to PCBs because these chemicals bioaccumulate in fish living in contaminated waters. PCBs contaminate Minnesota's waters because of past use and improper storage of PCBs. Disposal of PCBs at industrial or municipal waste sites has contributed to the contamination of some Minnesota lakes and rivers.

Nationwide, PCBs have been found in at least 286 Superfund hazardous waste sites listed by the Environmental Protection Agency (EPA). PCBs are not soluble in water; they are present either in sediment or adsorbed to suspended particulates. Aquatic organisms ingest and accumulate PCBs resulting in increasing levels of PCBs in the successive steps of a lake or river food chain. Levels of PCBs in fish can be a million - fold higher than the levels in water. The low water solubility of PCBs helps to prevent high concentrations of these chemicals in drinking water supplies.

### Who's at Risk:

There are some fish-eaters with potentially higher risks of long-term adverse health effects because of high exposures to contaminated fish or because they are particularly suseptible to the contaminants in fish. People who are likely to eat larger amounts of fish than the general population include: Southeast Asians, Native Americans, sport anglers, and others who subsist on fish out of financial necessity. Fetuses of mothers who eat contaminated fish are susceptible to developmental effects due to PCB exposure.

### Health Effects:

Health effects resulting from eating fish contaminated with PCBs are difficult to evaluate and are a focus of research conducted throughout the Great Lakes Region. Nearly all humans have been exposed to PCBs through environmental exposures. Consequently, all persons are likely to have trace levels of PCBs in their bodies. The link between low-level PCB exposure and human health problems is not clear and information from animal testing provides additional means of assessing risks from PCBs. PCBs are an animal carcinogen and reproductive toxin. Researchers suspect prolonged exposure to small doses of PCBs has adverse effects on human fetal development, reproduction, and may promote the growth of cancer. Based on studies, The Environmental Protection Agency (EPA) considers PCBs to be probable human carcinogens.

## Fetal Development and Reproduction Effects:

Research in the last decade indicates the potential health risks from PCBs are highest for the developing fetus. A study conducted by Fein, Jacobson, *et al.*, on 242 women who ingested PCB-contaminated fish from Lake Michigan for at least six years prior to pregnancy, found that the women delivered babies with significantly lower than normal birth weights, smaller head circumferences and, based on the Ballard examination, shorter gestational age and poorer neuromuscular maturity [1]. They found in utero exposures, but not postnatal exposures, were linked to delayed development measured at birth, seven months, and four years of age. A woman can transfer large doses of PCBs directly to her fetus while pregnant, and then later her infant can receive additional PCBs through her breast milk. Studies are available that address PCBs in breast milk [2]. [3]. The cautious approach is to tell women to reduce their exposure to PCBs during nursing.

## Acute Exposure:

Acute exposure to PCBs in fish is not a primary health concern because it doesn't result in acute health effects. The PCB levels which must be eaten to cause acute health effects are much higher than what fish could accumulate. Acute health effects from high levels of PCBs have occurred in cases of occupational and accidental exposures. Chloracne is the only known overt sign of acute PCB toxicity in adults.

## Chronic Exposure:

PCBs have a biological half-life of one year or more. Chronic exposure to low levels over long periods can result in significant body burdens.

## Medical Evaluation of PCB Exposure:

There are tests available to measure PCBs in blood, adipose tissue and breast milk. However, these tests are expensive ($50.00 per test), are not routine clinical tests, and only indicate if the patient has been exposed to PCBs. The measurements cannot determine the level of exposure, type of PCB, duration of exposure, or whether a patient will develop adverse health effects. The Agency for Toxic Substances and Disease Registry (ATSDR) recommends that testing should be evaluated carefully when PCB exposure is suspected to have been at high levels or when PCB exposure from breast milk is a concern. PCBs detected in breast milk are not always an indication that breastfeeding should be discontinued. There is no specific treatment for PCB toxicity; therefore, the only treatment is to prevent the PCB exposure.

## Communicating Risk to Patients:

The health professional plays an important role in providing information to patients about exposure to contaminants in fish and the potential health effects to the developing fetus and infant. Health professionals can assess their patient's potential health risks by questioning and evaluating their patient's fish consumption patterns. Although fish can provide nutritional benefits, anglers need to be aware of the health risks associated with some species of fish from certain waters. Health providers can assist patients in managing their health risks by recommending use of the Minnesota Department of Health's *Minnesota Fish Consumption Advisory.* The advisory has detailed guidelines for how often fish can be safely eaten from lakes and rivers that have been tested for contaminants.

## Reduce the Risk:

When advising your patients, the Minnesota Department of Health suggests these guidelines:

- Eat panfish rather than predator fish.
- Eat small game fish rather than large ones.
- Eat fewer fatty fish (carp, catfish, lake trout.)
- Trim skin and fatty areas where some contaminants accumulate.
- Advise women of child bearing age, pregnant women, nursing mothers, and young children to select their catch or meals carefully.
- Refer to the *Minnesota Fish Consumption Advisory* for the lakes and rivers in Minnesota that have been tested for contaminants.

**References:**

1. Fein G.G., Jacobson J.L., Jacobson S.W., Schwartz P.M., and Dowler J.K. Prenatal Exposure to Polychlorinated Biphenyls: Effects on birth size and gestational age. Journal of Pediatrics. 1984; 105: 315-320.

2. Rogan W.J., Bageniewska A., Damstra T. Pollutants in Breast Milk. N Engl J. Med. 1980; 302: 1450-1453.

3. Gladen B.C., Rogan W.J., Hardy P., Thullen J., Tingelstad J., Tully M. Development after exposure to polychorinated biphenyls and dichlorodiphenyl dichloreothane transplacentally and through human milk. J Pediatr. 1988; 113: 991-995.

**To request this document in another format call:**
612/627-5100. TDD: Minnesota
Relay Services: 612/297-5353
or call Toll Free: 1/800/627-3529 (in Greater Minnesota)

**Other Sources of Information:**

For further information regarding contaminants in fish. Contact the Minnesota Department of Health: 612/627-5047.

ATSDR CASE STUDIES IN ENVIRONMENTAL MEDICINE: self-instructional educational materials to guide physicians and other health professionals through the diagnosis, treatment and surveillance of persons exposed to hazardous substances.

For more information call Patricia Poindexter, Division of Health Education, ATSDR: 404/639-6205.

ATSDR TOXICOLOGICAL PROFILES available on over 150 chemicals. For copies or further information call ATSDR, Division of Toxicology: 404/639-6300.

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# FISH AND YOUR HEALTH

## FISHING IN MINNEAPOLIS AND ST. PAUL

*Many fish in the Minnesota River and the Mississippi River in Minneapolis and St. Paul ARE NOT safe to eat.*

*Fish in MOST LAKES near Minneapolis and St. Paul ARE safe to eat.*

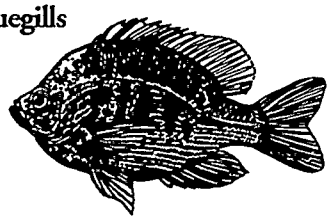
## Safe Fish to Eat

The fish in this picture ARE SAFE fish to eat. You can eat these fish every day.

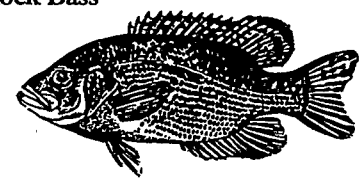
These fish contain fewer pollutants than the fish pictured on the next page.

Eat smaller SAFE fish rather than larger ones.

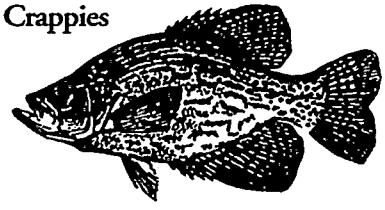
Bluegills



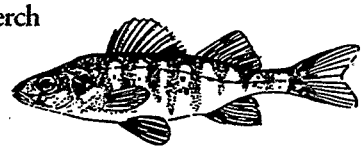
Rock Bass



Crappies



Perch



## What are Pollutants?

Some Minnesota lakes and rivers have pollutants in them. Pollutants come from factories, waste sites, and cars. Pollutants get into lakes and rivers through the air, water, and ground. Most Minnesota fish are good for you, but some kinds of fish have pollutants like mercury and PCBs.

Mercury is a poison that can make it hard for a person to walk, talk, see and hear. Babies with mercury poisoning do not walk as soon as they should.

PCBs are poisons that make people sick and can cause cancer after many years. Babies with PCB poisoning may have trouble learning.

### Some Fish Have Pollutants

Rain and snow carry pollutants in the air down into the lakes and rivers. Tiny animals in the water eat the pollutants. When small fish eat the tiny animals they eat the pollutants and the pollutants go into the small fish. Big fish eat many small fish and the big fish end up with the most pollutants.

- Polluted fish do not look sick. They feel, move, and taste the same as safe fish.
- Larger, older, and fatty fish (white bass, and carp) in rivers have the most pollutants.

### Pollutants In Fish Can Make You Sick

Pollutants stay in your body when you eat polluted fish. Pollutants in fish can make people sick, but only after many months or years of eating them. A man, woman, child, or baby may not act sick, but may be sick in ways you cannot easily see.

Provided by the Minnesota Department of Health and supported by funds from the Comprehensive Environmental Response, Compensation and Liability Act Trust Fund through a cooperative agreement with Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services.

## Pregnant Women

Women of child bearing age, pregnant women, nursing mothers, and young children should not eat polluted fish. Pollutants in fish go into the blood of mothers and into the baby growing inside her. A doctor can do a blood test to see if you are sick from mercury or PCBs.

## Choose Safe Fishing Places and Eat Safe Fish

Fish from polluted lakes and rivers are not safe to eat. Lakes and rivers in or near cities are more polluted than lakes and rivers in the country.

- Do not drink the water from any lake or river. It can make you sick.
- Bring water from home to drink.

The only way to know which lakes and rivers have safe and not safe fish is to ask your county or city health department, clinic or doctor. These people can help you choose safe places to fish and can give you more information on eating safe fish.

## Free Book

You can get a free fish book called the "Minnesota Fish Consumption Advisory." This book can help you choose safe places to fish. For a copy, in English, call the Minnesota Department of Health: 612/627-5047.

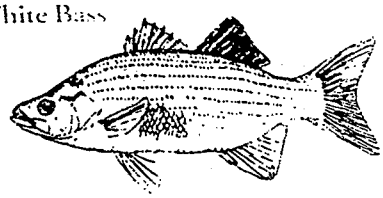
# Fish that are Not Safe to Eat

In rivers, fish in this picture are not safe to eat.

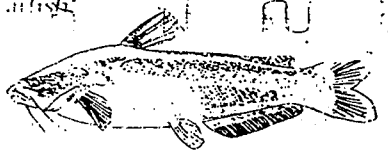
In lakes, these fish are safer to eat.

If you must eat these fish from the rivers, eat only one meal of fish a month and cut off and throw away the fatty parts of the fish before cooking.

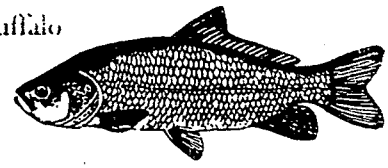
White Bass



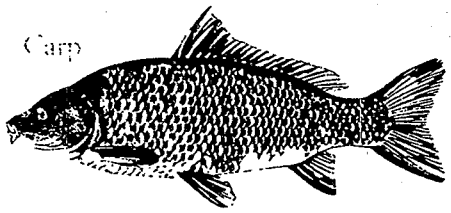
Catfish



Buffalo



Carp

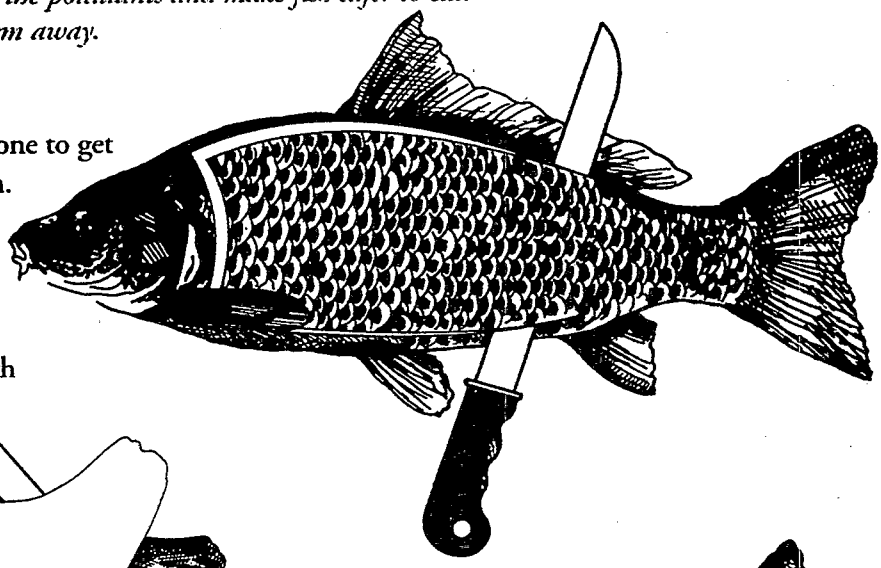


Suckers

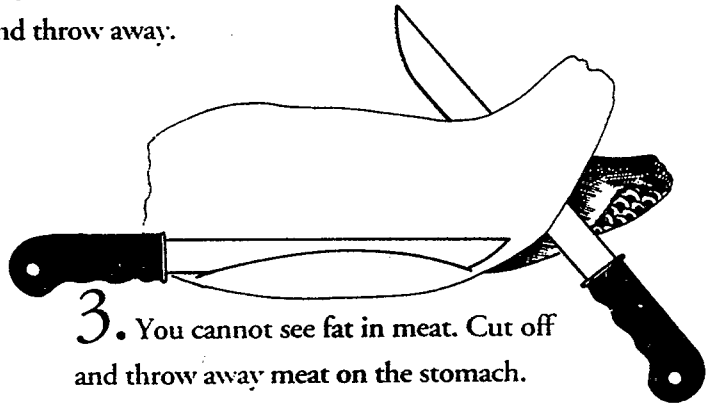
## CLEANING FISH:

*By cleaning the fish, you can take away some of the pollutants and make fish safer to eat.*
*It's important to remove the guts and throw them away.*
*Clean the fish as shown in the steps below.*

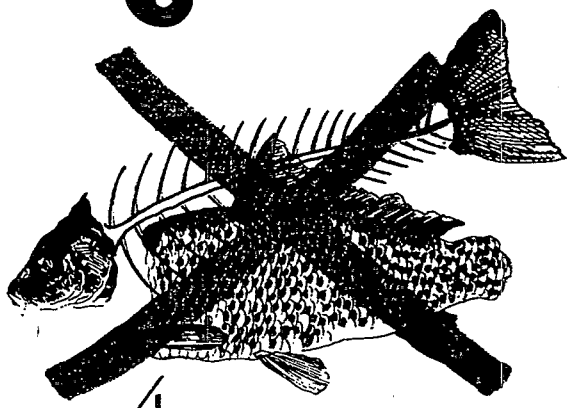
1. Cut along the bone to get just the meat and skin.



2. Fat is under the skin. Cut off the skin with the fat and throw away.



3. You cannot see fat in meat. Cut off and throw away meat on the stomach.



4. Use only the meat, throw away all other parts of the fish.

For More Information in English about Pollutants in Fish and Eating Safe Fish:

call: County or City Health Department
or Minnesota Department of Health, telephone: 612/627-5047

or write: Fish and Your Health (CES)
Minnesota Department of Health P.O. Box 59040
Minneapolis, MN 55459-0040

To Request this Document in Another Format call:
612/627-5100. TDD: Minnesota.
Relay Services: 612/297-5353
or call Toll Free: 1/800/627-3529 (in Greater Minnesota.)

Remember:

To fish in Minnesota, you must buy a fishing license. Children and adults need to wear a life jacket when fishing from shore or a boat.

MDH 6/93

# ត្រី និង សុខភាព របស់អ្នក

## អាសាទត្រីនៅក្នុងមីនីផ្លូវិនិងសាំងកោល

*ត្រីជារបៀបនៅក្នុងទន្លេមីនីសូតានិងទីន្លែ មីសស៊ីសស៊ីពភី ក្នុងមីនីផ្លូវិនិងសាំងកោល មិនល្អដើម្បីញ៉ាំទេ ។*

*ត្រីនៅក្នុងបឹងតាតប្រៃ នៅជិតមីនីផ្លូវិនិងសាំងកោល អាចញ៉ាំបានដោយគ្មានគ្រោះថ្នាក់ ។*

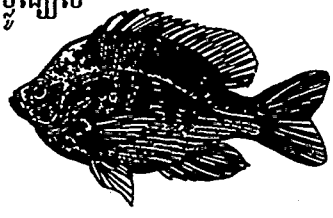
### ត្រីដែលអាចញ៉ាំបានដោយគ្មានគ្រោះថ្នាក់

ត្រីនៅក្នុងរូបនេះ ជាត្រីដែលល្អ អាចញ៉ាំបាន ។ អ្នកអាចញ៉ាំវាបានរាល់ថ្ងៃ ។

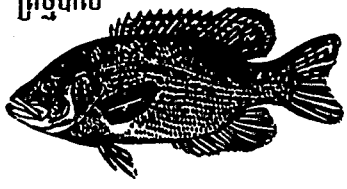
ត្រីទាំងនេះមានជាតិក្រខ្វក់តិចជាងត្រីដែលមានរូបនៅទំព័របន្ទាប់ ។

ញ៉ាំត្រីល្អអាចញ៉ាំបានដែលមានរូបរាងក្ងច ជាជាងញ៉ាំត្រីដែលមានរូបរាងធំ

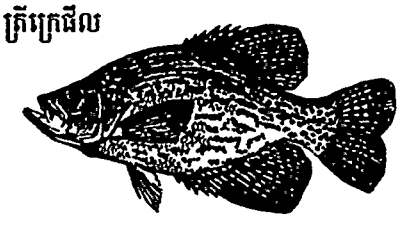
ត្រីប៊ូផ្សេល



ត្រីថ្មបាស់



ត្រីក្រេជីល



ត្រីជ័រឆ--

### តើអ្វីទៅជាជាតិក្រខ្វក់?

បឹងនិងទន្លេខ្លះនៅរដ្ឋមីនីសូតាមានជាតិក្រខ្វក់លាយឡំ ។ ជាតិក្រខ្វក់បណ្តាលមកពីរោចក្រ កន្ទែង ចោលសំរាម និងឡាន ។ ជាតិក្រខ្វក់ចូលទៅក្នុងបឹងនិងទន្លេតាមរយៈអាកាស ទឹកនិងដី ។ ត្រីភាគ ច្រើន នៅរដ្ឋមីនីសូតាមានរស់ជាតិសំរាប់ឆ្អែត ប៉ុន្តែមានត្រីប្រភេទខ្លះមានជាតិក្រខ្វក់ ដូចជាជាតិម្សៅឃ្មារិនិងភីស៊ីប៊ី ។

ម្សៅឃ្មារិមានជាតិពុលដែលអាចបណ្តាលឱ្យមនុស្សទៅជាពិបាកដើរ និយាយ មើល និងស្តាប់ ។

ក្ងួនដំរាដែលមានជាតិពុលម្សៅឃ្មារិ មិនអាចចេះដើរត្រូវតាមពេលដូចធម្មតាទេ ។

ភីស៊ីប៊ីធ្វើឱ្យមនុស្សឈឺនិងអាចបណ្តាលឱ្យកើតរោគមហារីកនៅរយៈពេលឆ្នាំក្រោយមក ។

ក្ងួនដំរាដែលមានជាតិពុលភីស៊ីប៊ី អាចមានបញ្ហាក្នុងការរៀនសូត្រ ។

### ត្រីខ្លះមានជាតិក្រខ្វក់

ឃ្យាងនិងត្រីលទីកកន្ទាំងកជាតិក្រខ្វក់នៅក្នុងអាកាសចូលទៅក្នុងបឹងនិងទន្លេ ។ សត្វល្អិតៗនៅក្នុងទឹក ស៊ុជាតិក្រខ្វក់ ។ តាលណាក្ងួនត្រីស៊ុសត្វល្អិតទាំងនោះ វាក៏ស៊ុទាំងជាតិក្រខ្វក់ចូលទៅក្នុងខ្លួន ។ ត្រីធំស៊ីត្រីតូចៗច្រើន ទើបត្រីធំមានជាតិក្រខ្វក់ច្រើននៅទីបំផុត ។

* ត្រីមានជាតិរកខ្វក់មិនឃើញដូចត្រីឈើទេ ។ វារីង ធ្វើចលនា និងមានរស់ជាតិដូចត្រីល្អដែរ ។
* ត្រីដែលធំជាង ចាស់ជាង និងធាត់។ (ត្រីបាសាណាសនិងត្រីខាប) នៅក្នុងទន្លេមានជាតិក្រខ្វក់ច្រើនជាងគេបំផុត ។

### ជាតិក្រខ្វក់នៅក្នុងត្រីអាចធ្វើឱ្យអ្នកឈឺបាន

ជាតិក្រខ្វក់ស្ថិតនៅក្នុងខ្លួនអ្នក ពេលដែលអ្នកញ៉ាំត្រីដែលមានជាតិក្រខ្វក់ ។ ជាតិក្រខ្វក់នៅក្នុងត្រីអាចធ្វើឱ្យមនុស្សឈឺបាន នៅច្រើនខែឬឆ្នាំបន្ទាប់ពីបានញ៉ាំវាមក ។ បុរស ស្ត្រី ក្មេង ក្ងួនដំរាអាចមិនដឹងថា ឈឺទេ ប៉ុន្តែអាចឈឺក្នុងរបៀបដែលអ្នកមិនធ្លាប់មើលឃើញទេ ។

ផ្តល់ឱ្យដោយស្រុងសុខាភិបាលរដ្ឋមិនីសូតា និងឧបត្ថម្ភដោយទូលនិធិចម្ងើយនៃការយល់ដល់ បរិយាកាស ពីមូលនិធិតាំងនៃមាត្រាពីសំណងនិងបំណុល តាមរយៈកិច្ចព្រមព្រៀងរវាងអន្តរៈភ្នាក់ ងារមួយ ជាមួយទីភ្នាក់ងារខាងបញ្ជីរឈ្មោះនៃរោគនិងសារធាតុដែលមានជាតិពុល ក្រសួង សាធារណៈសុខាភិបាល ក្រសួងខាងបរិស្ថានិងសុខភាព ។

### ស្ត្រីមានផ្ទៃពោះ

ស្ត្រីដែលនៅក្នុងវ័យដែលមានកូន ស្ត្រីមានផ្ទៃពោះ ម្តាយដែលបំបៅកូន និងក្មេងតូចៗ មិនត្រូវញ៉ាំត្រីដែលមានជាតិក្រខ្វក់ឡើយ ។ ជាតិក្រខ្វក់នៅក្នុងត្រីចូលទៅក្នុងឈាមម្តាយនិងទៅក្នុងកូនដំរានៅក្នុងផ្ទៃ ។ វេជ្ជៈបណ្ឌិតអាចធ្វើតែសឈាមមើលថាតើអ្នកឈឺដោយមានជាតិពុលម្សៅឃ្មារិឬ ភីស៊ីប៊ីឬទេ ។

### ជ្រើសរើសកន្លែងដែលមានត្រីល្អ និងញ៉ាំត្រីដែលគ្មានគ្រោះថ្នាក់

ត្រីដែលមកពីបឹងនិងទន្លេដែលមានជាតិក្រខ្វក់ មិនល្អសំរាប់ញ៉ាំឡើយ ។ បឹងនិងទន្លេដែលនៅក្នុងឬនៅជិតទីក្រុងមានជាតិក្រខ្វក់ច្រើនជាងបឹងនិង ទន្លេដែលនៅតាមជនបទ ។

* កុំផឹកទឹកយកមកពីបឹងឬទន្លេណាមួយវាអាចធ្វើឱ្យអ្នកឈឺបាន
* សូមផឹកទឹកដែលយកពីផ្ទះ

មធ្យោបាយតែមួយដែលអាចដឹងថា បឹងឬទន្លេណាមានត្រីគ្មានឬមាន ជាតិក្រខ្វក់ គឺត្រូវស្វែរក្រសួងសុខាភិបាលនៃក្រុងឬខោនធី វេជ្ជគ្រិះ និង វេជ្ជៈបណ្ឌិតរបស់អ្នក ។ អ្នកទាំងនេះអាចជួយអ្នករើសកន្លែងល្អដើម្បី នេសាទត្រី ហើយអាចផ្តល់ពាក្យមានថែមទៀតពីការញ៉ាំត្រីដែលគ្មានទុក្ខ ទោស ។

### ស្វែរភៅដោយឥតគិតលុយ

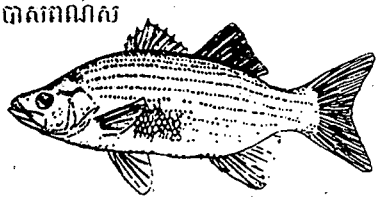
អ្នកអាចទទួលស្វែរភៅដោយឥតគិតលុយ ដោយទូរស័ព្ទទៅ "ក្រុម ត្រីក្បាខាងការប្រើប្រាស់ត្រីនៃរដ្ឋមីនីសូតា" ។ ស្វែរភៅនេះអាចជួយ អ្នករើសកន្លែងល្អដើម្បីនេសាទត្រី ។ ដើម្បីបានទទួលស្វែរភៅនេះមួយក្បាល សូមទូរស័ព្ទទៅក្រសួងសុខាភិបាលរដ្ឋមិនីសូតា តាមលេខ: ៦១២អ៦២៨-៤០៤៨ ។

# ត្រីដែលមិនល្អសំរាប់ញ៉ាំ

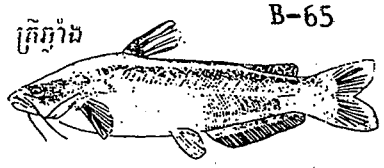
[illegible] ត្រីនៅក្នុងរូបនេះ មិនល្អសំរាប់ញ៉ាំទេ ។

ប៉ើគិនជាអ្នកត្រូវតែញ៉ាំត្រីដែលចាប់បានពីទន្លេ សូមញ៉ាំត្រីតែមួយរាល ក្នុងមួយខែ ហើយកាត់ចោលភាគដែលមានខ្លាញ់ចោលមុនរាលត់អិនរ៉ា ។

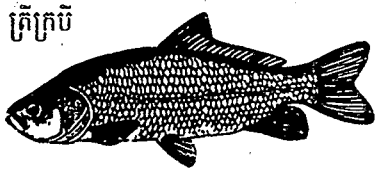
ត្រីចាសរាណិស



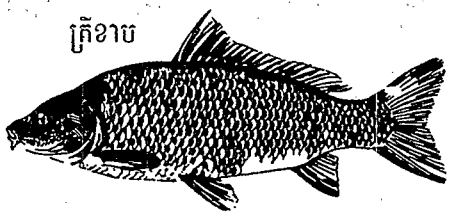
ត្រីភ្ជាំង



ត្រីក្រុបី



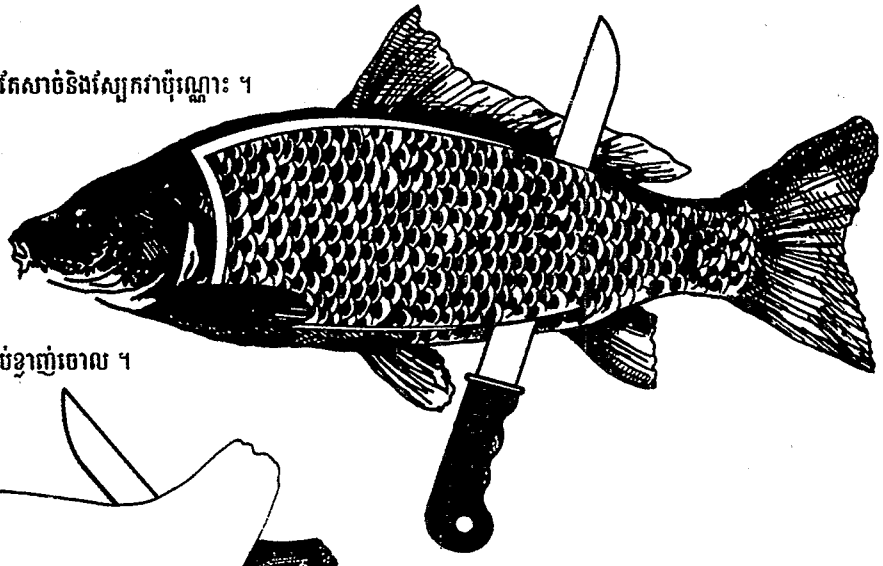
ត្រីខាប



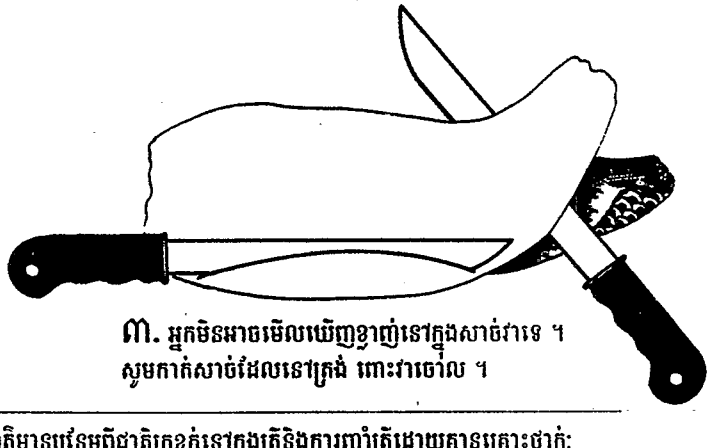
ត្រីសឺកខរ័

## ការលាងសំអាតត្រី:

ការលាងត្រីអាចជួយឱ្យអ្នកយកជាតិគ្រុនក់ខ្លះចេញពីត្រី ហើយធ្វើឱ្យត្រីនោះបានស្អាតគ្រាន់បើទីឯញ៉ាំ ។ សំខាន់គឺត្រូវចោលគ្រឿងក្នុងរបស់វាចេញ ។ លាងត្រីតាមលំដាប់ដូចបង្ហាញនៅខាង ក្រោម ។



១. កាត់តាមបណ្តោយឆ្អឹងដើម្បីយកតែសាច់និងស្បែកវាប៉ុណ្ណោះ ។



២. ខ្វាញ់វានៅនឹងស្បែក ។ កាត់ស្បែកដែលមានជាប់ខ្វាញ់ចោល ។

៣. អ្នកមិនអាចមើលឃើញខ្លាញ់នៅក្នុងសាច់វាទេ ។ សូមកាត់សាច់ដែលនៅត្រង់ ពោះវាចោល ។

៤. សូមញ៉ាំតែសាច់របស់វាបានហើយ ក្រៅពីនោះសូមត្រាំតចោល ។

ដើម្បីបានពត៌មានបន្ថែមពីជាតិគ្រុនក់នៅក្នុងត្រីនិងការញ៉ាំត្រីដោយគ្មានគ្រោះថ្នាក់:
សូមទូរស័ព្ទទៅក្រសួងសុខាភិបាលក្រុងឬខោនធ ឬក្រសួងសុខាភិបាលរដ្ឋមីនីសសូតា
តាមលេខ: ៦១២អ៦២៧-៥០៤៧ ។
ឬសរសេរទៅ: Fish and Your Health (CES)
Minnesota Department of Health P.O.Box 59040
Minneapolis, MN 55459-0040

ដើម្បីសូមឯកសារនេះជាទំរង់ម្យ៉ាងទៀត សូមទូរស័ព្ទទៅ:
៦១២អ៦២៧-៥១០០ ។ ទូរស័ព្ទសំរាប់មនុស្សថ្លង់គិត: មីនីសសូតា
កិច្ចបំរើបន្តភ្លាម: ៦១២អ២៩៧-៥៣៥៣
ឬទូរស័ព្ទដោយឥតគិតលុយលេខ: ១/៨០០/៦២៧-៣៥២៩
(នៅក្នុងរដ្ឋត្រូទ័រ មីនីសសូតា)

ចូរចងចាំ:
ដើម្បីទេសាទត្រីនៅរដ្ឋមីនីសសូតា អ្នកត្រូវតែទិញប័ណ្ណអនុញ្ញាត ។
ក្មេងនិងចាស់ត្រូវតែពាក់អាវជំនួយជីវិត
កាលណាទេសាទត្រីភ្លាយពីច្រាំងឬលើទូក ។

MDH 6/93

STAPLE OR TAPE HERE



**FISH ADVISORY MAILING LIST**
**Minnesota Department of Health**
**925 SE Delaware Street**
**P.O. Box 59040**
**Minneapolis, Minnesota 55459-0040**

## Survey

Please help us understand how people use the fish advisory. For each question, circle the appropriate answer.

1. Does the fish advisory help you in choosing fishing locations?

   YES NO DON'T KNOW

2. Does the fish advisory help you in deciding how much fish you could eat?

   YES NO DON'T KNOW

3. Does the fish advisory help you in learning how to clean and cook fish?

   YES NO DON'T KNOW

4. How often do you eat fish caught by you, relatives or friends? Answer for the current fishing season.

   - ☐ none
   - ☐ less than 1 meal a month
   - ☐ 1 meal a month
   - ☐ 2 or 3 meals a month
   - ☐ 1 meal a week
   - ☐ more than twice a week

5. If you eat fish, how much fish do you usually eat in a typical meal? Please respond only for yourself. Check the most appropriate answer.

   - ☐ less than 1/4 pound (4 ounces or 113 grams)
   - ☐ 1/4 pound (4 ounces)
   - ☐ 1/2 pound (8 ounces or 227 grams)
   - ☐ 3/4 pound (12 ounces)
   - ☐ one pound (16 ounces)
   - ☐ more than one pound (16 ounces or 454 grams)

6. Please look at the Lake Superior table on page 76 and let us know if you find the table more or less useful than the symbols that are used for the other lakes and rivers in the booklet.

   - ☐ more useful because:
   - ☐ less useful because:

## Upcoming Advisories

If you would like to receive future issues of the Minnesota Fish Consumption Advisory through the mail, please fill out the form below. You will be placed on our mailing list. If you are already on our mailing list, please help us keep it current by listing any changes in your address.

*Name* _____

*Street Address* _____

_____

*City, State, Zip Code* _____

☐ This is a corrected address

We welcome your comments concerning the advisory. Please use the space below to tell us what you think of the advisory program.

If you have any questions please call 612-627-5047. Please send this form to:

FISH ADVISORY MAILING LIST
Minnesota Department of Health
925 SE Delaware Street
P.O. Box 59040
Minneapolis, Minnesota 55459-0040

## FISH CONSUMPTION ADVISORY

The Minnesota Department of Health gives advice for eating fish from over 400 locations in Minnesota. Meals of some fish from these waters should be limited because of chemicals that might be in the meat.

A booklet listing current fish consumption advice is available from the Minnesota Department of Health, (612) 627-5423, toll-free number: 1-800-657-3908; the Minnesota Pollution Control Agency, (612) 296-6300; or the Minnesota Department of Natural Resources, (612) 296-2835. The advisory booklet covers only lakes and rivers that have been tested for contamination.

### New Advice for Lake Superior

Lake Superior's most commonly caught fish—lake trout, salmon, and herring (cisco) have fat that accumulates PCBs. Careful trimming and cooking removes half the fat—and PCBs—of fish. This advice for trimmed, cooked Lake Superior fish is the result of a recent collaboration among Minnesota and the other Great Lakes states. For Minnesota, the change means that more fish can be safely eaten. Detailed meal guidelines for Lake Superior fish are available from the Minnesota Department of Health.

### Chemicals of Concern

MERCURY enters waters throughout the state naturally and by way of air pollution from sources such as coal-burning power plants and garbage incinerators. Although mercury can damage an adult's nervous system, its most severe effects are on developing fetuses in pregnant women. In lakes with high concentrations of mercury, large predator fish such as walleye, northern pike, and lake trout contain the highest levels. The highest levels of mercury contamination are in northern Minnesota, where the Minnesota Department of Health advises no more than 1 meal per month of fish taken from some lakes. More fish can be safely eaten if the fish are only consumed a few months of the year. Mercury accumulates in the muscles of fish, and cannot be removed by cleaning or cooking.

PCBs are found in fish in major river systems, near and downstream from metropolitan areas, and in Lake Superior. PCB levels have dropped since the production of these industrial chemicals was banned in 1976, but they continue to persist in the environment. PCBs can damage infants and developing fetuses in pregnant women, and may cause cancer in adults. Highest PCB accumulations are in fatty fish such as lake trout, carp, buffalo, and catfish, and in older predator fish such as large walleye and large northern pike. On parts of the Minnesota and Mississippi Rivers, the Minnesota Department of Health advises no consumption of these fish.

### Reducing Your Risk

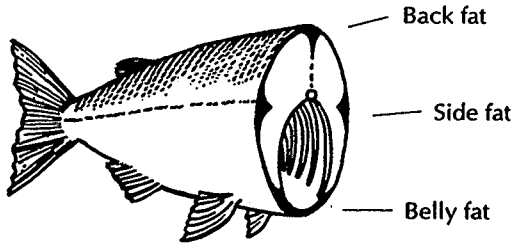
- Eat fish species that are less contaminated. PCBs build up most in fatty fish such as carp, catfish, and lake trout. Mercury levels are highest in large predatory fish such as walleye and northern pike. Species such as perch, sunfish, and crappie have the least amount of contaminants.
- Keep smaller fish for eating. Younger fish have had less time to accumulate contaminants.
- Reduce meal size and frequency. Anyone who eats freshwater fish more than once per week, especially those species listed above, could be at some risk.
- Remove PCBs by properly cleaning, trimming, and cooking fish. This chemical concentrates in the fat of fish. By removing the fat when you clean and cook fish, you can reduce your exposure to PCBs by 20 percent or more. Remove all fat from turtle meat.

### Should You Eat It?

In almost all cases, anglers can safely eat any fish they choose to take home. However, the Department of Health recommends young children, pregnant women, women of child-bearing age, and anglers who fish just one or two waters exclusively to space meals of some fish over specified periods of time. For more information to help you decide where to fish, what fish to eat, and how often to eat fish, see the Department of Health's fish consumption advisory booklet.

### Cleaning Your Catch

Remove the skin and fatty tissue, shown in black below. Also, discard all entrails, skin, and liver. Discard broth if fish is poached.



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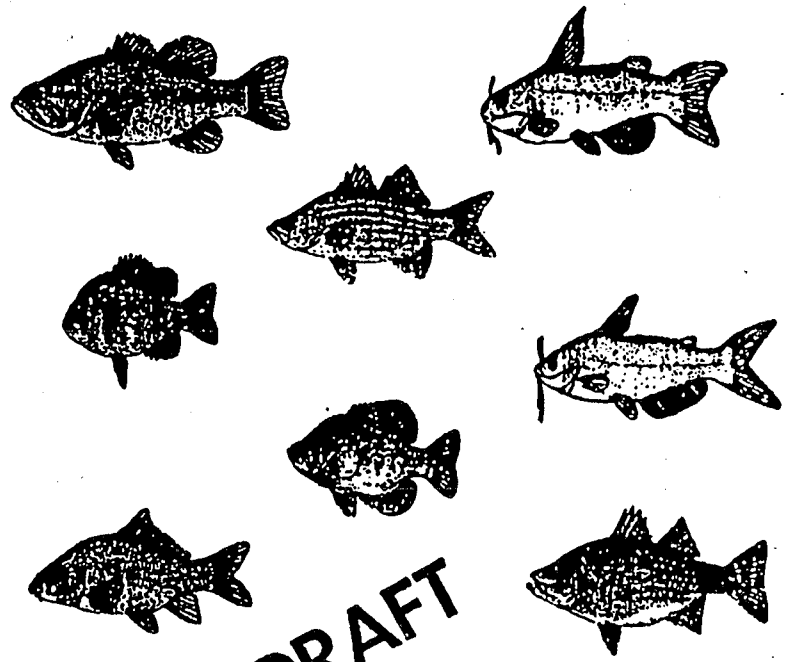
# Guidelines for Eating Fish from Georgia Waters



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**Produced by:**
**Georgia Department of Natural Resources**
**Environmental Protection Division and**
**Wildlife Resources Division**
**205 Butler Street, S.E., Suite 1152**
**Atlanta, Georgia 30334**

Fishing is a popular pastime in Georgia. Whether you go alone to relax and enjoy nature, with your friends to enjoy camaraderie and "fish tales," or with your family to pass on a sport you learned as a child, fishing is a fun and rewarding sport enjoyed by many people. Not only does fishing give people an excuse to get away from the hustle and bustle of daily life, but it can also put a healthy, satisfying meal on the table. Fish is low in saturated fat, high in protein, and can have substantial health benefits when eaten in place of other high-fat foods. The quality of sport fish caught in Georgia is very good; however, polychlorinated biphenyls (PCBs), chlordane, and mercury have been found in some fish from a few bodies of water. In most cases, the levels of these chemicals are low. However, to ensure the good health of Georgia anglers, the Georgia Department of Natural Resources has developed guidelines for how often certain species of fish can be safely eaten. It should be noted that these guidelines are based on the best scientific information and procedures available. As more advanced procedures are developed, these guidelines may change. Also, it is important to keep in mind that these calculations are based on eating fish with similar contamination over a period of 30 years of more. These guidelines are not intended to cause panic or to discourage people from eating fish, but anglers should use them as a guide for choosing to eat fish from Georgia waters.

## What contaminants are found in Georgia's fish and where do they come from?

The Georgia Department of Natural Resources has one of the most progressive fish testing programs in the Southeast. A variety of different fish species were tested for 43 separate contaminants, including metals, organic chemicals and pesticides. Many of these contaminants did not appear in any fish; however three contaminants were present in a few species from some bodies of water. This publication provides you with information on those three contaminants.

The three contaminants that showed up in some fish from some Georgia waters are PCBs, chlordane and mercury.

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In some areas, fish are contaminated with low concentrations of PCBs, which stands for polychlorinated biphenyls. It is now illegal to manufacture PCBs; however, in the past, these synthetic oils were used regularly as fluids for electrical transformers, cutting oils, and carbonless paper. Although they were banned in 1976, they do not break down easily and remain in lake sediments for years. It is not known how long these PCBs take to break down, but over time levels of PCB contamination will decrease.

Some species of fish in the Chattahoochee River Basin contain chlordane. Chlordane is a man-made pesticide used in the U.S. from the late 1940's to the early 1980's. Historically, chlordane was used as an agricultural pesticide, but in 1978 it was restricted to termite control use only. It has since been banned for all uses. Chlordane is persistent in the environment and may remain in lake sediments for up to 20 years.

Mercury is a naturally occurring metal that recycles between land, water, and air and enters plant and animal tissue. It is not known where the mercury in Georgia's fish originated. Mercury may be present in fish because of the mercury content of soils and rocks in the southeast, from municipal and industrial sources, and fossil fuel use. It is also possible that mercury contamination is related to global atmospheric transport.

## How do contaminants get into water and fish?

Contaminants get into water as a result of stormwater runoff, industrial and municipal discharges, agricultural practices, nonpoint source pollution and other factors. When it rains, chemicals from the land are washed into the water. Contaminants are carried down the streams, rivers and creeks into lakes and reservoirs. Lakes act like a sink because they collect whatever flows into them from the streams and rivers that feed them. Since water does not move as much in lakes, contaminants can build up more than they can in fast-flowing waterways like streams and rivers.

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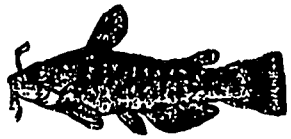
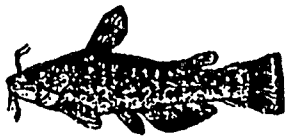


Contaminants can get into fish in a variety of ways. Fish absorb PCBs and chlordane from either water, suspended sediments, or their food. Both of these chemicals concentrate in the fat of fish and in fatty fish such as carp and catfish. Cleaning and cooking a fish to remove fat will lower the amount of PCBs and chlordane in a fish meal. Larger, older fish and fish which eat other fish may accumulate more contaminants than smaller, younger fish. Contaminants are not usually detected in panfish such as crappie and bluegill.

Once in the water, mercury is converted to methylmercury by bacteria and other processes. Fish absorb methylmercury from their food and from water as it passes over their gills. Mercury is bound to proteins in fish tissue, including muscle.



## How does the sampling work and what is the Department of Natural Resources doing to address fish contamination?

The Department of Natural Resources (DNR) is committed to protecting Georgia's rivers, streams, lakes and other waters. Both PCBs and chlordane have been banned, and, over time, the levels of these chemicals are expected to decrease. The Department has begun this progressive sampling program to evaluate problem areas and to protect public health by giving people the information they need to make decisions about eating fish from different waters. DNR's fish testing program will be ongoing. Testing on additional lakes and rivers will be balanced with retesting of waters where changes may be occuring. Since contaminant levels in fish change very slowly, sampling the same species of fish from the same locations over time will allow DNR to document changes and trends in contamination levels.

Georgia has more than 71,000 miles of rivers and streams and more than 421,000 acres of lakes. It will not be possible for DNR to sample every stream and lake in the state. However, high priority has been placed on the 26 major reservoirs, which make up more than 90% of the total lake acreage. Waterways listed in this guide will continue to be sampled as part of a five year rotating schedule to track any trends in fish contaminant levels. The Department has also made sampling fish in rivers and streams downstream of urban and/or industrial areas a high priority. In addition, DNR will focus attention on areas which are frequented by a large number of anglers.

Most lakes and rivers contain a wide variety of fish and selecting which species of fish to test is important. In general , DNR samples fish that are top predators (high in the food chain) and fish that feed on the bottom. For this reason, largemouth bass and channel catfish, when present, are the primary species tested. Hybrid bass are also tested in areas with good fisheries for this species. Smaller fish, such as crappie, bream and shellcracker, are tested in secondary studies after the larger target fish have been tested. This is because smaller fish accumulate contaminants slower and in smaller amounts than larger fish and bottom feeders.

In order to prevent future contamination, the Department seeks to identify pollution sources and to work with industries, cities, farmers and others to reduce the threat posed by pollutants. In many cases, this means implementing new technologies or practices that eliminates the creation of contaminants and thus the need to dispose of or discharge these chemicals. State laws have tough restrictions and penalties for discharge of toxic substances. DNR is responsible for enforcing these laws in Georgia and for ensuring compliance with these regulations.

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In addition, individuals can play a role in preventing contamination of Georgia's waters by disposing of chemicals, such as oil, antifreeze, paint, and other contaminants, in a proper manner. In order to protect Georgia's waterways from future contamination, individuals, industries, farmers and others groups must learn to modify their day-to-day activities and work to create new technologies to eliminate the causes of pollution. DNR will continue to work closely with these groups to improve water quality in Georgia. In addition, planning, regulations, facilities modernization, public education and a variety of other activities will play a major role in protecting Georgia's waters for future generations.

## What are the health benefits of eating fish?

Fish provide a high protein, low fat diet which is low in saturated fats. Many scientists suggest that eating a half-pound of fish a week can help prevent heart disease. Fish may have substantial health benefits when they replace a high fat source of protein in the diet. These guidelines are based on a range in fish meal size from 4 to 8 ounces (1/4 to 1/2 pound). In areas where meal advice is limited to 1 meal per month or week, you may prefer to have two smaller meals over that same time period.

## What are the health risks of eating contaminated fish?

These guidelines were designed to protect you from experiencing health problems associated with eating contaminated fish. PCBs, chlordane, and methylmercury build up in your body over time. It may take months or years of regularly eating contaminated fish to accumulate levels which would affect your health. It is important to keep in mind that these guidelines are based on eating fish with similar contamination over a period of 30 years or more. Current statistics indicate that cancer will affect about one in every four people nationally, primarily due to smoking, diet and hereditary risk factors. If you follow Georgia's consumption guidelines, the contaminants in the fish you eat may not increase your cancer risk at all. At worst, using U.S. EPA's estimates of contaminant potency, your cancer risk from fish consumption should be less than 1 in 10,000.

PCBs can cause infant development problems in children whose mothers were exposed to PCBs before becoming pregnant. This consumption advice is intended to protect children from developmental problems. PCBs can also cause changes in human blood, liver and immune functions of adults. Some forms of PCBs also cause cancer in laboratory animals and may cause cancer in human, but these guidelines are designed to prevent this from happening.

Exposure to chlordane has been linked to health effects on the nervous system, the digestive system, and the liver. These effects have been seen in people who swallowed chlordane mixtures. Chlordane has also been shown to cause cancer in laboratory animals given high doses and may cause cancer in humans. These consumption advisories should protect you from health problems due to chlordane.

Small amounts of methylmercury can be safely eliminated by your body but larger amounts may damage the nervous system. The fetus is especially sensitive to mercury poisoning. The consumption advice provided is intended to protect you from mercury poisoning.

## How do Georgia's fish compare with other states?

Georgia has one of the most extensive fish monitoring programs in the Southeast. This is not because Georgia has highly contaminated fish, but because DNR has made a serious commitment to thoroughly evaluate fish quality and provide detailed information to the people of Georgia. A comparison of data collected on fish tissue contamination in Georgia with data on fish tissue contamination in surrounding states reported in U.S. EPA's "National Study Of Chemical Residues In Fish" indicates that the quality of fish in Georgia's lakes is similar to that in other southern states.

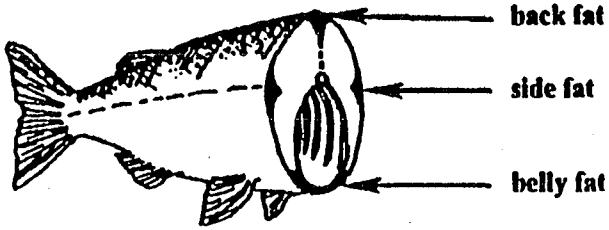
## General Guidelines to Reduce Your Health Risk

**Keep smaller fish for eating.** As a general rule, larger, older fish may be more contaminated than younger, smaller fish. You can minimize your health risk by eating smaller fish that are within legal size limits and releasing the larger fish to be caught again.

**Vary the kinds of fish you eat.** Contaminants build up in large predators and bottom-feeding fish, like bass and catfish, more rapidly than in other species. By substituting a few meals with panfish, such as perch, sunfish and crappie, you can reduce your risk.

**Eat smaller meals when you eat big fish and eat them less often.** If you catch a big fish, freeze part of the catch and space the meals from this fish out over a period of time.

**Clean and cook your fish properly.** How you clean and cook your fish can reduce the level of contaminants by as much as half in some fish. Some chemicals have a tendency to concentrate in the fatty tissues of fish. By removing the fish's skin and trimming fillets according to the following diagram, you can reduce the level of chemicals substantially. Mercury is bound to the meat of the fish, so these precautions will not help reduce this contaminant.




Trim away these fatty areas

**Remove the skin from fillets or steaks.** The internal organs (intestines, liver, and so forth) and skin are often high in fat and contaminants.

**Trim off the fatty areas shown in black on the drawing.** These include the belly fat, side fat, and the flesh along the top of the back. Careful trimming can reduce some contaminants by 25 to 50%.

**Cook fish so fat drips away.** Broil, bake or grill fish and do not use the drippings. Deep-fat frying removes some contaminants, but you should discard the oil once you have cooked the fish. Pan frying removes few, if any, contaminants.

## Using These Guidelines

Check the following pages for the area where you fish. The lakes and rivers on the list are arranged in alphabetical order. If your fish or fishing location is **NOT** in the booklet, follow the General Guidelines to Reduce Your Health Risk on page ???. (add this number when lay out complete)

If your fish or fishing location is in the booklet, it does not necessarily mean that there is a contaminants problem, only that the fish have been tested. Meal advice will depend on what contaminant(s) were found and how much was found in different kinds and sizes of fish. Follow these instructions carefully.

- Measure fish from the tip of the nose to the end of the tail fin.
- Turn to the page where your lake is listed. Find the species and size of fish you caught. If there is no frequency listed for a particular size fish, that size has not been tested or this size fish is illegal to harvest and keep.

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Listed below are the different frequencies of meal consumption that are safe for different species and sizes of fish.

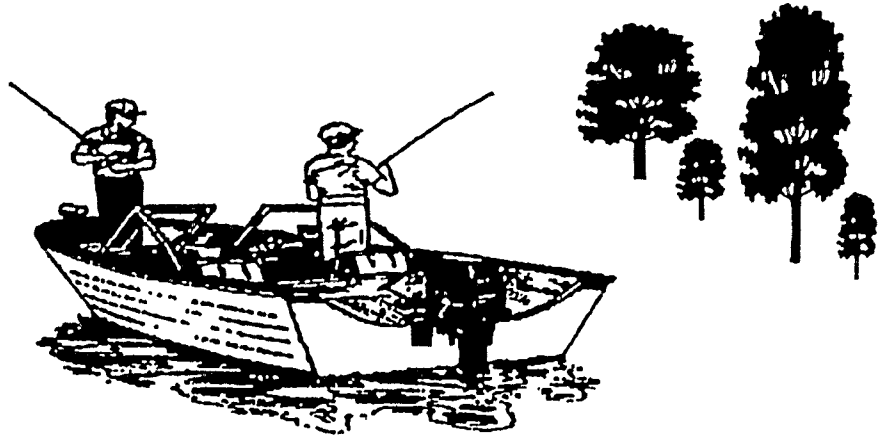
no restriction
1 meal per week
1 meal per month
do not eat

For the purposes of these guidelines, one meal is assumed to range from 1/4 to 1/2 pound of fish (4-8 ounces) for a 150 pound person. Subtract or add 1 ounce of fish to the range for every 20 pounds of body weight. For example, one meal is assumed to be 3-7 ounces for a 130 pound person and 5-9 ounces for a 170 pound person.

## Special Notice for Pregnant Women, Nursing Mothers, and Children

If you plan to become pregnant in the next year or two, are pregnant now, or are a nursing mother, you and your children under 6 years of age are especially sensitive to the effects of some contaminants. For added protection, women in these categories and children should limit consumption to a greater extent than recommended in the tables. For example,

| **if the table recommends:** | **pregnant women, nursing mothers and children should limit consumption to:** |
|---|---|
| no restriction | no restrictions |
| 1 meal/week | 1 meal/month |
| 1 meal/month | do not eat |
| do not eat | do not eat |



## For more information

For more information on fish consumption in Georgia, contact the Georgia Department of Natural Resources.


Department of Natural Resources
Environmental Protection Division
205 Butler Street, S.E., Suite 1152
Atlanta, GA 30334
(404) 656-4713

Department of Natural Resources
Wildlife Resources Division
2123 U.S. Hwy. 278, S.E.
Social Circle, GA 30279
(404) 918-6418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# Georgia Lakes Fish Consumption Guidelines

## Lake Allatoona

| Species | Less than 12 inches | 12-16 inches | Over 16 inches | Chemical |
|---|---|---|---|---|
| Crappie | No Restrictions | | | |
| Carp | 1 meal per week | 1 meal per week | 1 meal per week | PCB's |
| White Bass | | 1 meal per week | | PCB's |
| Largemouth Bass | | No Restrictions | 1 meal per week | PCB's |

## Lake Blackshear

| Species | Less than 12 inches | 12-16 inches | Over 16 inches |
|---|---|---|---|
| Largemouth Bass | | No Restrictions | |
| Spotted Sucker | | No Restrictions | No Restrictions |

## Lake Blue Ridge

| Species | Less than 12 inches | 12-16 inches | Over 16 inches |
|---|---|---|---|
| White Bass | | No Restrictions | |
| Channel Catfish | | No Restrictions | No Restrictions |

## Lake Burton

| Species | Less than 12 inches | 12-16 inches | Over 16 inches |
|---|---|---|---|
| Largemouth Bass | *No Restrictions | No Restrictions | |
| White Catfish | No Restrictions | No Restrictions | |
| Channel Catfish | | | No Restrictions |

*Only largemouth bass 6 inches and longer may be legally retained and possessed on Lake Burton. All other largemouth bass caught from the lake must be released immediately.

## Carters Lake

| Species | Less than 12 inches | 12-16 inches | Over 16 inches |
|---|---|---|---|
| Channel Catfish | | No Restrictions | No Restrictions |
| Walleye | | | No Restrictions |

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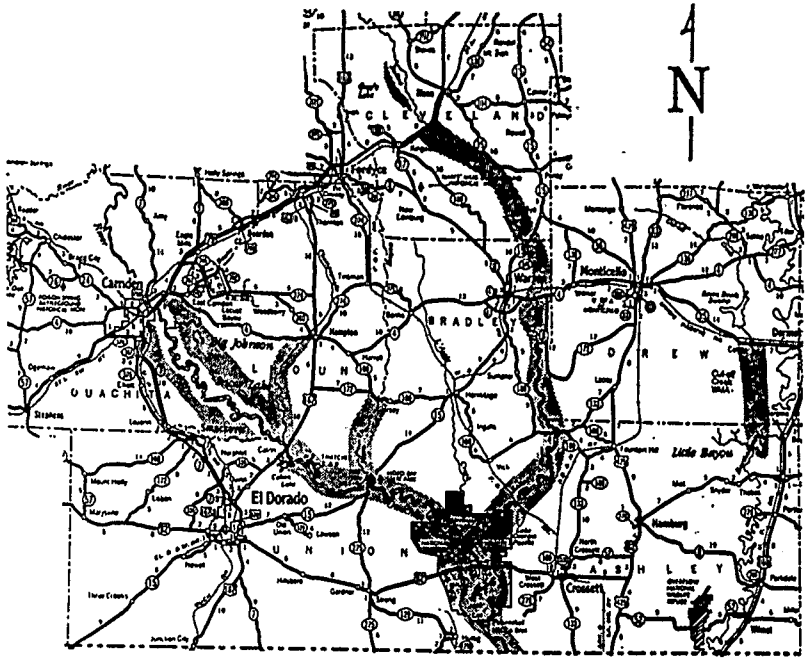
# A Fishing Advisory for Arkansas Effective July, 1993




**LOUISIANA BORDER**

Areas with Fish Advisories*

Elevated levels of mercury have been found in fish flesh in South Arkansas. Advisories limiting consumption of fish caught in contaminated areas have been issued by the Arkansas Department of Health.

**Pregnant women, women who plan to get pregnant, women who are breastfeeding, and children age 7 years or younger are considered at high risk for health effects due to mercury exposure and should not eat fish from advisory areas.**

Persons who eat fish from advisory areas occasionally are not at risk for health effects from mercury. This includes people who vacation around and do not regularly fish in advisory areas.

* Lake Columbia in Columbia County is not shown on this map but is under this health advisory. It is important to note that the areas above represent health advisories issued effective July, 1993 and that testing is continuing for additional affected areas in South Arkansas.

## Fish Consumption Advisories

**Effective July, 1993**

| Advisory Area | *Level of Consumption* | |
|---|---|---|
| | Predators | Non-Predators |
| Lake Columbia (Columbia County) | *No more than 2 meals per month. No restrictions on large mouth bass less than 16 inches in length.* | *No restrictions* |
| Cut-off Creek (from where the creek crosses Highway 35 in Drew County to its confluence with Bayou Bartholomew) | *No more than 2 meals per month.* | *Do not consume* |
| Bayou Bartholomew (from where it crosses Highway 35 in Drew County to its confluence with Little Bayou in Ashley County) | *No more than 2 meals per month.* | *No restrictions* |
| Big Johnson Lake (Calhoun County) | *No more than 2 meals per month.* | *No restrictions* |
| Snow Lake (Calhoun County) | *Do not consume* | *No restrictions* |
| Grays Lake (Cleveland County) | *No more than 2 meals per month.* | *No restrictions* |
| Moro Bay Creek (from Highway 160 to its confluence with the OuachitaRiver) | *Do not consume* | *No restrictions* |
| Champagnolle Creek (to include Little Champagnolle from Highway 4 to its confluence with the Ouachita River) | *No more than 2 meals per month.* | *No restrictions* |
| Ouachita River (from Smackover Creek to the Louisiana border) | *Do not consume* | *No more than 2 meals per month.* |
| All ox-bow lakes, backwaters, overflow lakes, and bar ditches formed by the Ouachita River below Camden to include waters in Felsenthal Wildlife Refuge | *Do not consume* | *No more than 2 meals per month.* |
| Saline River (from Highway 79 in Cleveland County to the Ouachita River) | *No more than 2 meals per month.* | *No more than 2 meals per month.* |
| Saline River (below Highway 160) | *Do not consume* | *No restrictions* |

**Predator species** include bass, pickerel, catfish, crappie, gar, bowfin, etc.

**Non-predator species** include bream, drum, buffalo, red-horse, suckers, etc.

**A meal consists of 8 ounces of fish.**

All areas affected by these advisories have been closed to commercial fishing. Fish continue to be tested in other areas of the state and additional advisories will be issued if needed.

State of Kansas
Joan Finney, *Governor*

## Department of Health and Environment
Robert C. Harder, *Secretary*

FOR IMMEDIATE RELEASE
December 10, 1993

Contact: Mindee Reece-Chaudhry, KDHE
(913) 296-5565

Bob Matthews, KDWP
(316) 672-5911

The Kansas Department of Health and Environment (KDHE) and the Kansas Department of Wildlife and Parks (KDWP) have issued several new fish consumption advisories effective immediately.

KDHE and KDWP recommend that consumption of bottom feeding or bottom dwelling fish (common carp, blue catfish, channel catfish, flathead catfish, freshwater drum, bullheads, sturgeons, buffaloes, carpsuckers, or other sucker species) from the following locations be avoided due to levels of the insecticide chlordane:

1 The lower Kansas River from the Interstate-435 highway crossing (Holliday) to the confluence with the Missouri River in Kansas City, Kansas (Johnson and Wyandotte Counties). Since 1987, a "no consumption" advisory has been in effect for the lower 10.5 miles of the Kansas River. The new advisory applies to the lower 18 miles of the river.

2. Antioch Park Lake (south) in Antioch Park, Overland Park/Merriam (Johnson County).

3. Cow Creek and major Cow Creek branches within the City of Pittsburg and Cow Creek downstream of the City of Pittsburg to the City of Lawton (Crawford and Cherokee Counties).

KDHE and KDWP recommend a limitation of one (1) five-ounce meal per month (or twelve (12) five-ounce meals per year) on the consumption of any bottom feeding or bottom dwelling fish (common carp, blue catfish, channel catfish, flathead catfish, freshwater drum, bullheads, sturgeons, buffaloes, carpsuckers, or other sucker species) from the following locations due to the insecticide chlordane:

4. The Arkansas River within the City of Wichita and downstream to the confluence with Cowskin Creek southeast of the City of Belle Plaine (Sedgwick and Sumner Counties).

5. The Little Arkansas River from the Main Street bridge immediately west of the City of Valley Center to the confluence with the Arkansas River in the City of Wichita (Sedgwick County).

-MORE-

Consumption Advisory - 2

6. Cowskin Creek within the City of Wichita and downstream to the confluence with the Arkansas River southeast of the City of Belle Plaine (Sedgwick and Sumner Counties).

7. Cow Creek within the City of Hutchinson and downstream to the confluence with the Arkansas River (Reno County).

8. The mainstem of the Blue River, from the U.S. 69 highway crossing to the Kansas-Missouri state line (Johnson County).

9. The Kansas River from the City of Lawrence (below Bowersock Dam) downstream to the City of Eudora (Douglas and Leavenworth Counties).

10. The mainstem of Kill Creek, from the confluence of Spoon Creek to the Kansas River (Johnson County).

11. The Cottonwood River within the City of Emporia and downstream to the confluence with the Neosho River (Lyon County).

According to KDHE and KDWP, these fish consumption advisories do not mean that "Kansas" fish are unsafe to eat. The "typical" person fishing in Kansas probably spends most of his or her time fishing at lakes and farm ponds, since most streams in the state are privately owned and access is limited. Lakes, and particularly non-urban lakes, do not appear to have bottom feeding or bottom dwelling fish with significant chlordane contamination. So, for most people, chlordane contamination is not a great issue.

People who should be most concerned are those who fish in urban areas and utilize the catch as a large part of their diet. These people may fish frequently or may occasionally stock a large supply for the freezer.

Not all urban streams in Kansas have been monitored, but a general correspondence between urban areas and fish with elevated chlordane levels has been observed. KDHE and KDWP recommend that people dependent on fish from any urban stream as a large part of their diet should limit consumption to one (1) five-ounce meal per month (or 12 (twelve) five-ounce meals per year). The correspondence between urban areas and chlordane contamination in fish appears to be greater in streams than in lakes.

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93-326\fishadv.pr

(Note to reporters: Additional background information is attached. Maps of specific locations are available upon request.)

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93-326\fishadv.pr

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# FISH CONSUMPTION ADVISORY
# BACKGROUND INFORMATION

## RECOMMENDED GUIDELINES FOR AVOIDING CONSUMPTION OF FISH CONTAMINANTS

All Types of Contaminants:

Larger-older fish may have accumulated higher levels of contaminants than smaller-younger fish.

Chlordane:

Fish in streams at locations upstream of urban areas. The fish within and immediately downstream of urban areas usually have elevated levels of chlordane.

When fishing in urban areas fish in lakes. In general, fish in urban lakes have been found to be either free of detectable chlordane levels or have much lower levels of chlordane than stream fish.

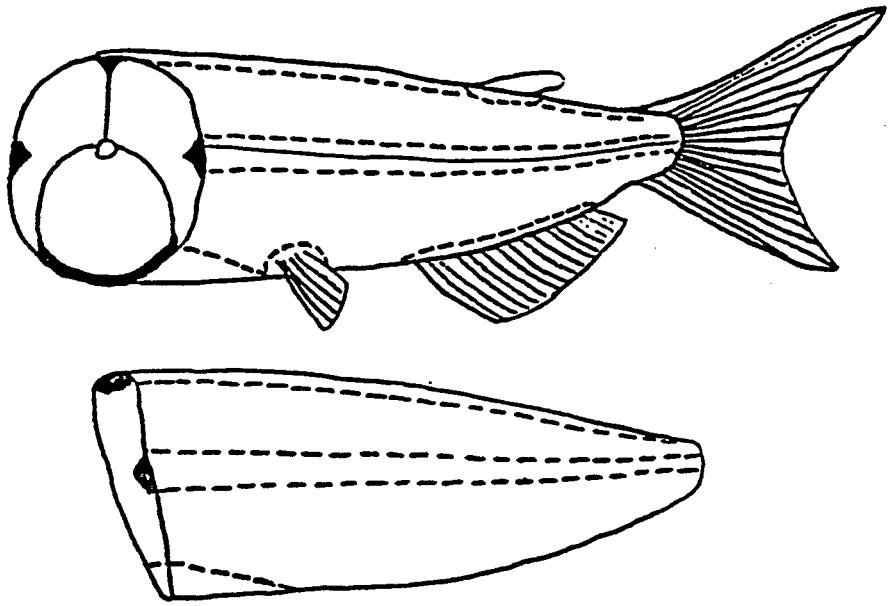
PCBs and Pesticides in general, including chlordane:

Bottom feeding or bottom dwelling fish contain greater levels of contaminants such as PCBs and pesticides than do fish like bass, sunfish, crappie, walleye, or trout.

Consume only muscle tissue. Avoid consuming fish organs, eggs, or skin.

When cooking fish, grill, bake, or broil the fish so the fats can drip away. When frying, do not reuse the oil from one cooking to another. When poaching, do not use the broth.

PCBs and many pesticides including chlordane are concentrated in fat tissue. Trimming away 1/2 inch strips of meat along the length of the back and the dark lateral line (dark lines along the sides) as well as the belly flesh will reduce the amount of fat consumed and should reduce the amount of contaminant consumed (see illustration, dotted lines).



FILLET

## CHLORDANE

The insecticide (termiticide) chlordane is widely detected in freshwater fish in the United States. At least 21 states, including Missouri, Nebraska, Iowa, and Oklahoma, have some form of fish consumption advisories due to chlordane. In Kansas, chlordane is detected in nearly 100 percent of whole fish samples, and in streams in urban areas chlordane is commonly detected in fillet (edible) samples. Particularly in more recent years, chlordane was used primarily as a residential termite control and preventative. The U.S. Environmental Protection Agency (EPA) suspended the registration of chlordane in 1988. The registration was suspended not because of accumulation in fish tissue, but because it was believed the application posed a direct threat to humans following termite treatments of homes.

No fish have ever been found in Kansas with contamination at levels which could cause acute or short-term health affects. Consumption advisories are based on concerns over possible cancer risk and noncarcinogenic toxicity such as liver damage from long-term fish consumption.

## HISTORICAL PERSPECTIVE

Since 1987, a "no consumption" advisory has been in effect for the lower 10.5 miles of the Kansas River. The new advisories extend this area to approximately 18 miles. Formerly, "consumption limitations" less restrictive than those being proposed were in effect for the following waterbodies: the Kansas River from the City of Lawrence to the City of Eudora (1986-1988); the Arkansas River within the City of Wichita city limits (1986-1988); and the Little Arkansas River within the City of Wichita city limits (1986-1989). The new advisories reinstate the consumption limitation advisories for all of these waterbodies.

A word of explanation:

As KDHE, EPA, and other states have engaged in intensive monitoring of fish tissue quality, much has been learned about the distribution of chlordane-contaminated fish and the variability and quality of fish tissue data. Past KDHE fish consumption advisories were issued and rescinded with less data than the advisories which are currently being proposed. This would in many ways be similar to conducting a nationwide opinion poll by questioning only 200 people rather than the customary 1,000-1,500. Given the variability in fish tissue data from a given locality, confidence in the average level of contamination grows with the number of samples analyzed.

During the time since the last fish consumption advisories were issued much has changed in terms of guidelines for evaluating the significance of fish tissue data. Risk assessment techniques have been applied and potential cancer causing and non-cancer causing endpoints of toxicity have been considered. Risk assessment, as it has been applied in these proposed advisories, (one in 1,000,000 in the case of carcinogens) are conservative (protective of consumers). While such risk assessment techniques may be criticized as too conservative or unrealistic, their primary purpose is to make people aware of the data KDHE has collected and provide a worst case risk estimate for those who are most concerned about their health, and then provide guidelines as to how they may still consume fish while reducing or eliminating the risk.

## FISH ADVISORY CRITERIA

Minimum data requirements for issuing a fish consumption advisory for a specific waterbody include: a minimum of three duplicated composite (three to six fish each) fillet samples of a representative species of bottom feeding fish collected over a three-year period, and an average level of the contaminant in excess of the level of concern. Most advisories will be issued with considerably more data including larger numbers of duplicate or triplicate samples, split samples between different laboratories, multiple species of fish, and more than three years of sample

collection. Lifting or changing an advisory will require a reduction of the contaminant to an average level of contamination below the level of concern for at least a three-year period.

The data used in the fish consumption advisories is based solely on fillet (edible) samples with the skin removed. Samples used in determination of average "total chlordane" were analyzed by EPA Region VII and KDHE laboratories. Samples were collected by KDHE, EPA Region VII, and the Kansas Department of Wildlife and Parks.

The threshold average concentration of total chlordane (sum of isomers) used for the "no consumption" fish advisory is 0.1 mg/Kg (=parts per million, ppm) wet weight. This 0.1 mg/Kg level for total chlordane is the functional equivalent of the 0.3 mg/Kg Food and Drug Administration (FDA) Action Level for technical chlordane in commercial fish. Average total chlordane concentrations less than 0.1 mg/Kg with more than 50 percent of data points in excess of 0.1 are included. The actual goal is prevention of consumption in excess of a one in 1,000,000 cancer risk rate. The "no consumption" water bodies also exceed total chlordane levels which could cause noncarcinogenic toxic effects at consumption rates of less than three (3) five-ounce meals per week.

The fish "consumption limitation" advisories also have the goal of prevention of consumption in excess of a one in 1,000,000 cancer risk rate. Water bodies in these categories have a lesser degree of contamination but it is recommended that caution be exercised in the amount and frequency of consumption. These waterbodies have total chlordane fish tissue levels which could cause noncarcinogenic toxic effects at rates of consumption greater than three to seven (3-7) five-ounce meals per week. The locations of advisories for which fish consumption should be limited to one (1) meal per month have average total chlordane concentrations ranging from 0.03 mg/Kg to less than 0.1 mg/Kg with less than 50 percent of measurements in excess of 0.1 mg/Kg. Also included in this category are "all urban streams" as an acknowledgement of the general trend observed in chlordane fish tissue contamination. Due to limited resources, there are streams which have not been specifically investigated.

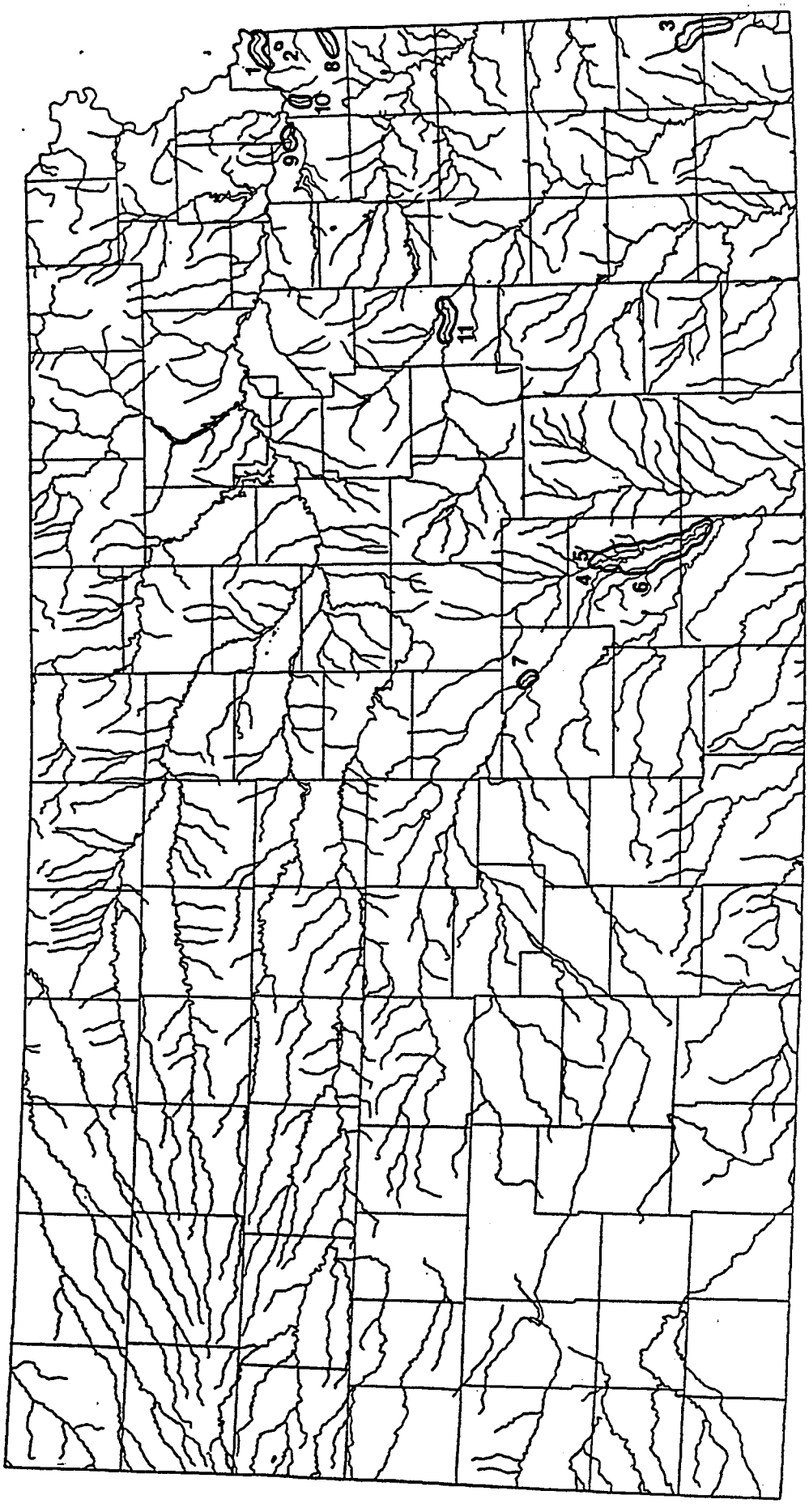
## UNCERTAINTY OF RISK ASSESSMENT

Risk-based criteria are very conservative by nature. They represent a worst case scenario of uncertain probability. Assuming that the downward extrapolation from a few dose animal feeding studies is correct, that the resultant upper bound, 95 percent confidence limit carcinogenic potency factor for chlordane is correct, and that carcinogenesis in humans is probable, then the following assumptions provide additional layers of conservatism. First, an average level of contamination must be determined. Several samples collected over multiple years usually have considerable variability. If one or two data points out of a total of six or eight represent high levels of contamination, then the average may be pulled up a great deal. The probability of encountering fish with the "average level of contamination" has an uncertainty. Second, the lifetime exposure assumption assumes the level of chlordane in fish will remain unchanged for a lifetime, whereas it will likely decrease over time as the chlordane remaining in soils and sediment is gradually degraded or transported downstream. Third, the assumption that levels measured in raw (uncooked) fillet samples is the same as that which will be consumed is unlikely. Some studies show a partial loss of fat soluble contaminants during the cooking process. Other studies indicate that trimming away the most fatty portions of the fish also reduces the level of fat soluble contaminants. There is evidence to indicate that less than 100 percent of the chlordane consumed is retained by the body.

## TO REITERATE WHAT THIS MEANS TO THE FISHING PUBLIC

These advisories do not mean that all Kansas fish are unsafe to eat. The "typical" person fishing in Kansas probably spends most of his or her time fishing at lakes and farm ponds. Lakes, and particularly non-urban lakes, do not appear to have bottom feeding or bottom dwelling fish with significant chlordane contamination. So, for most people, chlordane contamination is not a great issue.

People who should be most concerned are those who fish in urban areas and utilize the catch as a large part of their diet. These people may fish frequently or may occasionally stock a large supply for the freezer. People dependent on fish from urban streams as an important part of their diet should fish upstream of urban areas or should consume fish from urban streams less frequently and follow the recommended guidelines.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Missouri Department of
News Release HEALTH
P.O. Box 570, Jefferson City, MO 65102

**For Immediate Release:**
Monday, May 13, 1991

**Contact:**
Mark Roebuck
Public Information Officer
314/751-6062

## State Health Officials Issue New Advisories for Chlordane-Contaminated Fish on Rivers, Lakes

JEFFERSON CITY, MO. — The Missouri Department of Health today issued new and revised health advisories on fish from Missouri's rivers and lakes. The advisories are primarily based on fish sampling completed by the Missouri Department of Conservation during 1990 and the previous two years. Fish samples were analyzed for chlordane and other contaminants.

"We've tracked chlordane in fish for several years now and, even though its use was banned in 1988, it continues to be a source of concern," said state health director Dr. John R. Bagby.

Bagby explained that chlordane was once widely used for termite control around buildings and to control other insects on crops, particularly corn. Once applied, it lasted 20 years or more. "That's one of the reasons it was very useful as a termiticide," said Bagby. "But, that is also why there is still a lot of it around in the soil in both urban and rural areas." Rain runoff carries contaminated soil particles into lakes and rivers, making small amounts of the chlordane available for fish to absorb.

Bagby said that chlordane may damage the nervous system, digestive system, and liver, if taken in large enough doses. It also has produced cancers in laboratory animals. The health department is continuing studies which will help determine if advisories are effective in minimizing human exposure, Bagby said.

He emphasized that there is no immediate threat to human health and that the concern is only for long-term exposure. He stated there should be no concern over swimming, boating, or catch-and-release fishing in any of Missouri's waters. Bagby added that most lakes and rivers tested in the state did not show high contaminant levels.

The health department uses a three level advisory system. "Level I" means chlordane levels have been found to be less than the level of concern. However, heavy consumption of certain species may still cause significant exposure. "Level II" means some of the fish tested have elevated chlordane and the department recommends limiting consumption to one meal per month or less. "Level III" means that most of the fish tested have been found to be contaminated and should not be eaten. The advisories are for specific species of fish in specific lakes or river systems and apply only to that species in the designated area.

A summary table and major river map are included to help locate and explain the advisory areas. The conservation department is continuing tests of fish in Missouri waters and the health department will update the advisories each year, incorporating both new contamination data and the latest health effects information.

# # # #

**Summary of 1991 Chlordane Health Advisory for Missouri Waterways**

Level I: Fish sampled do not contain elevated chlordane levels.

Level II: Consumption of specified species should be limited to one meal a month.

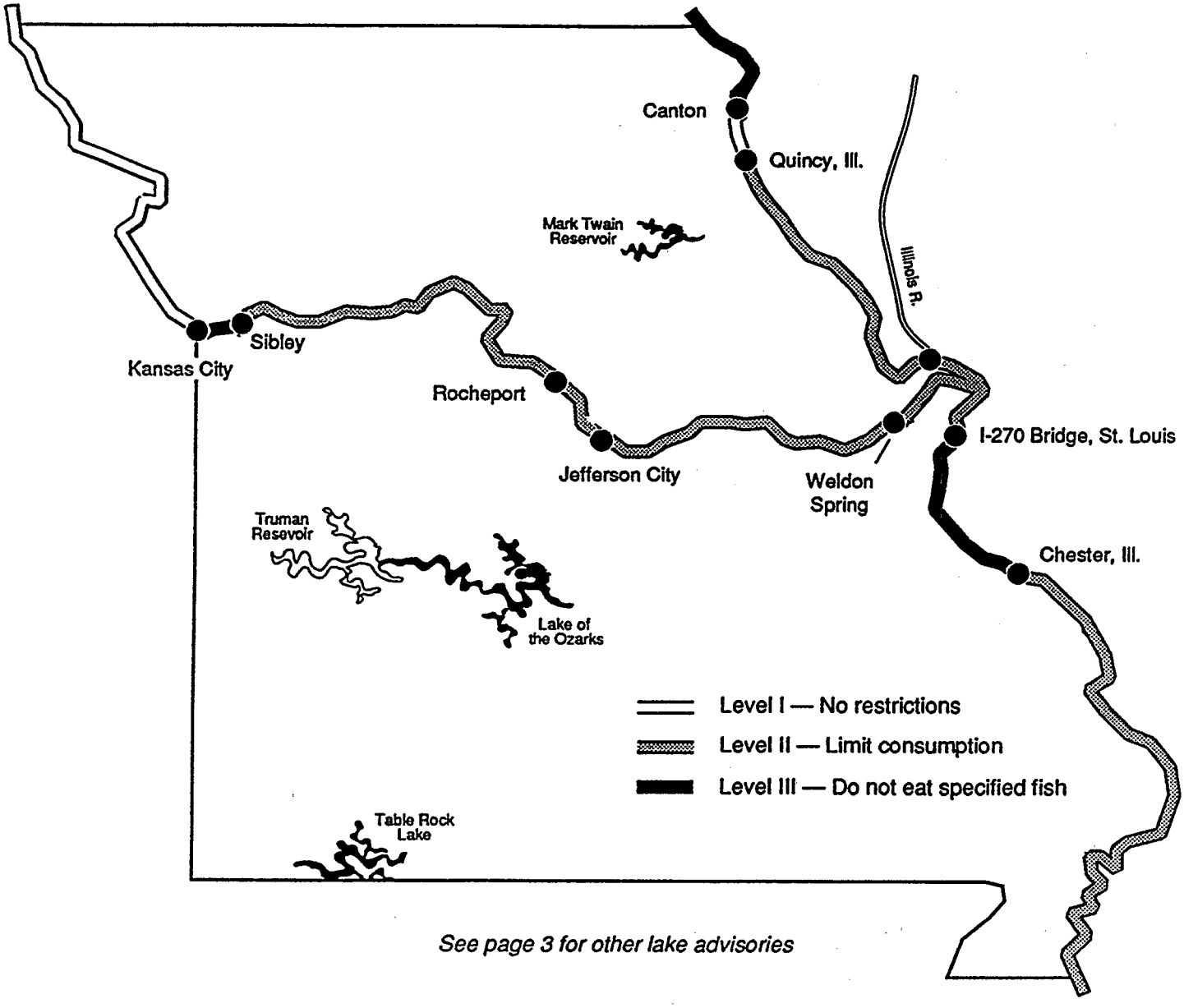
Level III: Specified species should not be eaten.

| Area | Level | Species | Miles |
|---|---|---|---|
| *Mississippi River* | | | |
| Confluence of Des Moines River to Lock & Dam 20 (Canton) | III<br>II | Channel Catfish<br>Carp | 19 |
| Lock & Dam 20 (Canton) to Lock & Dam 21 (Quincy, Ill.) | I | all | 18 |
| Lock & Dam 21 (Quincy, Ill.) to Hwy I-270 bridge (St. Louis) | II | Carp, Channel Catfish, Buffalo | 135 |
| Hwy I-270 bridge (St. Louis) to Hwy 51 bridge (Chester, Ill.) | III | Carp, Channel Catfish | 81 |
| Hwy 51 bridge (Chester , Ill.) to the Arkansas state line | II | Carp, Channel Catfish | 226 |
| Confluence of Illinois River downstream to state line | III | Shovelnose Sturgeon & Eggs | 343 |
| *Missouri River* | | | |
| Above Kansas City | I | all | 181 |
| Kansas City (Hwy I-635 bridge) to Sibley (Santa Fe bridge) | III | Bigmouth Buffalo, Carp, Channel Catfish, River Carpsuckers | 38 |
| Sibley (Santa Fe bridge) to the mouth of the Missouri river | II<br>I | Carp, Channel Catfish, Shovelnose Sturgeon<br>Paddlefish | 336 |

| Area | Level | Species |
|---|---|---|
| *Other Bodies of Water* | | |
| Blue River from the Kansas border to the mouth of the river | III | Carp, Channel Catfish |
| Blue River Road Lake in Kansas City | II | Carp |
| Creve Couer Lake | III | Carp, Channel Catfish |
| Englewood Lake in Kansas City | II | Carp |
| James River (Wilson Creek to Piney Creek) | I | Carp, Channel Catfish, Flathead Catfish |
| | III | Paddlefish, Paddlefish Eggs |
| Lake Buteo in Knob Noster | II | Channel Catfish |
| Lake of the Ozarks | III | Paddlefish, Paddlefish Eggs |
| Lake of the Woods in Kansas City | II | All |
| Lake Taneycomo | I | All |
| Lake Tapawingo in Jackson County | III | Channel Catfish |
| Lakewood Lake in Lakewood Park | II | Carp |
| Little Blue River | I | All |
| Mark Twain Reservoir | III | Channel Catfish |
| Meramec River and tributaries from Hwy 141 bridge to river mouth | III | All |
| Osage River in Bates County | II | Channel Catfish |
| Pleasant Hill Lake in Cass County | III | Carp |
| Prairie Lee Lake in Kansas City | III | Carp, Channel Catfish |
| Ritter Spring in Greene County | II | Carp |
| Salt River below Clarence Cannon Dam | III | Channel Catfish |
| Schuman Park Lake in Phelps County | II | Channel Catfish |
| Smithville Reservoir | III | Channel Catfish |
| Spring River, Lawerence County Verona to Hoberg (Dioxin) | III | All Species |
| Swift Ditch in New Madrid County | III | Buffalo, Carp |
| Swope Park Lagoon in Kansas City | II | Carp |
| Table Rock Lake | III | Paddlefish, Paddlefish Eggs |
| Terrace Lake in Kansas City | II | Channel Catfish |
| Truman Reservoir | I | All |
| Wilson Creek | III | Carp, Channel Catfish |

# 1991 Chlordane Health Advisory

## for the Missouri & Mississippi Rivers and Other Bodies of Water




*See page 3 for other lake advisories*

# FISH CONSUMPTION ADVISORY

The Alabama Department of Public Health has issued a fish consumption advisory for Choccolocco creek from the confluence of Snow creek and Choccolocco creek, south of Oxford, to where Choccolocco creek flows into Logan Martin. The Department recommends persons avoid eating all fish caught from this area. Several species of fish were found to have levels of polychlorinated biphenyls over the Food and Drug Administration tolerance level.

**NOTICE: CATCH AND RELEASE ONLY**

Water from the creek entering this pond has over time carried a once commonly used insecticide called chlordane. It was banned in 1988. This insecticide has settled into the pond's bottom sediments and has found its way into the tissues of bottom-feeding fish. Consumption of large quantities of these fish may be a health risk.

The catch and release regulation will allow recreational fishing while providing for your safety.

**DO NOT EAT THE FISH FROM THIS POND**

**JOHNSON COUNTY PARK & RECREATION DISTRICT**

# HEALTH WARNING

**Fish from these waters have been found to contain potentially dangerous levels of mercury and can cause serious illness if eaten regularly over a long period of time. Until further notice, fishermen are advised not to consume fish taken from these waters.**

**For more information contact the Marquette County Health Department — 906-475-9977.**

**Michigan Department Of Public Health**

# WARNING

## JULY 1993

## DO NOT EAT FISH

CAUGHT IN TOWN BRANCH OR THE MUD RIVER
FROM THE HANCOCK LAKE DAM TO GREEN RIVER.
THESE FISH ARE A POTENTIAL HEALTH RISK
AS THEY ARE CONTAMINATED WITH PCBs (POLYCHLORINATED BIPHENYLS).
FOR FURTHER INFORMATION PLEASE CONTACT
THE BARREN RIVER HEALTH DEPARTMENT
AT (502) 781-2490.

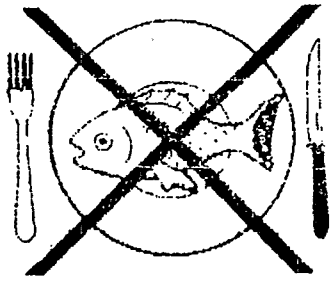
P-1265

J. L. DARLING CORP. (206) 383-1714

B-92

# WARNING

## Ten Mile River Fish



## Fish Contaminated With Lead
## DO NOT EAT

(Portuguese)

## Tôxico Com Chubo
## Não-fe Come

(Vietnamese)

## CÁ BỊ CHÌ NHIỄM ĐỘC
## KHÔNG ĂN ĐƯỢC

(Cambodian)

## ត្រីពុលជាតិសំណ
## ស្មុកកុំពិស

For more information, contact:
Massachusetts Department of Public Health 617-727-0049
Department of Fisheries, Wildlife, and Environmental Law Enforcement 617-366-4470
Department of Environmental Quality Engineering 617-292-5515

# WARNING

Fish taken from this body of water may contain elevated levels of mercury that can be harmful to health. It is believed that the source of the mercury is natural geological mercury in the rocks and soils of the area and, possibly, past mining activities. The Oregon Health Division (OHD) and _____ County Health Department advise you to limit your eating of these fish as follows:

1. Pregnant women, nursing women and children up to six years of age should not consume <u>any</u> fish from this body of water; and

2. Children older than six years and healthy adults should limit their consumption of fish from this body of water to no more than one half pound (8 ounces) of fish per _____.

If you have questions about this advisory please call _____ County Health Department at (503) _____ or the Oregon Health Division at (503) 731-4015.

34-72 (1/94)

# ADVERTENCIA

Peces que se saquen de esta fuente de agua pueden estar contaminados con niveles elevados de mercurio que pueden ser dañinos para la salud. Se cree que el origen del mercurio es de las rocas y suelo de esta área, posiblemente debido a actividades mineras en el pasado. La División de Salud de Oregon (Oregon Health Division - OHD) y el Departamento de Salud del Condado de (County Health Department of) _____ recomiendan que se limiten del consumo de estos peces a:

1. Mujeres embarasadas, mujeres que esten lactando y niños hasta los seis años de edad, no deben de comer ningún pez de esta fuente de agua, y

2. Niños mayores de seis años de edad y adultos saludables deben limitar el consumo de peces de esta fuente de agua, a no más de media libra (8 onzas) de pescado por _____.

Si tiene preguntas acerca de esta advertencia, por favor llamar al Departamento de Salud del Condado de _____ al (503) _____ o al Departamento de Salud de Oregon al (503) 731-4015.

34-72S (1/94)

# Should You Eat Your Michigan SPORT FISH?

*By Dr. James Bedford*

Eating fish is a very healthy choice. Fish are very nutritious, low in calories, and an excellent source of protein. Their flaky flesh is low in fat, and even the oilier species such as lake trout have much lower levels of fat than lean beef.

Fish are especially low in saturated fats, but they are high in omega-3 fatty acids. These unsaturated fatty acids may reduce the risk of heart disease by lowering the level of cholesterol in your system and inhibiting the process of atherosclerosis.

In spite of all the beneficial reasons for eating fish, we are constantly warned to either limit consumption or not eat many Michigan sport fish species. The reason for these warnings are chemical contaminants which are found in our trout, salmon, bass, walleyes, catfish, and other game fish. PCBs, organochlorine pesticides, and mercury are the most common contaminants of the fish. Nursing mothers, pregnant women, women who intend to have children, and children age 15 and under are especially advised to restrict their consumption of contaminated fish since many of these chemicals can accumulate in our bodies and can be passed from mother to infant.

Relatively high levels of these contaminants are found in fish because the chemicals become more and more concentrated as we move up the food chain. In addition, these compounds can enter the fish from the water by passing through the gills as the fish breathes. Most of the fish contaminants are very persistent in the environment and are hydrophobic and lipophilic. This means that the chemicals will move out of the water and into fats at every opportunity. Couple this with their resistance to breakdown and it is easier to understand why a few parts per trillion in the water can result in contaminated fish.

Even though organochlorine insecticides such as DDT, chlordane, and dieldrin have been banned in this country and all of the uses and production of PCBs have been discontinued, these chemicals continue to linger in the environment. A large percentage of these chemicals along with mercury enter our lakes and streams from the air, making their control very difficult. In most cases, though, levels of contaminants are going down, albeit more slowly than we would like. We can help speed this process by decreasing the amount that gets into the atmosphere via incineration and volatilization.

Despite the presence of these contaminants, we can still enjoy eating Michigan fish. We can choose species to eat which

**Joseph Mazner with steelhead taken on Pere Marquette River. Releasing the lunkers will lower your potential exposure to toxic contaminants.**

tend to have lower levels of contaminating chemicals. In the case of the lipophilic contaminants, we can avoid high levels by choosing fish with a very low fat content such as walleyes, northern pike, black bass, and yellow perch. Picking fish for the table that are lower in the food chain, such as bluegills and smelt, rather than the top predators helps to avoid all types of contaminants. It is also prudent to eat a variety of species from different bodies of water rather than concentrating on one type of fish from one lake.

Taking smaller fish home to eat and releasing the lunkers will also lower your potential exposure to toxic contaminants. The smaller fish are usually younger and have a lower fat content with the net result, in most cases, a lower body burden of contaminants. The smaller fish are also usually better tasting than the large, older fish. Keep a camera handy on your fishing trips and photograph the big fish you catch prior to release. This will make it easier to slide that hawg bass or trophy trout back into the water. In addition to lowering the possibility of exposure to chemicals, releasing large fish is likely to improve the fishing, especially in warmwater lakes.

Another way to avoid contaminants is to fish in bodies of water that are known to be relatively free of the toxic chemicals that bioconcentrate in fish. Information is provided on lakes and rivers with known contamination problems in the "Michigan Fishing Guide" that comes with your license. While there are exceptions, bays, rivers, and lakes with little or no industry on their shores are less likely to contain contaminants at harmful levels. Background or natural levels of mercury can cause problems in some lakes, but it is hard to identify these without chemical analyses.

Once you have captured that mess of fish for the table you can further reduce the PCB and organochlorine levels by the way you dress and cook the fish. Remember that these compounds concentrate in the fat so that removal of the fat from the fish will reduce the contaminant level.

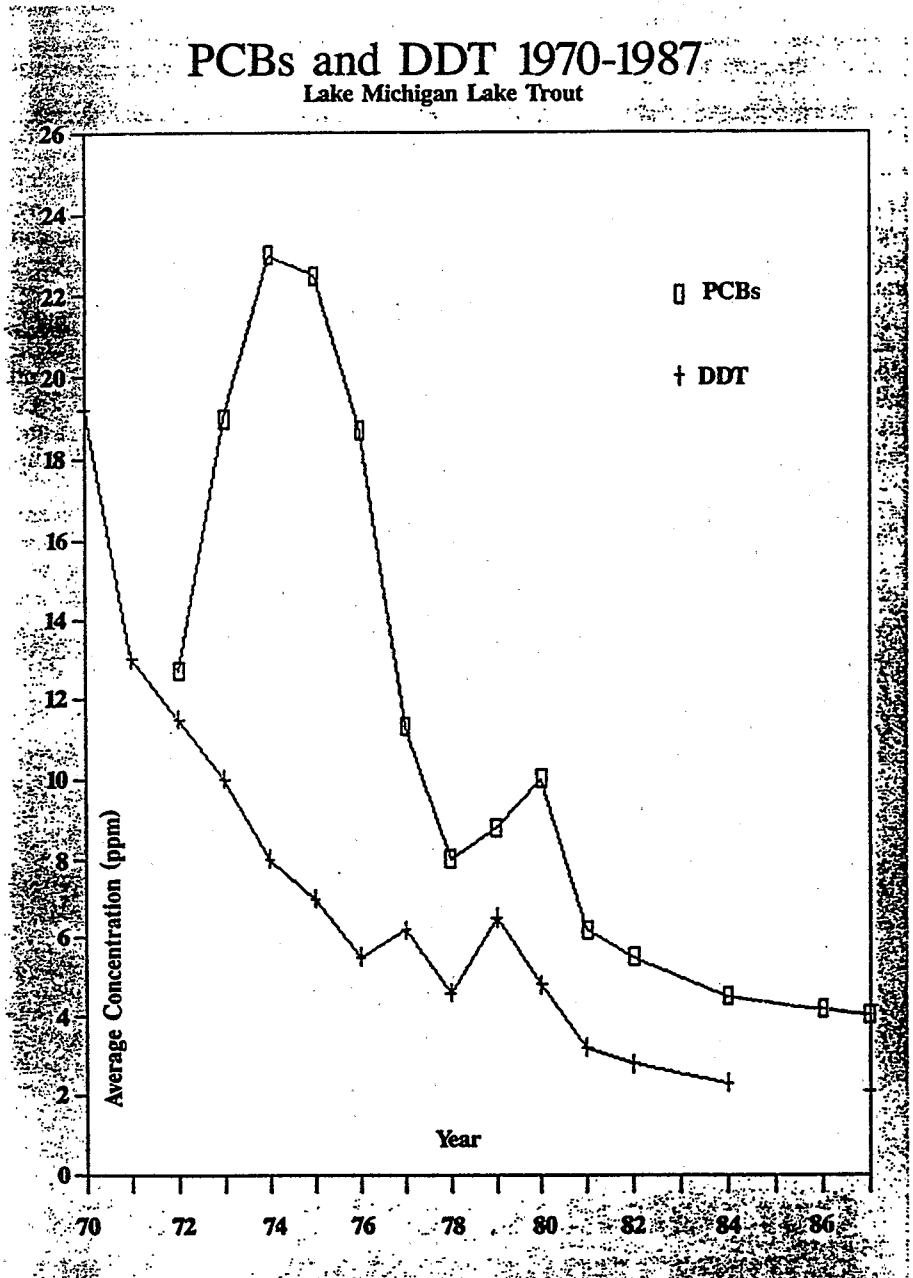
Fat tends to be concentrated in and under the skin, along the lateral line which runs lengthwise along the side of the fish, along the base of the dorsal fin, and in the belly meat. Except for the belly flaps, the areas of high fat content are darker in color and have poor flavor. Cut these parts out and discard when you dress or filet your catch.

Further removal of fat can be accomplished through cooking. Broiling, grilling, and baking on a rack all allow the fat to be drained away from the fish. Poaching or salt boiling will also remove fat provided that you discard the cooking liquid. Likewise, deep frying your filets in vegetable oil will draw out the contaminant-laden fat. Be sure to drain away and dispose of the cooking oil. Additional information on cleaning and cooking fish can be found in the booklet, "Eating Great Lakes Fish," which is available from the Cooperative Extension Service.

Can we safely eat Michigan sport fish? I think so. By avoiding contaminants as described above, you can enjoy a delicious and healthy meal of our bountiful freshwater fish.

If you have questions about particular contaminants, bodies of water, or fish call the Department of Public Health's "Toxic and Health Hotline"—1-800/648-6942.

**The author:** Dr. James Bedford is environmental health ombudsman on the staff of the Michigan Council for Environmental Quality.




**Most of the major contaminants in Great Lakes fish are either banned or no longer manufactured in the United States. Michigan was a leader in stopping the use of DDT and PCBs. The levels of these compounds in fish rapidly declined following the bans. The concentrations continue to decrease but at a much slower rate because, while the major point sources have been controlled, these contaminants continue to enter the lake via atmospheric deposition and leaching from contaminated sediments.**

Hot Topics

# Are there toxic chemicals in the fish you're eating

Recently there have been headlines in the newspapers about the presence of mercury in water bodies that can be absorbed by the fish you catch and eat and affect your health.

What exactly does this mean? Are there other chemicals that can also get into fish and affect your health?

In some Louisiana waters, fish and shellfish have chemical contamination in amounts that may be harmful to your health if you were to eat too much over a long period of time. These contaminants may be in the environment due to various reasons like industrial discharges, leaking landfills, municipal runoff, aerial deposition, or natural occurrence. Bacterial contamination occurs naturally or comes from sewage or agricultural runoff.

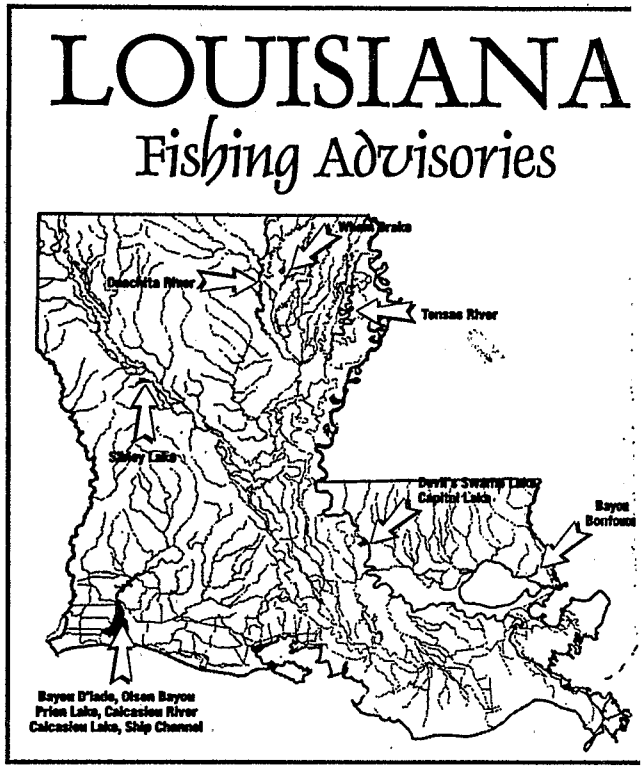
Fish take in the contaminants from water, suspended sediments and food. The Louisiana Office of Public Health's Section of Environmental Epidemiology (SEE) evaluates the amount of chemicals in different species of fish from water bodies to determine if the chemicals present could harm your health from eating the fish. A fish consumption advisory is issued when unacceptable levels of chemical contaminants have been found in fish. The advisory tells you how much and which fish are safe to eat from a certain area.

In order to determine if an advisory is needed, SEE calculates the exposure dose from fillet samples taken by the Department of Health and Hospitals (DHH), the Department of Environmental Quality (DEQ) and other agencies.

Fish samples are usually collected by DEQ if the water quality is poor enough to indicate a chemical contamination problem may exist in fish. In the past, the whole fish was analyzed for contaminants; however most people eat only the fillets.

Now, routinely only fillets are analyzed for public health studies of fish contamination. However, if SEE receives information that normal eating habits of an area are to use the whole fish, such data would be used to calculate the dose.

To calculate the dose of contami-




## The following chart lists the current fishing advisories in Louisiana.

| BANS\ADVISORIES\DATES | PARISH | LOCATION | POLLUTANT | AREA | DEPT |
|---|---|---|---|---|---|
| Information on fish consumption/4-7-92.* | Calcasieu, Cameron | Calcasieu Estuary | HCB, HCBD, PCB | 37 miles | DEQ & DHH |
| Fish & shellfish consumption limits; swimming & water sports & contact with bottom sediments/4-7-92.* | Calcasieu, Cameron | Bayou d'Inde | HCB, HCBD, PCBs | 6 miles | DHH & DEQ |
| Sediment contamination/1-17-89.* | Calcasieu | Bayou Olsen at Lake Charles | chloroform, misc. chemicals | 0.5 miles | DEQ |
| No fish consumption/Sediment contamination/8-24-83.* | East Baton Rouge | Capitol Lake in Baton Rouge | PCBs | .12 sq.mi. | DEQ |
| Fish consumption of no more than 2 meals a month, water contact sports, swimming/7-9-93. | East Baton Rouge | Devil's Swamp, Devil's Swamp Lake and Bayou Baton Rouge northwest of Baton Rouge | HCB, HCBD, PCBs, mercury, lead, arsenic. Superfund site. | 7 sq. mi. | DHH & DEQ |
| No fish sale & consumption/2-16-89.* | Natchitoches | Sibley Lake at Natchitoches | PCBs | 3.4 sq.mi. | DHH & DEQ |
| No Bass fish consumption; Other fish species no more than 2 meals a month/7-29-92.* | Ouachita, Union, Morehouse, Caldwell | Ouachita River, LA/AR border to lock at Columbia | Mercury | 102 miles | DHH & DEQ |
| No Crappie fish consumption; other fish species no more than 2 meals per month/3-7-94. | Ouachita, Richland, Morehouse | Bayou Lafourche from Highway 80 Overpass downstream to Interstate 20 | Dioxin | 2 miles | DHH & DEQ |
| Fish consumption of two meals or less per month of small mouth buffalo; no limit of consumption on other species/3-7-94. | Ouachita, Richland and Morehouse | Lake Irwin from one mile upstream of the Morehouse Parish Road Overpass downstream to the weir. | Dioxin | 2 miles | DHH & DEQ |
| No fish consumption/3-7-94. | Ouachita, Morehouse and Richland | Wham brake near Swartz | Dioxin | 7.2 sq.mi. | DHH & DEQ |
| No fish consumption, swimming, sediment contact/11-24-87. | St. Tammany | Bayou Bonfouca, Slidell | Creosote, Superfund Site. | 7 miles | DHH & DEQ |
| No fish consumption/2-19-92. | Franklin, Richland, Tensas and Madison | Tensas River | DDT, Toxaphene | 83 miles | DHH, DEQ, DAF |

* Newer data exists and will be reviewed for possible revision of advisory.

3-22-94

nants present in the fish, the SEE uses the National Academy of Science risk assessment methodology. This technique assumes that a person weighing 154 lbs. is eating 1/2 lb. of contaminated fish once a week for 70 years, and that they absorb 100% of the contaminants in the fish.

The contaminant level used in the calculations is the average of concentration levels from all the fish samples for each species that was tested. There is another calculation done with different assumptions for pregnant and nursing women, and children.

*The technique assumes that a person weighing 154 pounds is eating 1/2-pound of contaminated fish once a week for 70 years.*

If the calculated dose exceeds the safe dose estimated by the Environmental Protection Agency or the Agency for Toxic Substances and Disease Registry, a site specific evaluation is made by LOPH and SEE. If it is determined that human exposure is occurring at the elevated dose, a joint agency advisory is issued.

Once there is agreement about the advisory, a news release is distributed to the region that is affected. An announcement is also published in the Louisiana Register. The information is provided to the Governor's Office and Cabinet Secretaries. Signs are made and posted around the affected water bodies and a public meeting may be held.

SEE has designed a brochure with a summary of the advisories and advice on how to reduce the amount of contamination in the fish you catch and eat. This brochure is available at the Parish Health Units and through SEE.

When new sampling data becomes available, the advisory is reviewed and either remains the same, is expanded or is lifted. For the advisory to be lifted, the calculated dose must reach acceptable levels for a minimum of two years. A news release is distributed to inform the public of any changes.

## Health Advice and Guidelines

Fish are a low-fat, high-protein food source, and the health benefits from eating fish must be weighed against the risks of ingesting contaminated fish that may affect health.

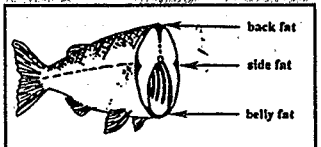
The contaminants that are found in Louisiana fish can be grouped into two categories: organic chemicals (HCB, HCBD, PCB, Dioxin, DDT and Toxaphene) and metals (mercury, arsenic and lead).

Organic contaminants build up in fish fat deposits and just under the skin, more than in the muscle tissue (fillet). The metals are spread throughout the whole fish.

The presence of chemicals in fish do not mean you have to stop eating them completely. Follow the advisories and prepare fish to eat responsibly.

Follow these steps when cooking fish to reduce the amount of contamination present.

- Remove all organs and skin from fillets or steaks. Organs and skin can be high in fat and organic chemicals.
- Trim off the fatty areas shown in black on the drawing. This includes the belly fat, side fat and the flesh along the top of the back. Most contaminants concentrate in the fat.




*Trim away these fatty areas.

- Bake or broil skinned, trimmed fish on a rack or grill so fat drips off. Throw away drippings.
- When fish is poached or fried, throw away the broth or oil.
- Keep smaller fish to eat. Usually, younger, smaller fish are less contaminated than larger, older fish.
- Eat fewer predator fish such as bass, gar or pickerel. Contaminants accumulate in the predator fish.

You should report suspected chemical contamination in fresh or frozen store-bought or caught fish and shellfish to LOPH, Seafood Sanitation at (504) 568-8227 or (800) 256-4609 from 8:30am to 4:30pm Monday through Friday. Questions regarding oysters should be directed to the Oyster Water Program at (504) 896-1378 or (800) 256-2775.

For questions about the advisories call LOPH Environmental Epidemiology at (504) 568-8537 or (800)256-4609.

**4. How can I get the chemicals out of the fish?**

*ANSWER:* You cannot remove all of the chemicals. If you CHOOSE to eat Lake Ontario fish, the following will help REDUCE the amount of chemicals in the fish you eat:

A. Choose small fish (of legal size)
B. Remove the skin, fat, and dark meat before cooking
C. DO NOT FRY the fish (frying retains fish fat, where most chemicals are stored)
D. Broil, poach, boil, or bake the fish
E. Drain off and throw away all cooking juices
F. DO NOT eat cooking juices or grease

**5. WHAT should I ask about the fish I buy?**

*ANSWER:* You should ask what kind of fish it is AND where was it caught. Most fish from Lake Ontario and its connecting streams cannot be sold legally. Buy fish only from grocery stores or licensed fish sellers.

**6. What should I eat instead of Lake Ontario fish?**

*ANSWER:* Fish caught in the ocean and those raised on fish farms generally have less of these chemicals in them than Lake Ontario fish. Fish without these chemicals are considered to be part of a healthy diet. Also, include more beans and rice, pasta, and whole grain foods in your meals since these foods are inexpensive and good for your family.

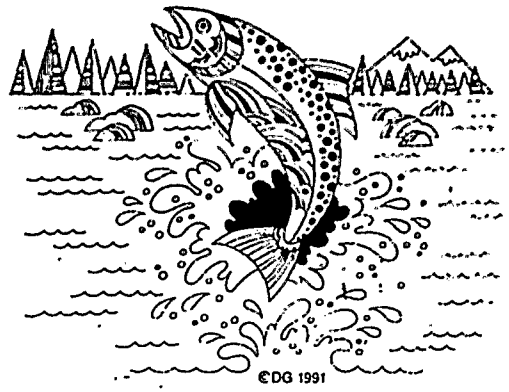
**REMEMBER ... for your children's sake, it is best NOT to eat fish from Lake Ontario and its connected waters. MOTHERS, the more fish you eat, the more harmful chemicals YOU take in and pass on to your unborn and breastfed CHILDREN.**

**For more information, the New York State Department of Health provides a toll-free number: 1-(800)-458-1158.**

Printing was funded by the U.S. Environmental Protection Agency.

Fish illustrations provided courtesy of Gannett Rochester Newspapers.

This document is based on the 1992-93 New York State Department of Health Fish Consumption Advisory.




# Should My Family Eat Fish Caught In Local Waters?


## If Your Family Eats Local Fish, Please Read This.

B-100

Some fish from Lake Ontario and its connecting streams, rivers, ponds, and bays contain dangerous chemicals in amounts considered too high by the New York State Health Department.

This pamphlet explains why you and especially YOUR CHILDREN may be harmed by eating fish caught in Lake Ontario and its connected streams, rivers, ponds, and bays.

## BACKGROUND

Many people in our area enjoy cooking and eating fish caught in Lake Ontario and the rivers, streams, bays and ponds that connect to the lake. However, some of these fish contain a variety of chemicals that may be harmful. These chemicals have entered our environment from factories, businesses and households. People take in these chemicals from eating the fish, but not from drinking tap water.

## HERE ARE SOME QUESTIONS YOU MAY HAVE ABOUT EATING FISH FROM LAKE ONTARIO:

**1. What's the problem?**

*ANSWER:* Severe birth defects have been found in wild animals and birds that eat Lake Ontario and Great Lakes fish. Some scientists have found that birth weights are lower and learning is delayed in some children whose mothers eat Great Lakes fish. Some of the chemicals in these fish may increase the risk of cancer.

**2. WHO is most at risk from eating Lake Ontario fish?**

*ANSWER:* Women should not eat these fish since they can pass the chemicals on to their unborn babies and nursing infants. Children under the age of 15 also should not eat these fish.

**3. WHAT fish shouldn't I eat?**

*ANSWER:* Infants, children under the age of 15, and women of child-bearing age should not eat fish from Lake Ontario and connecting streams, rivers, ponds, and bays.

Other members of your family SHOULD NOT EAT these kinds of fish from Lake Ontario:

- Channel catfish
- American eel
- Lake trout
- Chinook salmon
- Coho salmon (over 21 inches long)
- Rainbow trout (over 25 inches long)
- Brown trout (over 20 inches long)
- Carp

Other members of your family SHOULD NOT EAT MORE THAN ONE MEAL A MONTH of these fish from Lake Ontario:

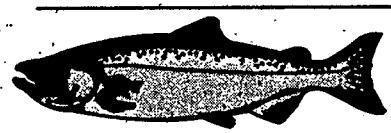
- *White perch
- Coho salmon (under 21 inches long)
- Rainbow trout (under 25 inches long)
- Brown trout (under 20 inches long)
- White sucker

***As of June 1991 the New York State Department of Health recommends that NO WHITE PERCH caught west of Pt. Breeze be eaten.**

AND, other members of your family SHOULD NOT EAT more than one meal a week of any other kind of fish from Lake Ontario and its connected waters.

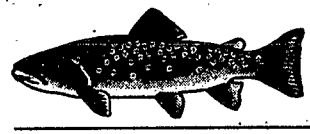
Here are some pictures of fish you and your family should not eat any of:

**Channel catfish**
**American eel**



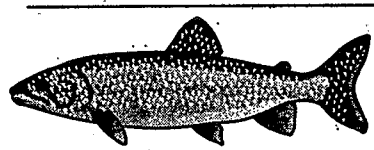
**Chinook salmon**
Silvery with spotted markings; 30 to 40 pounds.

**Coho salmon**
Silvery color, weighing eight to 10 pounds.

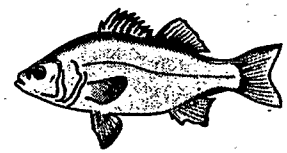


**Brown trout**
Brown with dark spots, three to six pounds.

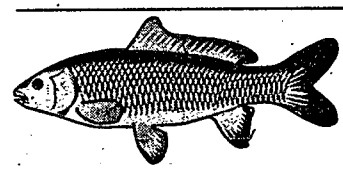
**Rainbow trout**
Bluish or olive on back, silvery green on sides. Up to 20 pounds.



**Lake trout**
Gray with pinkish spots, 10 to more than 20 pounds.



**White perch**
Brilliant silver with darker green cast on the back; about one pound.



**Carp**
Color varies widely. Averages one to six pounds.

B-101

# ATTENTION

## Fish Consumption Advisory — Lake Hartwell S.C. Department of Health and Environmental Control (SCDHEC)

- All fish taken from the Seneca River arm of Lake Hartwell north of SC Highway 24 and 12 Mile Creek should be released and not eaten.
- All fish larger than three (3) pounds taken from the remainder of Lake Hartwell should be released and not eaten.
- Fishing is not prohibited but SCDHEC advises that these fish not be eaten due to the presence of elevated levels of polychlorinated biphenyls (PCBs). Swimming, boating, and other water related activities are not restricted by this advisory.

For additional information, contact SCDHEC at:

| COLUMBIA | GREENVILLE | ANDERSON |
|---|---|---|
| 734-5300 | 242-9850 | 225-3731 |

## ATTENTION
## FISH CONSUMPTION ADVISORY - LANGLEY POND
**South Carolina Department of Health and Environmental Control**

- All fish taken from Langley Pond should be released and not eaten.
- The South Carolina Department of Health and Environmental Control advises that these fish not be eaten due to the presence of elevated levels of mercury and polychlorinated biphenyls (PCBs).

**For Additional Information, Contact**
**South Carolina Department of Health and Environmental Control at:**

**Columbia**
**(803) 734-5300**

**Aiken**
**(803) 648-9561**

## APPENDIX C

### Example Evaluation Measurement Instruments

1. "Catching and Eating Freshwater Fish in New York" mail survey instrument (Connelly et al. 1992) (C-2)

2. "Angler Attitudes and Behavior Associated with Ohio River Health Advisories" (Knuth et al. 1993) (C-16)

# CATCHING AND EATING

# FRESHWATER FISH

# IN NEW YORK

Human Dimensions Research Unit
Department of Natural Resources
New York State College of Agriculture and Life Sciences
A Statutory College of the State University
Cornell University, Ithaca, N. Y.

# CATCHING AND EATING

# FRESHWATER FISH IN NEW YORK

Research conducted by the
Human Dimensions Research Unit
in the Department of Natural Resources
New York State College of
Agriculture and Life Sciences
Cornell University

The purpose of this survey is to learn more about freshwater fishing in New York State. We're interested in the activities and opinions of anglers related to fishing and eating fish. Your answers will help improve the process of advising anglers about the safety of eating freshwater fish in New York State.

Please complete this questionnaire at your earliest convenience, seal it, and drop it in any mailbox (no envelope is needed); return postage has been provided. Your responses will remain confidential and will never be associated with your name.

**THANK YOU FOR YOUR ASSISTANCE!**

**Printed on recycled paper**

1. **At what age did you first fish on a fairly regular basis (at least 5 days per year?)**

   Age when you first started fishing regularly: _____

   Check here _____ if you have never fished at least 5 days in any year.

2. **Did you do any freshwater fishing in New York State between January 1, and December 31, 1991?** *(Check one.)*

   _____ Yes ➡ How many days? *(Count any part of a day as a whole day.)*

   _____ days

   _____ No

3. **Please indicate which of the following methods you use to prepare and eat any sport-caught fish in your household. Circle the number for each item that best describes your actions.**

   1=Always; 2=Usually; 3=Sometimes; 4=Rarely; 5=Never

| | Always | | | | Never |
|---|---|---|---|---|---|
| a. Trim the strip of fat along the back of the fish | 1 | 2 | 3 | 4 | 5 |
| b. Trim belly meat | 1 | 2 | 3 | 4 | 5 |
| c. Puncture or remove the skin | 1 | 2 | 3 | 4 | 5 |
| d. Eat whole, gutted fish | 1 | 2 | 3 | 4 | 5 |
| e. Fillet the fish | 1 | 2 | 3 | 4 | 5 |
| f. Pan fry | 1 | 2 | 3 | 4 | 5 |
| g. Deep fry | 1 | 2 | 3 | 4 | 5 |
| h. Make fish soups or chowders | 1 | 2 | 3 | 4 | 5 |
| i. Bake, barbecue, or poach fish | 1 | 2 | 3 | 4 | 5 |
| j. Reuse oil or fat from cooking fish | 1 | 2 | 3 | 4 | 5 |
| k. Freeze or can the fish for use at a later time | 1 | 2 | 3 | 4 | 5 |

4. **Please indicate on the chart below the name and county location for each area that you fished in New York State between January 1 and December 31, 1991. For each location record the number of each species of fish you personally caught in the upper left corner of the box. Record the number of meals of fish you ate of each species from each location below the diagonal line in the lower right corner of each box.** (*If you can't remember the number, but know you caught or ate some put a "?" in the appropriate triangle.*) *If you did not fish in New York in 1991, skip to Question 5.*

| Name of Lake or Stream | County | American Eel | Bass | Bullhead | Brown Trout 20" or under | Brown Trout over 20" | Carp | Channel Catfish | Chinook Salmon | Coho Salmon 21" or under | Coho Salmon over 21" | Lake Trout 21" or under | Lake Trout over 21" | Rainbow Trout 25" or under | Rainbow Trout over 25" | Walleye | White Perch | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | |
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**Sportfish in a number of New York waterways have been found to contain levels of chemical contaminants which may pose health risks to fish consumers. The New York Department of Environmental Conservation distributes health advisories written by the Department of Health which give advice about limiting consumption of fish from certain waters of the State.**

5. **Prior to this survey were you aware of these health advisories?** *(Check one.)*

_____ YES, aware of specific species and/or water bodies
_____ YES, generally or vaguely aware
_____ NO *(SKIP TO QUESTION 11)*

6. **Which of the following information sources made you aware of the health advisories?** *(Please check all that apply.)*

_____ Newspaper article or editorial
_____ Magazine article
_____ 1990-1991 Fishing, Small Game Hunting, and Trapping Regulations Guide
_____ Previous years Fishing, Small Game Hunting, and Trapping Regulations Guides
_____ Newsletters from fishing clubs
_____ Cooperative Extension information
_____ New York Sea Grant information
_____ New York State Fisheries agency personnel (Department of Environmental Conservation)
_____ New York State Department of Health personnel
_____ Warnings posted on waters that I fish
_____ Friends
_____ Television or radio
_____ Guides or charterboat operators

**7. Since you learned about the New York State health advisories, have you made any changes in either your fishing habits or in the way you eat the fish you catch?**

____ NO. I made no changes as a result of the advisories, because: *(Please check all that apply.)*

_____ I never ate New York sport-caught fish even before I learned about the advisories.
_____ The amount of fish I ate before I learned about the advisories was less than the recommended limits.
_____ I don't believe sport-caught fish pose a health risk for me.
_____ I couldn't tell from the advisories which locations would have cleaner fish in them.
_____ I couldn't tell from the advisories which species of fish have less chemicals in them.
_____ I don't know how to fish for the species of fish that have less chemicals in them.
_____ I couldn't tell from the advisories what sizes of fish have less chemicals in them.
_____ I couldn't tell from the advisories how to clean my fish in a way that reduces chemicals in them.
_____ I couldn't tell from the advisories how to cook my fish in a way that reduces chemicals in them.

____ YES. What changes have you made? *(Please check all that apply.)*

_____ I no longer eat any sport-caught fish.
_____ I eat less sport-caught fish now than before the advisories.
_____ I eat more sport-caught fish now because I can choose to keep fish from waters where there are less serious advisories.
_____ I have changed the ways I clean fish before eating them.
_____ I have changed the ways I cook fish before eating them.
_____ I have changed fishing locations because of the advisories.
_____ I take fewer fishing trips since learning about the advisories.
_____ I take more fishing trips now because I can choose waters with less serious contaminant problems.
_____ I have changed the species of fish I eat because of the advisories.
_____ I have changed the sizes of fish I eat because of the advisories.

8. **For each type of fish, please circle the number that best describes the change you made in the amount of fish you eat <u>because of the advisories</u>. Circle 5 if you never ate a certain type of fish before or after learning about the advisories.**

| | Stopped Eating | Decreased Amount | No Change | Increased Amount | Never Ate |
|---|---|---|---|---|---|
| American eel | 1 | 2 | 3 | 4 | 5 |
| Brown bullhead | 1 | 2 | 3 | 4 | 5 |
| Brown trout | 1 | 2 | 3 | 4 | 5 |
| Carp | 1 | 2 | 3 | 4 | 5 |
| Channel catfish | 1 | 2 | 3 | 4 | 5 |
| Chinook salmon | 1 | 2 | 3 | 4 | 5 |
| Coho salmon | 1 | 2 | 3 | 4 | 5 |
| Crappie | 1 | 2 | 3 | 4 | 5 |
| Lake trout | 1 | 2 | 3 | 4 | 5 |
| Largemouth bass | 1 | 2 | 3 | 4 | 5 |
| Muskellunge | 1 | 2 | 3 | 4 | 5 |
| Pickerel or Pike | 1 | 2 | 3 | 4 | 5 |
| Rainbow trout | 1 | 2 | 3 | 4 | 5 |
| Smallmouth bass | 1 | 2 | 3 | 4 | 5 |
| Sunfish (e.g. bluegill, pumpkinseed) | 1 | 2 | 3 | 4 | 5 |
| Walleye | 1 | 2 | 3 | 4 | 5 |
| White perch | 1 | 2 | 3 | 4 | 5 |
| White sucker | 1 | 2 | 3 | 4 | 5 |
| Yellow perch | 1 | 2 | 3 | 4 | 5 |

**9. Please check YES, NO, or NOT SURE for each statement below:**

| | Yes | No | Not Sure |
|---|---|---|---|
| a. The health advisories provide me with enough information to decide whether or not to eat certain fish. | ____ | ____ | ____ |
| b. The advisories are not needed, or are exaggerated. | ____ | ____ | ____ |
| c. The New York State health advisories have increased my interest in water pollution control and cleanup efforts. | ____ | ____ | ____ |
| d. The negative health effects from eating contaminated fish are mainly short term. | ____ | ____ | ____ |
| e. The potential negative health effects from eating contaminated fish include nervous system disorders and cancer. | ____ | ____ | ____ |
| f. Older fish generally have more contaminants in them than younger fish. | ____ | ____ | ____ |
| g. Many chemical contaminants are found in greater amounts in fatty fish than in lean fish. | ____ | ____ | ____ |
| h. Fish contaminated with chemicals will taste odd. | ____ | ____ | ____ |
| i. Fish contaminated with chemicals don't behave normally. | ____ | ____ | ____ |
| j. To reduce the levels of chemical contaminants in fish you should: | | | |
| 1. remove the belly fat | ____ | ____ | ____ |
| 2. pan fry the fish | ____ | ____ | ____ |
| 3. broil the fish on a rack | ____ | ____ | ____ |
| 4. remove the skin | ____ | ____ | ____ |

**10. Which of the following methods do you think is used to measure contaminant levels in fish for the New York health advisories?** *(Check one.)*

_____ measure whole fish, skin on
_____ measure fillet from fish, skin on
_____ measure fillet from fish, skin off
_____ don't know

**11. What do you think the State recommends as the maximum number of meals of fish that a person should eat from any water in New York State?** *(Check one.)*

| | | |
|---|---|---|
| _____ None | _____ 1 per week | _____ 5-6 per week |
| _____ 1 or less per mo. | _____ 2 per week | _____ 1 per day |
| _____ 2-3 per mo. | _____ 3-4 per week | _____ Don't Know |

**12. What do you think the State recommends as the maximum number of meals of fish that women of childbearing age and children under 15 should eat if the fish have elevated contaminant levels?** *(Check one.)*

| | | |
|---|---|---|
| _____ None | _____ 1 per week | _____ 5-6 per week |
| _____ 1 or less per mo. | _____ 2 per week | _____ 1 per day |
| _____ 2-3 per mo. | _____ 3-4 per week | _____ Don't Know |

**13. For questions 13a and 13b, please use this list of government agencies to answer the questions:**

a. New York State Department of Health
b. County/City Department of Health
c. Department of Environmental Conservation, Bureau of Environmental Protection
d. Department of Environmental Conservation, Bureau of Fisheries
e. Don't Know

**13a. If someone wanted to know more about health effects from exposure to chemical contaminants, which government agency do you think the person should contact?**

_____ (Write one letter from the list above.)

**13b. If someone wanted more information about contaminant levels in fish, which government agency do you think the person should contact?**

_____ (Write one letter from the list above.)

**14. How much control do you believe you have in determining whether you will experience health problems due to eating New York sport-caught fish?** *(Circle the number that best reflects your opinion.)*

| Almost No Control | | Very Little Control | | Very Much Control | | Almost Complete Control |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

**15. How concerned should the general public be about the potential health risks from New York sport-caught fish?** *(Circle one number.)*

| Very Concerned | Somewhat Concerned | Slightly Concerned | Not at All Concerned | Don't Know |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

**16. How concerned are you personally that eating New York sport-caught fish is a potential health risk to you or members of your immediate family?** *(Circle one number.)*

| Very Concerned | Somewhat Concerned | Slightly Concerned | Not at All Concerned | Don't Know |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |

**17. Please check YES, NO, or NOT SURE for each statement below:**

| | Yes | No | Not Sure |
|---|---|---|---|
| a. Chemicals from fish can have a greater impact on developing organs in children or unborn babies than on organs in adults. | ____ | ____ | ____ |
| b. Eating fish oils decreases the risk of coronary heart disease. | ____ | ____ | ____ |
| c. Increasing fish consumption reduces dietary fat and helps to control weight. | ____ | ____ | ____ |
| d. Eating contaminated fish can result in accumulation of chemicals in my body. | ____ | ____ | ____ |
| e. Eating contaminated fish over many years increases my health risks. | ____ | ____ | ____ |

**18. Please indicate how strongly you agree or disagree with the following statements.** *(Circle one number for each item.)*

1=Strongly agree
2=Agree
3=Neutral
4=Disagree
5=Strongly disagree
6=Don't know

| | Strongly Agree | | | | Strongly Disagree | Don't Know |
|---|---|---|---|---|---|---|
| a. The health risk from eating contaminated sport-caught fish is minor when compared with other risks I'm exposed to. | 1 | 2 | 3 | 4 | 5 | 6 |
| b. I don't think government agencies really know how much chemical contaminants are in fish. | 1 | 2 | 3 | 4 | 5 | 6 |
| c. The health benefits of eating sport-caught fish are greater than the health risks. | 1 | 2 | 3 | 4 | 5 | 6 |
| d. The health benefits children get from eating sport-caught fish are greater than the health risks. | 1 | 2 | 3 | 4 | 5 | 6 |
| e. The health benefits unborn children get when their mothers eat sport-caught fish are greater than the health risks. | 1 | 2 | 3 | 4 | 5 | 6 |
| f. I would eat more sport-caught fish if health risks from chemical contaminants did not exist. | 1 | 2 | 3 | 4 | 5 | 6 |

**19a. Please rate how believable you think each of the following are as sources of information about the potential health risks from eating sport-caught fish.** *(Circle one number for each information source.)*

| | Not At All Believable | | | Moderately Believable | Extremely Believable |
|---|---|---|---|---|---|
| a. U.S. Environmental Protection Agency | 1 | 2 | 3 | 4 | 5 |
| b. NYS Department of Health | 1 | 2 | 3 | 4 | 5 |
| c. NYS Department of Environmental Conservation, Bureau of Fisheries | 1 | 2 | 3 | 4 | 5 |
| d. NYS Department of Environmental Conservation, Bureau of Environmental Protection | 1 | 2 | 3 | 4 | 5 |
| e. Sportsmen's associations or clubs | 1 | 2 | 3 | 4 | 5 |
| f. Charter boat operators or guides | 1 | 2 | 3 | 4 | 5 |
| g. Sea Grant Extension specialists | 1 | 2 | 3 | 4 | 5 |
| h. Environmental interest groups | 1 | 2 | 3 | 4 | 5 |
| i. Newspaper reporters or writers | 1 | 2 | 3 | 4 | 5 |
| j. Your own physician | 1 | 2 | 3 | 4 | 5 |

**19b. If you wanted to know more about the health risks from eating sport-caught fish, which one of the sources of information listed in 19a would you contact first?**

_____ Please write one letter from the list in Question 19a.
*(Check here _____ if you don't know)*

**20. Please check YES, NO, or NOT SURE for each statement below:**

| I would like more information about: | Yes | No | Not Sure |
|---|---|---|---|
| a. how potential health risks change as more or less fish is eaten. | ____ | ____ | ____ |
| b. the potential health problems that may occur in adults who eat contaminated fish. | ____ | ____ | ____ |
| c. the potential health problems that may occur in children who eat contaminated fish. | ____ | ____ | ____ |
| d. the potential health problems that may occur in children whose mothers eat contaminated fish before or during pregnancy. | ____ | ____ | ____ |
| e. comparing health risks from eating contaminated fish with health risks from eating other protein sources. | ____ | ____ | ____ |
| f. comparing health risks from eating contaminated fish with health risks from other activities such as smoking cigarettes or drinking alcohol. | ____ | ____ | ____ |
| g. how to clean fish to reduce the health risks posed by contaminants. | ____ | ____ | ____ |
| h. how to cook fish to reduce the health risks posed by contaminants. | ____ | ____ | ____ |
| i. the chemical contaminants in sport-caught fish that cause advisories to be issued. | ____ | ____ | ____ |
| j. the way in which health agencies and fishery management agencies decide how much fish to recommend eating in advisories. | ____ | ____ | ____ |
| k. how to choose fishing locations to reduce the health risks posed by contaminants. | ____ | ____ | ____ |
| l. which sizes of fish to eat to reduce the health risks posed by contaminants. | ____ | ____ | ____ |
| m. which species of fish to eat to reduce the health risks posed by contaminants. | ____ | ____ | ____ |
| n. the potential health benefits that may occur for people who eat sport-caught fish. | ____ | ____ | ____ |