APPENDIX B

SCREENING VALUES FOR DEFINING GREEN AREAS

APPENDIX B

Recommendations for Designating Areas of Unrestricted Fish Consumption as Part of State Fish Advisory Programs

Fish consumption advisories issued across the United States have increased over the past 5 years from 1,266 advisories in 1993 to 2,506 advisories in 1998. Many states are now advising their citizens either (1) not to consume any fish or any fish of a specific species or specific size class from specified waterbodies, or (2) to restrict their consumption of these fish to a specified number of meals per time interval (such as one meal per week or two meals per month). This comes at a time when the health benefits of consuming fish have also become widely recognized (Burr et al., 1989; Dolecek and Granditis, 1991; Kimbrough, 1991; Knapp and Fitzgerald, 1989; Kromhout, 1993; Kromhout et al., 1985; McVeigh, 1990; Norell et al.,1986; Shekelle et al., 1985; Simopoulous, 1991). In an attempt to promote consumption of fish with relatively low body burdens of chemical contaminants as part of a healthy diet, some states have defined certain waterbodies as containing fish that are safe for “unrestricted consumption.” These areas that are identified as safe for unrestricted fish consumption are often referred to as “green” areas. The U.S. Environmental Protection Agency (EPA) National Fish and Wildlife Contamination Program is recommending that states develop an approach for designating and communicating the location of these safe fishing areas to the fish-consuming public. This risk management tool encourages both fishing as a recreational activity and the consumption of fish that are low in chemical contaminant residues, high in protein, and low in fat content.

This green area concept, already in use in several U.S. states and Canadian provinces, would enable states, territories, and tribes to define areas where fish tissue monitoring data and appropriate risk assessments have determined that fish may be safely consumed at unrestricted levels (as defined by the state) from a particular waterbody or waterbodies in a particular watershed. The green areas concept is in contrast to the more traditionally issued fish advisory that discourages fish consumption from specified waterbodies altogether or advises reduced consumption of fish. These green areas may comprise watersheds that are relatively undeveloped from an industrial and agricultural perspective, such as wilderness areas, or areas that border county, state, or national forests or preserves. One cautionary note with regard to waterbodies in very remote areas must be made, however. Several studies have monitored what were perceived as pristine watersheds and unexpectedly found elevated chemical contamination in fish tissues at levels of potential human health concern (Datta et al., 1999; Grieb et al., 1990; Henry et al., 1998; Sorensen et al., 1990; Swackhamer and Hites, 1998). Although these waterbodies were removed from direct industrial point source discharges and agricultural nonpoint source pollution, several chemical contaminants such as mercury, toxaphene, and PCBs, can be transported in the atmosphere from highly contaminated areas and be deposited relatively long distances from the actual pollutant sources. This atmospheric transportation of some chemical contaminants has resulted in the issuance of statewide freshwater advisories for mercury in 10 states (U.S. EPA, 2000).

Most states sample fish from a variety of waters during their annual fish monitoring programs. Not all waterbodies sampled are found to be contaminated to such a degree that issuance of advisories is necessary. It is those waterbodies containing fish with lower chemical residues (below human health screening values) that would potentially fall under the broad category of green areas. Within the green areas, however, there need to be criteria for distinguishing those waterbodies that are only slightly below the human health levels of concern from those that are truly pristine with respect to chemical contaminant levels in fish tissues. Once these green areas have been identified, states can use appropriate information on fish-consuming populations to establish appropriate consumption information.

To designate a waterbody as a green area where unrestricted fish consumption (as defined by the state) is sanctioned, EPA recommends that a state

- Collect a variety of fish species in the waterbody under review for green area status, but particularly target those species that are generally consumed by the local recreational or subsistence fishers using the waterbody.

- Assess levels of contamination for all of the 25 target analytes identified in this guidance document in the sampled fish tissue that are likely to impact that waterbody and compare residue levels to selected human health screening values.

- Conduct a risk assessment of the resulting chemical analysis data to determine whether the waterbody can be designated a green area and to more clearly define “unrestricted consumption” for the fish-consuming population given the specific levels of contamination for each of the target analytes found

- Clearly define for and communicate to the fish-consuming public the definition of “unrestricted consumption” based on the specific assumption used in the risk assessment procedure for the green area waters so that all segments of the fish-consuming public including sensitive populations (e.g., pregnant women/fetuses, nursing mothers, and children) understand the limitations of this unrestricted consumption status.

EPA suggests that the states follow the guidance in this volume for designing a monitoring program (Sections 2, 3, and 6), including the selection and sampling of appropriate target species in adequate numbers and of appropriate size classes. Two distinct screening values are available to the states based on different consumption rates of two distinct fisher populations: recreational fishers and subsistence fishers. State-collected information from creel surveys or interviews with these two distinct populations is most desirable for use in deriving screening values. (See U.S. EPA, 1998, *Guidance for Conducting Fish and Wildlife Consumption Surveys* for further information.) If local information on these fisher populations is not available, states may use the EPA default consumption rate values of 17.5 g/d and 142.4 g/d for recreational and subsistence populations, respectively, to calculate screening values.

Table B-1 summarizes the screening values (SVs) that states may choose to use to initially identify green areas. Screening values for the 25 target analytes are provided for both recreational and subsistence fishers based on the EPA default consumption rates (see Tables 5-3 and 5-4 in Section 5.2 for additional information on calculating screening values.) These calculated SVs for each of the target analytes should not be exceeded in fish tissues for the respective target fish-consuming population. The SVs listed in the table for target analytes such as inorganic arsenic, chlordane, DDT, dieldrin, heptachlor epoxide, hexachlorobenzene, lindane, toxaphene, oxyfluorfen, and PCBs that have both noncancer and cancer health endpoints are represented by the more conservative or protective of the two calculated SVs.

One concern states must address relates to the detection limit of the analytical method selected for chemical analysis of each target analyte in fish tissue samples. Just because an analyte cannot be detected in fish tissue, does not ensure that the area is safe for unrestricted consumption. For some of the target analytes, especially those calculated using subsistence consumption rates, the SVs are at or below the detection limit for even the most state-of-the-art residue analysis methods (see Table B-1). Thus, the analytical result of a sample being less than the mean detection limit for a particular analyte will not provide the state with adequate information about the actual contaminant level to accurately determine the meal size and meal frequency that can safely be consumed.

States in many cases have been forced by limited monitoring resources to target the collection and analysis of fish tissues to those waterbodies deemed most likely to be contaminated by chemical pollutants. Unlike sampling to determine whether a fish consumption advisory should be issued for a chemical contaminant, which requires only that one chemical be found in exceedance of a human health SV, sampling and analysis to determine green area status must confirm that there are no chemical contaminants in exceedance of the selected human health SVs. It is also important that the state directly monitor the contaminant tissue levels of the various chemical contaminants of concern in fish tissue rather than rely on indirect methods such as measuring water or sediment contaminant levels to estimate the level of fish tissue contamination in a particular waterbody.

EPA further recommends that states clearly define for the fish-consuming population the meaning of “unrestricted consumption.” For example, a state may choose a green area designation for their jurisdictional waters that are primarily used by recreational fishers. These waters must then not exceed SVs for

Table B-1. Screening Values for Defining Green Areas Based on Recreational or Subsistence Use of the Waterbody (ppm)

Target Analyte	SV Based on Recreational Fisher Consumption	SV Based on Subsistence Fisher Consumption	Analytical Detection Limits
Arsenic (inorganic)	0.026	3.87×10^{-3} [a]	0.005
Cadmium	4	0.58	0.005
Mercury	0.4	5.8×10^{-2}	0.001
Selenium	20	2.9	0.017
Tributyltin	1.2	0.17	0.002
Chlordane (Total)	0.114	0.016	0.001
DDT (Total)	0.117	0.017	1×10^{-4}
Dicofol	1.6	0.23	0.001
Dieldrin	2.5×10^{-3}	3.07×10^{-4} [a]	1×10^{-4}
Endosulfan (I and II)	24	2.949	0.005
Endrin	1.2	0.147	1×10^{-4}
Heptachlor epoxide	4.39×10^{-3}	5.40×10^{-4} [a]	1×10^{-4}
Hexachlorobenzene	2.50×10^{-2}	3.07×10^{-3}	1×10^{-4}
Lindane	3.07×10^{-2}	3.78×10^{-3}	1×10^{-4}
Mirex	0.8	0.098	1×10^{-4}
Toxaphene	3.63×10^{-2}	4.46×10^{-3}[a]	0.003
Chlorpyrifos	1.2	1.147	0.002
Diazinon	2.8	0.344	0.002
Disulfoton	0.16	0.019	0.002
Ethion	2	0.245	0.002
Terbufos	0.08	0.009	0.002
Oxyfluorfen	0.546	0.067	0.010
PAHs	5.47×10^{-3}	6.73×10^{-4}	1×10^{-6}
PCBs (Total)			
Sum of Aroclors[a]	0.02	2.45×10^{-3} [a]	0.020
Non-ortho coplanar PCBs			2×10^{-6}
Other congeners/ homologues			0.002
Dioxins/Furans	2.56×10^{-7} [a]	3.15×10^{-8} [a]	1×10^{-6}

[a] Target analyte (total)s for which the analytical detection limit is likely to be at or above the calculated SV depending on the analytical method selected. States must ensure that the analytical method chosen provides detection limits lower than the selected SVs for all 25 target analytes for designation of green area waters.

recreational fishers and the state must define “unrestricted consumption” for the consumer. For example, the state’s green areas may be defined as areas from which fish consumers may safely eat four 8-ounce fish meals per month (or approximately one fish meal per week) without any additional health risks. This definition must be clearly communicated, particularly to members of high-end fish-consuming groups such as some Native Americans, certain ethnic groups, and subsistence fishers as well as to sensitive populations (pregnant women/ fetuses, nursing women and children). The state should clearly define for the public both the **meal size** and **meal frequency** used in their green area designations so that high-end fish consumers do not erroneously assume that the unrestricted consumption designation that is protective of recreational fishers based on their consumption rate is also protective of subsistence fishers. In addition, the state should provide the fish-consuming public with information on the types of fish samples (whole fish, skin-on fillets, skin-off fillets, or other sample types) used to establish the green area designation. Because skinning, trimming, and certain cooking procedures also help reduce chemical residues in fish tissues (EPA, 1999) (see Volume 2 of this series, Appendix C—Dose Modification Due to Food Preparation), the state should also provide information on these procedures particularly to fisher populations who consume whole fish or portions of the fish other than the standard fillet. If the green area concept is to be effective in promoting fishing and the consumption of fish, it is essential that the fish-consuming public be given adequate information to understand the definition of unrestricted fish consumption from these green areas.

One approach is to communicate these locations to the public in fishing brochures annually distributed as part of the existing fish advisory programs. In addition to publishing this information in state fishing brochures, EPA anticipates making this information a new choice of advisory designations available to the states and tribes for incorporation into the National Listing of Fish and Wildlife Advisories (NLFWA) database. EPA realizes that this new designation will be successful only if the states and tribes receive guidance and the information is presented in an easily implemented format.

In addition to implementation of green areas within their jurisdictions, states are also encouraged to initiate or expand the use of general fish consumption guidance for all fish. Several states provide advise on catching, cleaning, cooking, and consumption of fish species. In some jurisdictions, states have issued unlimited consumption or restricted consumption advisories for smaller size classes of those species that are particularly popular with consumers. In this way, the state is still encouraging the recreational aspects of fishing and continued consumption of smaller-sized fish within a given species that typically contain lower residues of chemical contaminants. As a result, the public is encouraged to enjoy both the sport of fishing and the health benefits of eating fish within the specific consumption guidance provided by the state.

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