

F I N A L

ENVIRONMENTAL IMPACT STATEMENT

FOR

POLICY ON CONTAMINANTS IN FISH

FOR

N.Y.S. DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Required Under: State Environmental Quality Review Act of 1978
(SEQR)

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SUMMARY

In January 1985, the Department of Environmental Conservation (DEC) proposed a policy to explain how it will respond to knowledge about chemical contamination of fish which may pose a public health threat. Public hearings were held during February in Albany, Stillwater, Hauppauge, White Plains, Williamsville, and Syracuse. A report of these hearings is appended in Appendix X. Public review surfaced a number of issues and concerns with the policy which are summarized in Appendix XI along with responses to each issue.

In response to public comment and further discussion with New York State Department of Health (DOH), the policy was modified in three ways:

1. The policy regarding how DEC will react to chemical contamination of commercial fisheries was clarified, particularly to explain the procedures that must be followed to close a contaminated fishery or reopen a once-contaminated fishery.
2. The need for the Commissioner of Health to declare an emergency before a recreational fishery would be closed was changed.
3. The policy on posting of waters was also modified.

In letters dated June, 1985 and July, 1985 (Appendix XII), the DOH certified that fishing on the Hudson River between Fort Edward and Troy should remain closed, but that fishing on Onondaga Lake could resume with an advisory to not eat the fish and with posting of the advisory to minimize public misunderstandings of the change in regulation. Discussion of other alternatives to prohibiting fishing in Chapter V.

The policy has as its goal to protect the public health and to encourage the beneficial uses of fishery resources (commercial and recreational fishing). The State's actions will differ depending on the magnitude of the health risks, whether or not the risks are to society in general, or to individuals, whether the risk is voluntary or involuntary, and whether or not information on the risks can be made readily available to those exposed. For example, a strong action (prohibiting commercial fishing) is proposed for minimizing health risks to the general public from contaminated commercial fisheries; similarly recreational fishing is prohibited if the health risks are severe. In contrast, health advisories will be issued and efforts made to inform private citizens of the health implications associated with eating contaminated fish caught by recreational anglers when health risks are not severe. The Department of Health (DOH) is the appropriate agency for developing the health advisories and public information documents and judging when health risks are severe enough to warrant closing recreational fisheries. The Department of Environmental Conservation and other organizations can assist in providing this information to affected individuals.

The policy has three components:

1. Data Collection:

Data will be gathered regarding chemical contamination of fish and shellfish which may pose public health risks. Data will be gathered directly by monitoring efforts of DEC and indirectly by review of data generated by other agencies, institutions, or individuals. Whenever practical, contaminant on fish collected by DEC will be gathered in such a way that health advisories or regulatory actions can be directly derived (i.e. analyses will use protocols that produce the same type and quality of data as that used by USFDA).

2. Chemical Contamination of Recreational Fisheries:

- a. These data will be compiled by DEC staff and evaluated by DEC and DOH staff as soon as possible upon receipt from the analytical laboratory. DOH will determine the nature of health advisories in consultation with DEC staff. These advisories will be updated as required by any new data and completely reviewed at least annually. DEC and DOH will regularly inform the public about health advisories and health-related closures of fisheries.
- b. DEC and DOH will inform the public about health advisories and regulations necessitated by contaminants in fish. Press releases will be issued by DOH and/or DEC whenever changes in the advisories occur. DEC will annually publish the advisory in the Fishing, Small Game Hunting, and Trapping Regulations Guide. Pamphlets, brochures, and other forms of public information will be prepared and distributed to explain the significance of fish contamination to the public as needed. Waters where fishing is prohibited will be posted. For waters which have been closed to fishing and where regulations are being changed to permit fishing, restrictive consumption advisories (if appropriate) will be posted to inform and remind the public that restrictive consumption is nonetheless advised.
- c. DEC will not prohibit recreational fishing as a consequence of chemical contamination unless the Commissioner of Health certifies in writing that a condition exists that dictates the need for such an action. A similar certification in writing by the Commissioner of Health is required to reopen a closed recreational fishery.

3. Chemical Contamination of Commercial Fisheries

- a. Chemical contamination of fisheries will be evaluated using guidelines formally adopted or established by USFDA, DAM, or DOH. Preparation of fish and analytical methodology will be consistent with or comparable to that used by USFDA.
- b. Statistical analysis and interpretation of data will be based on analytical results for legally marketable fish, or a strong rationale will be provided if concentrations in other fish are considered.
- c. Commercial fishing will be closed if the fishery is found to exceed the guidelines specified in 3.a. above. Appropriate statistical analysis will be conducted to identify when such a guideline has been exceeded. Such an action will require:
 - i. consultation with DOH and DAM;
 - ii. certification as required by ECL §11-0325.1;
 - iii. consideration of alternatives including partial closures if justified by the data;
 - iv. assessment of economic impacts and other pertinent factors necessary for the development of a regulatory impact statement.
- d. A commercial fishery closed because of chemical contamination will be reopened when appropriate statistical analysis demonstrates that these guidelines are no longer exceeded. Such an action will require:
 - i. consultation with DOH and DAM;
 - ii. certification by DOH or DAM that conditions requiring the closure are no longer met;
 - iii. consideration of alternatives including partial reopening if justified by the data; and
 - iv. assessment of economic impacts and other pertinent factors necessary for the development of a regulatory impact statement.

In New York, the following contaminants have been found in some fish at levels exceeding federal, state, or international human health guidelines:

DDT	heptachlor epoxide
PCB	dioxin
mirex	mercury
chlordan	cadmium
dieldrin	lead

With adoption of this policy, some individuals will catch and eat contaminated fish beyond what is recommended. The number of individuals is difficult to predict. The proposed efforts at public information should help keep the numbers small. Even if fishing were prohibited, compliance is expected to be a problem. Approximately 23% of New York residents fish, and about 13% by weight of the angler harvest is contaminated to levels warranting restrictive consumption advisories. Thus, the public health impact of contaminated fish is probably small, particularly when compared to cigarette smoking and alcohol use.

Health advisories and fishery closures necessitated by this policy could have significant economic effects, particularly in locales highly dependent on recreational fishing. Commercial fishermen could be driven out of business; however, the economic impact would not be substantial unless marine fisheries were affected. In New York, recreational angling dominates the total economic value to the state (93%) and marine fisheries comprise 98% of the economic value of commercial fisheries.

Compliance with existing regulations prohibiting recreational angling is a problem. Enforcement has been weak and often unsuccessful. When individuals succeed in ignoring one fishing regulation, many are encouraged to violate other fishing regulations or laws. Adoption of this policy may remove a potential source of scofflaws.

To truly mitigate the public health threats posed by contaminated fish requires elimination of the sources of these contaminants. The new water quality standards are designed to prevent fish contamination. Environmental permitting programs in the DEC use these standards to abate discharges to acceptably low levels. Where fish contamination results in restrictive consumption advisories, classified water uses are considered impaired or precluded. Attention is then focused on identifying potential sources of contamination and their abatement.

Until corrected, public health threats posed by contaminated fish are communicated in the following ways:

1. The Health Advisory is published annually on the inside front cover of the Fishing, Small Game Hunting, and Trapping Regulations Guide. This Guide is provided to each individual who purchases a fishing license in the state and is available free of charge to anyone who requests it from the Department.

2. Press releases are distributed to every major newspaper in New York. At or near the beginning of the fishing season, a press release is prepared to announce any changes in the Health Advisory resulting from review of contaminant data from the previous year and to remind anglers of the Advisory.
3. Scientific and popular articles have been periodically prepared to discuss contamination of fisheries in New York. The existence of the Health Advisory and its content is always mentioned in popular articles.
4. Levels of PCB, mirex, and possibly other contaminants can be reduced by removing the skin and fatty portions along the back, sides, and belly of some fish species. A pamphlet describing this method is available from any DEC office and its availability is noted in the Guide.
5. DEC and DOH work with staff of Cooperative Extension (Cornell University) to prepare materials for teaching extension agents who are routinely communicating with low income and migrant groups who catch and eat fish in the state.

Further efforts will be identified, assessed, and implemented as necessary.

Posting will be reserved for waters closed to fishing or waters newly reopened to fishing. This will reinforce the public health evaluations for these waters and ensure the proper message is evident to the user of the resource. Posting of these waters does not alter the assessment of health effects nor the health advice provided for other waters.

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I. DESCRIPTION OF PROPOSED ACTION.

A. Project Purpose.

This proposed policy is being developed to explain how and under what circumstances the Department of Environmental Conservation (DEC) will respond to knowledge of the presence of chemical contaminants in fish which may pose a public health threat. The Department intends to encourage beneficial uses of fishery resources (i.e. commercial fishing and recreational angling) in waters of the state while at the same time protecting public health. Ideally the Department's actions should be uniform throughout the state and should reflect the nature and extent of the public health threat (risks) created by chemical contamination of fish flesh.

When this policy is adopted, one regulation would need to be changed. Therefore, this EIS is intended to cover the proposed change in regulation which bans all fishing on Onondaga Lake. Recreational fishing would be allowed on these waters with advisories not to eat the fish.

These regulation changes should not be interpreted as an indication that contamination of fish from Onondaga Lake has improved substantially in recent years. Mercury levels in fish from Onondaga Lake have declined since 1970-71 but remain above acceptable levels.

B. Background and History.

In the late 1950's and 1960's fish from waters throughout the world were discovered to contain elevated levels of chemical contaminants such as mercury and DDT. Mercury was the first contaminant of fish to receive careful study of effects on human health when residents of Minimata, Japan were found to be suffering severe illness and death from mercury poisoning. These deaths and illnesses were traced to mercury contamination of the fishery from industrial discharges of mercury to Minimata Bay. By the mid-1960's mercury contamination of swordfish taken from the Atlantic led to the establishment of an action level by the US Food and Drug Administration (FDA) and a ban on swordfish sales in the United States.

In New York State, contamination of fish by mercury to levels in excess of this action level was discovered in late 1969 and early 1970. Throughout 1970, fish from one water after another were discovered to exceed the action level. A series of public announcements closed fisheries in a number of waters in the State. In 1971, the New York State Departments of Health (DOH),

Agriculture and Markets (DAM) and DEC established a statewide advisory to eat no more than one meal of fish per week from any water of the state.

In the early 1970's, DEC began collecting limited data on PCB in New York waters and fish. In 1974, the FDA established a PCB tolerance, and DEC began intensive sampling of fish for PCB analysis. By early 1976, the Department had sufficient information about PCB contamination of Hudson River fish to close the commercial fishery for striped bass and to close 40 miles of the river from Fort Edward to Troy to recreational fishing. Later that year, mirex contamination of fish from Lake Ontario led the Department to ban the possession of seven species of Lake Ontario fish and to terminate the stocking of Pacific salmon with the exception of limited coho salmon stocking for the purposes of continued contaminant monitoring.

In 1978, after a series of relaxations of the ban, the Department lifted the ban on fishing in Lake Ontario. The press release announcing the action provided the following reasons:

- The Department has changed its fish stocking program so that the big fish species with high contamination levels are no longer there; the Department is not stocking them.
- Recent studies show certain preparation methods can drastically reduce the amount of contamination in fish to be eaten.
- A uniform regulation and enforcement policy is necessary on the New York and Canadian sides of the waters."

The press release also noted that the fish possession ban was difficult to enforce. Along with this change, however, the Department emphasized advice of the DOH that fish not be eaten and noted that the FDA and Environmental Protection Agency (EPA) had established a joint committee "to provide the states with consistent guidelines in controlling exposure to toxic chemicals in fish and wildlife".

The joint EPA/FDA committee never issued a report or set of guidelines, but the Department began to define elements of a policy on fish contaminants in the development of two environmental impact statements. Early in 1980 the Division of Fish and Wildlife prepared a draft programmatic environmental impact statement on fish species management activities. By June 1980 that document was finalized and includes a brief treatment of contaminants in fish (Shepherd et al., 1980; pp. 28, 29, 48, 49). Later that year, the Department also completed a draft environmental impact statement on stocking of Pacific salmon in Lake Ontario, an activity which was resumed in 1979. The final EIS (Eckert et al., 1981) discusses the public health risks created by stocking large numbers of Pacific salmon which are expected to become contaminated with a variety of organochlorine chemicals, particularly mirex and PCB.

In June 1981 the Department and DOH participated in a meeting with officials from EPA, FDA, Michigan, Canada Health and Welfare, Canada Fisheries and Oceans, and Ontario Ministry of the Environment to discuss the newly discovered contamination of Lake Ontario fish by dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin or TCDD). After two days of discussion, health officials did not agree on what level should trigger an advisory or ban on fishing. Immediately following the meeting, DOH proposed that the criterion be 10 ppt (parts per trillion), while Canadian officials recommended 20 ppt. The FDA suggested that fish exceeding 25 ppt should not be eaten more than one meal per week, and fish exceeding 50 ppt should not be eaten at all and action should be taken to keep such fish out of the marketplace. To date, no official food tolerance has been proposed for dioxin in fish by any US or Canadian agency.

Brown trout, lake trout, and Pacific salmon had been found to contain almost 20 ppt TCDD, and anglers were already advised not to eat these species because of excessive mirex contamination. The health agencies found no need for stronger action than the existing advisories.

Monitoring of chemical contaminant levels in fish from many waters in New York State has documented declining concentrations in many waters, with a few notable exceptions (Armstrong and Sloan, 1980; Horn, Sloan, and Brown, 1983; Horn and Sloan, 1984). Specifically, and of importance to the preparation of this policy, PCB concentrations in striped bass from the lower estuary of the Hudson River averaged 4.8 parts per million in 1983, slightly less than the FDA tolerance of 5 ppm. In 1978, PCB levels in striped bass in the same region of the river had averaged approximately 19 ppm. Although the Department decided not to reopen the commercial fishery for striped bass in the Hudson River, it was clearly necessary to firmly establish a "regulatory-end-point" or criterion which would be used for deciding when to reopen the commercial fishery.

In addition, recreational anglers have requested that the Department open fishing on the upper Hudson River from Fort Edward to Troy (Appendix I) and to a more limited extent the Department has received inquiries about resuming fishing on Onondaga Lake.

C. Public Need.

Commercial fishermen on the Hudson River have accused the Department of being anything but candid about when it would reopen closed commercial fisheries, particularly the Hudson River striped bass fishery. In the past, commercial fisheries for "minor" species have been closed in the Hudson with little or no species-specific data, and the Department did not reopen the striped bass fishery when the average PCB level dropped slightly below the FDA tolerance level.

Table 1. Responses to a question asked in the 1976-77 statewide angler survey.

Question: "Based on what is now known about the presence of toxic substances in certain species of fish in Lake Ontario and the Hudson River, what do you feel is the approach that should be taken by the New York State Department of Health and the New York State Department of Environmental Conservation if another toxic substance problem is discovered in New York fish?"

Response Options	Percent of Anglers (± 95 CI)	
	Resident anglers	Nonresident anglers
1. Allow unlimited eating of fish, issue no health warnings, and permit fishing.	1 ± 0	2 ± 2
2. Warn of possible health hazards, let individuals decide how much to eat, and permit fishing.	25 ± 1	20 ± 6
3. Warn of possible health hazard, recommend only one serving per week, and permit fishing.	18 ± 1	11 ± 4
4. Recommend no eating of fish, but permit fishing	28 ± 2	32 ± 7
5. Recommend no eating of fish, close the waters to all types of fishing, and prohibit possession of any contaminated fish	12 ± 1	13 ± 5
6. No opinion	6 ± 1	10 ± 4
7. Did not answer	10 ± 1	12 ± 5

Note: 25,564 questionnaires were mailed to license holders
 11,037 usable responses were returned
 311 respondents did not answer this question
 10,142 resident anglers responded to this question
 634 non-resident anglers responded to this question

-source Kretser and Klatt, 1981

Recreational anglers have also been critical of DEC policies on recreational angling in the upper Hudson River and Onondaga Lake being inconsistent with the rest of the state. Currently the Upper Hudson River (Fort Edward to Troy) is closed to recreational fishing as a consequence of PCB contamination, and mercury contamination of fish in Onondaga Lake led to closure of recreational fishing there. Other contaminated fisheries in the state remain open with advisories to restrict human consumption of fish. Clearly there is a need to establish uniform policy for responding to contamination of fisheries in this state and to take actions which are consistent with the public health risk.

In 1976, the ban on possession of fish from Lake Ontario received a mixed public reaction, but among anglers the reaction was overwhelmingly negative (Eckert et al., 1981). Extensive correspondence and petitions overwhelmingly opposed the possession ban. In 1976-77, the statewide angler survey included a question requesting opinions on how the Department should respond to discovery of contaminants in fish. Both resident and non-resident anglers supported the concept of health advisories, but only a small minority (12-13 percent) favored a ban on possession of contaminated fish (Table 1).

More recently, anglers and the Town Board of Stillwater have requested that the Hudson River be opened to catch-and-release fishing (Appendix I). Currently, a number of petitions with signatures have been received by the Department requesting that the ban on fishing be lifted in the Hudson River.

Annual aerial surveys of angler use have identified anglers in the section of the upper Hudson River closed to fishing. Clearly the general public, and particularly anglers, do not widely support the closure of recreational fisheries as a means to protect public health. Many individuals appear to be violating the regulations and enforcement is difficult. The public senses that fish from the Hudson River and Onondaga Lake do not reflect public health risks unique in the state and question the need for the more extreme action on these fisheries compared to other contaminated fisheries in the state.

The lack of uniformity and consistency raises questions in the public's mind about the appropriateness and validity of the health advisories themselves. In addition, when anglers are successful in violating the regulation which bans fishing on the Hudson anglers are encouraged to violate other fishing regulations. Neither of these consequences is desirable, and this policy is designed to alleviate them.

D. Statutory Authority.

Since 1970, the Department has taken actions to close fisheries under Section 11-0325 of Environmental Conservation Law (Appendix II). This statute gives the DEC the authority to restrict the taking of fish when a public health threat has been certified by either the DOH or DAM. In 1970, the actions were taken upon the recommendation of an interagency committee of individuals representing each of the three departments. However, in recent years, DEC has taken action based on certification by DOH.

E. Objectives of Policy.

The objectives of this policy are two-fold:

1. To identify criteria or circumstances under which advisories will be issued, fisheries will be closed, and closed fisheries will be reopened if fisheries are found to contain contaminants which may pose a risk to public health, and
2. To clarify how conditions of ECL §11-0325 will be implemented when contaminated fisheries are discovered.

F. Rationale and Premises

In general, the Department's policy is to encourage the beneficial use of the state's fishery resources (i.e. commercial fishing and recreational angling). However, such uses are not encouraged if significant health risks exist. When fisheries are found to be contaminated, the actions taken differ depending on several different factors. These include whether or not the risks are to the general public or individuals, the magnitude of the health risks, whether or not the risks are voluntary or involuntary, and the ability to readily provide information about the health risks.

Generally, government's role is to regulate for the general benefit of society. Government's role is less clear when it regulates for an individual for his/her own benefit. Government, both at the federal and state level, has established complex procedures to protect consumers in the marketplace from the public health risks associated with contaminated foods. At the federal level, these procedures are administered primarily by the U.S. Food and Drug Administration (FDA) with assistance from EPA and the U.S. Department of Agriculture. In New York, the DAM is generally responsible for implementing FDA programs. For chemical contaminants in food, including fish, the procedures are based on the establishment of guidelines (food tolerances, action levels, or

other guidelines) which, when exceeded, lead to the confiscation or removal from the marketplace of these foods. No such procedures have been developed for protecting individuals from the health risks associated with the harvesting of food from the wild. The harvesting of fish and wildlife resources is regulated by state or local government with federal involvement for those species which routinely cross state and international boundaries. DEC is charged with general responsibility of managing the environment of New York State including the fishery resources. As such, DEC has accepted the responsibility for generating information on fish contamination in the state's waters which can be used to regulate or manage commercial or recreational fishing.

When fisheries are found to be contaminated, actions should be taken commensurate with the magnitude of the health risk involved. However, a tremendous amount of professional judgement is still required to assess the public health risk from eating contaminated food. In addition to the guidelines for contaminants which have been established by the FDA, the health risk associated with an individual contaminant will be evaluated by determining the health effects known to be associated with the particular contaminant, determining the reliability and completeness of the toxicological data base for the contaminant, and estimating the probability of causing a particular health effect. Some health risks are easier to evaluate and recognize than others. For example, if shellfish contain human pathogens, an individual has a high risk of contracting the disease (e.g. gastroenteritis, hepatitis) within a short period of time. Numerous humans have died from eating contaminated shellfish of this kind, and there is no longer any controversy that consumption of a single contaminated shellfish can lead to illness and even death. The health risks associated with the consumption of fish containing elevated levels of chemical contaminants, such as most of those which are found in New York (e.g. DDT, PCB, mirex, dioxin, chlordane), are harder to evaluate. The adverse health effects are primarily associated with long-term, low level exposure and are not expected to be exhibited immediately. A cause and effect relationship would be difficult, if not impossible, to prove in humans. The chemicals currently found in fish are known to cause adverse health effects in humans and animals. For the most part, the health risks following long-term exposure to the levels currently being found in fish are estimated from animals (rats, mice, monkeys) exposed at higher levels than are found in fish. The magnitude of health risks is determined from data on certain levels found in fish species from specific waters and toxicological data on health effects of these contaminants.

The risks associated with eating contaminated fish can be either voluntary or involuntary. The consumption of contaminated food, including fish, from the marketplace poses an involuntary risk; it is not a risk that the public takes both willingly and knowingly.

Allowing the harvesting of commercial fishery for use in commerce is not justified if the fish would be confiscated from the marketplace. In contrast, an angler can make a voluntary decision regarding consumption of the fish. If, however, the health risks from the consumption of fish from a water body are judged to be severe, the water should be closed to recreational fishing.

The availability of information about the health risks is also an important consideration in taking action and is tied to the issue of voluntary and involuntary risk since information is needed by the public before an informed decision can be made about a voluntary risk. The consumer of fish from the marketplace is unaware of the contamination of the fish and has no easy method for becoming informed about the matter. If contaminant and health effects information is gathered and disseminated, an angler can become informed about contamination of fish from a given water body and can make an informed decision.

DEC has accepted the responsibility for generating the information which is needed to inform anglers of the public health risks associated with consuming fish caught from the waters of this state and of providing that information to the angler in a form that can be understood. DOH has been responsive in developing health advisories and informing the public of them.

The actions of the Department differ depending on the nature and impact of health risks. Where the risks are involuntary and fish contamination would lead to confiscation and destruction by agencies regulating food in the marketplace or where the health risks from contaminated fish are high, harvesting of the resource should be prohibited. In contrast, where the health risks are not severe and an informed, voluntary decision can be made by an individual, information on the health effects and contamination will be given to the public and recreational fishing, a beneficial use of a resource, will be allowed.

DEC is also charged with the responsibility of more generally managing the environment of New York State. In particular, water quality is managed through the establishment of classified uses for each water in the state and a permitting process that ensures that these uses are not impaired or precluded. For waters classified for fishing, chemical contamination of the fishery to an extent that poses a significant public health risk is a clear use impairment. Therefore, the Department is also responsible for becoming aware of such situations and attempting to rectify them.

Once the Department is aware that fisheries are contaminated, it is clearly responsible to the public to inform them of this contamination and the public health risks which result from consumption of fish from these fisheries. Every effort must be made to make these health risks understandable to the general public. An attempt should also be made to insure that the actions of the Department are compatible with the other marketplace controls associated with contamination of food.

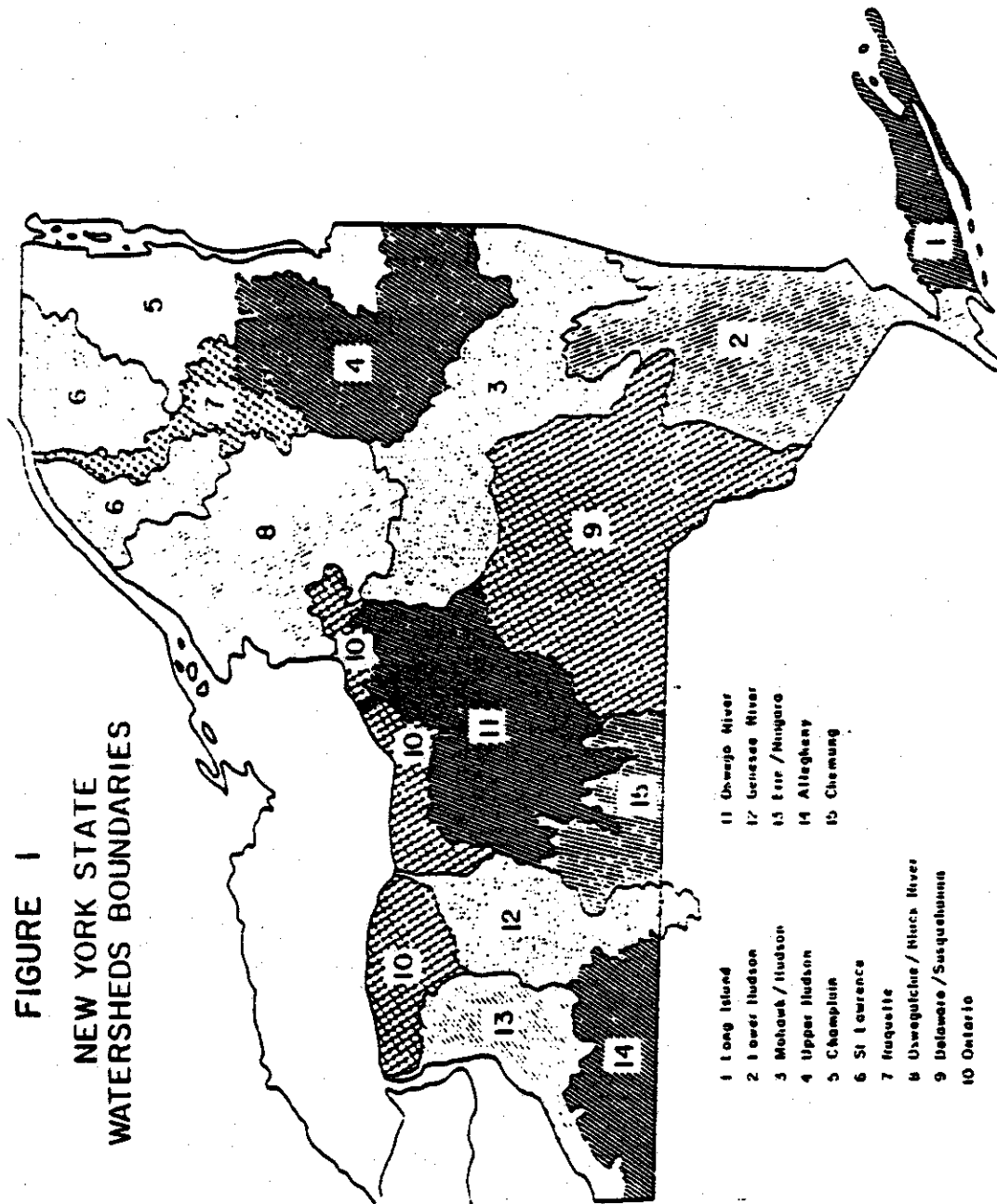
In responding to knowledge of contamination of fisheries, the Department should take actions commensurate with the public health risks involved and the public perceptions of the nature of those risks. As mentioned above, fish in the marketplace pose an involuntary risk to the consumer, i.e. the consumer is unaware of the state of contamination of fish and has no easy alternative for becoming informed about this matter. If contaminant information is gathered and disseminated, an angler can become informed of the contamination of fish from a water and can make a voluntary decision regarding consumption of the contaminated fish. Catch-and-release fishing and fishing for trophies are accepted sports. These recreational pursuits should not be discouraged when they can be reasonably practiced. On the other hand, the harvesting of fish to support a commercial fishery would be irresponsible if these fish could not be safely consumed.

A tremendous amount of professional judgement is still required to assess the public health risk from eating contaminated food. These risks can differ in type as well as magnitude. The certainty or scientific consensus associated with determining a public health risk also varies. For example, if shellfish contain human pathogens, an individual has a high risk of contracting the disease (e.g. gastroenteritis, hepatitis) within a short period of time. Numerous humans have died from eating contaminated shellfish of this kind, and there is no longer any controversy that consumption of even a single contaminated shellfish can lead to illness and even death.

On the other hand, the health effects associated with the consumption of fish containing elevated levels of chemical contaminants such as those which are found in New York (e.g. DDT, PCB, mirex, dioxin, chlordane) are chronic in nature. The adverse health effect will not be exhibited until a later time (on the order of years) and probably only after frequent consumption of fish with these levels of contaminants. To date, for the chemical contaminants which are currently being found in fish, there is only a suspected etiology between chemical contaminants at the levels that are currently being observed in fish and adverse health effects in humans. The risks are calculated from extrapolations of animal data (rats, mice, monkeys) fed much higher doses than are found in fish, and few data are available on actual human effects.

The actions of the Department for these two types of health risks should be different. Where there is a known, reasonably high risk of an acute, serious health effect, harvesting of the resource should be prohibited (e.g. microbiological contamination of shellfish). On the other hand, where the health effects are more chronic in nature, requiring continual exposure (i.e. frequent consumption) and far less certain, it is more appropriate to inform the public of these risks where they are most likely to be voluntary (i.e. in a recreational fishery), but to restrict the entry of these fish into the marketplace (i.e. close commercial fishing) where the risks are involuntary and contamination would lead to confiscation and destruction by agencies regulating food in the marketplace.

FIGURE 1
NEW YORK STATE
WATERSHEDS BOUNDARIES



G. Statement of Policy

With these background objectives and rationale in mind, the Department establishes as policy the following:

1. Data Collection:

Data will be gathered regarding chemical contamination of fish and shellfish which may pose public health risks. Data will be gathered directly by monitoring efforts of DEC and indirectly by review of data generated by other agencies, institutions, or individuals. Whenever practical, contaminant on fish collected by DEC will be gathered in such a way that health advisories or regulatory actions can be directly derived (i.e. analyses will use protocols that produce the same type and quality of data as that used by USFDA).

2. Chemical Contamination of Recreational Fisheries:

- a. These data will be compiled by DEC staff and evaluated by DEC and DOH staff as soon as possible upon receipt from the analytical laboratory. DOH will determine the nature of health advisories in consultation with DEC staff. These advisories will be updated as required by any new data and completely reviewed at least annually. DEC and DOH will regularly inform the public about health advisories and health-related closures of fisheries.
- b. DEC and DOH will inform the public about health advisories and regulations necessitated by contaminants in fish. Press releases will be issued by DOH and/or DEC whenever changes in the advisories occur. DEC will annually publish the advisory in the Fishing, Small Game Hunting, and Trapping Regulations Guide. Pamphlets, brochures, and other forms of public information will be prepared and distributed to explain the significance of fish contamination to the public as needed. Waters where fishing is prohibited will be posted. For waters which have been closed to fishing and where regulations are being changed to permit fishing, restrictive consumption advisories (if appropriate) will be posted to inform and remind the public that restrictive consumption is nonetheless advised.
- c. DEC will not prohibit recreational fishing as a consequence of chemical contamination unless the Commissioner of Health certifies in writing that a condition exists that dictates the need for such an action. A similar certification in writing by the Commissioner of Health is required to reopen a closed recreational fishery.

3. Chemical Contamination of Commercial Fisheries

- a. Chemical contamination of fisheries will be evaluated using guidelines formally adopted or established by USFDA, DAM, or DOH. Preparation of fish and analytical methodology will be consistent with or comparable to that used by USFDA.
- b. Statistical analysis and interpretation of data will be based on analytical results for legally marketable fish, or a strong rationale will be provided if concentrations in other fish are considered.
- c. Commercial fishing will be closed if the fishery is found to exceed the guidelines specified in 3.a. above. Appropriate statistical analysis will be conducted to identify when such a guideline has been exceeded. Such an action will require:
 - i. consultation with DOH and DAM;
 - ii. certification as required by ECL §11-0325.1;
 - iii. consideration of alternatives including partial closures if justified by the data;
 - iv. assessment of economic impacts and other pertinent factors necessary for the development of a regulatory impact statement.
- d. A commercial fishery closed because of chemical contamination will be reopened when appropriate statistical analysis demonstrates that these guidelines are no longer exceeded. Such an action will require:
 - i. consultation with DOH and DAM;
 - ii. certification by DOH or DAM that conditions requiring the closure are no longer met;
 - iii. consideration of alternatives including partial reopening if justified by the data; and
 - iv. assessment of economic impacts and other pertinent factors necessary for the development of a regulatory impact statement.

II. ENVIRONMENTAL SETTING

A. Waters of New York

New York State is blessed with extensive and diverse aquatic habitats. Two Great Lakes border New York to the west and north, and more than 2.5 million acres and 438 miles of shoreline of Lake Erie and Lake Ontario are included in New York State. The northwestern border of New York State includes 97,000 acres of Lake Champlain with 190 additional miles of shoreline. An additional 4,000 lakes and reservoirs are in New York State and represent almost 3/4 million surface acres. Eight of these lakes are each greater than 10,000 acres in size.

Many of the geologically young lakes are oligotrophic, deep, thermally stratified, and well oxygenated. These waters (e.g. Lake Ontario, Lake George and the Finger Lakes) provide excellent habitat for several coldwater fish species. Other lakes (e.g. Oneida and Chautauqua) are eutrophic, shallow, non or partially stratified, and the habitat for a wide variety of warmwater fish species.

Approximately 70,000 miles of streams and rivers in 15 major watersheds cross through the state (Figure 1). These streams range in size from large rivers such as the Hudson, Niagara, and St. Lawrence to small, spring-fed brooks. The largest rivers in New York State (i.e. Hudson, Mohawk, Niagara, St. Lawrence, Oswego, Genesee, Allegheny, Susquehanna and Delaware) comprise almost 1,000 miles.

In addition to these freshwater resources, New York State has 1.1 million acres of marine waters extending 3 miles from shore. Approximately 20 to 50 miles of the Hudson River are saline depending on fresh water discharge. Although only a small portion of the Hudson River is saline, the lower 150 miles forms a tidal estuary which several species of marine fish use for spawning (e.g. Atlantic sturgeon, striped bass, American shad, alewife, and blueback herring).

B. Recreational Anglers

The most recent data available to describe the recreational angler in New York is the statewide angler survey conducted by the Bureau of Fisheries in 1976-77 (Kretser & Klatt, 1981). The information in this survey is based on 11,721 responses to an extensive questionnaire mailed to 25,564 anglers randomly distributed by county from a total of 822,813 licenses sold during the 1976-77 angling season. The following characteristics of recreational anglers are derived from this survey.

1. Why anglers fish

Recreational anglers in New York fish primarily "to be outdoors" or "for fun, sport or skill" (Table 2).

Table 2. Why anglers fish in New York, responses to question on 1976-77 angler survey.

Question: "Which of the following are reasons why you go fishing?
(More than one box may be checked to answer the question.)"

Reason (in order of popularity statewide)	Percent of Anglers $\pm 95\%$ CI		
	Coldwater Anglers	Warmwater Anglers	Nonspecific Anglers
To be outdoors	77 ± 3	73 ± 1	84 ± 1
For fun, sport or skill	78 ± 3	73 ± 1	83 ± 1
For a change of pace or activity	46 ± 3	52 ± 2	49 ± 1
To be with family or friends	35 ± 3	48 ± 2	47 ± 1
For food	27 ± 3	27 ± 1	36 ± 1
For scenery	33 ± 3	25 ± 1	35 ± 1
To be alone	23 ± 3	14 ± 1	26 ± 1
For exercise	24 ± 3	11 ± 1	22 ± 1
To observe or photograph wildlife	15 ± 2	11 ± 1	17 ± 1
Other	*	*	*
Did not answer	3 ± 1	2 ± 4	2 ± 1

*Too small to be accurately estimated.

-source Kretser and Klatt, 1981

Significantly fewer anglers (approximately half as many and about one third of the anglers surveyed) responded that fishing "for food" was an important reason for fishing. Although this response does not provide information about what proportion of the catch is eaten, it does strongly indicate that a sizeable proportion of anglers fish without the motivation of eating their catch. This is further supported by responses to the question "Why did you not fish in New York?". Only 9% of resident anglers and 2% of nonresident anglers refrained from fishing because "fish are not edible or unsafe to eat" (Table 3). Competing interests, health, and "poor fishing" were more frequently cited as reasons for not fishing.

These data also support the conclusion that non-consumptive angling is a socially acceptable and reasonably popular recreational activity. Many anglers desire to fish even if the fish should not be eaten.

2. What anglers catch

In 1976-77 anglers reported catching almost 66 million fish (Table 4). This number is probably not very accurate because it required the angler to recall catch and effort over a 3-15 month period of time. However, the relative contribution of various species groups is probably more accurately represented by these data.

Panfish and yellow perch comprise approximately 44% of the reported catch in freshwater of the state. Trout and salmon represent approximately 14% and black bass approximately 9% of the statewide catch. Because the average trout or salmon is considerably heavier than an average panfish or yellow perch, the total weight of the harvest of these two groups is roughly comparable. The weight of black bass harvested is probably 25-50% of the trout and salmon harvest. Carp, eel, and catfish (species, in addition to trout and salmon, that have been found to accumulate organic chemical contaminants) were not significant components of the recreational catch reported by respondents (Kretser and Klatt, 1981).

C. Commercial Fisheries

Commercial fisheries which produce fish for human consumption include marine waters, the lower Hudson River estuary, and the Great Lakes. Fishing for bait and ornamental purposes are included in commercial harvest statistics currently available, but probably comprise less than 10% of the reported catch and value.

Table 3. Why anglers did not fish in New York, responses to question on 1976-77 angler survey.

Question: "Why did you not fish in New York?"

Reason (in order of importance to resident anglers)	Percent of non-fishing respondents \pm 95% CI	
	Resident Anglers	Nonresident Anglers
Work or other family responsibilities	35 \pm 3	7 \pm 8
Other recreational activities	15 \pm 2	2 \pm 5
Bought license only to support New York fishing programs	14 \pm 2	5 \pm 6
Family health problems	14 \pm 2	5 \pm 6
Poor fishing	12 \pm 2	5 \pm 6
Lack of fishing partners	9 \pm 2	10 \pm 9
Fish are not edible or unsafe to eat where I usually fish	9 \pm 2	2 \pm 5
Financial reasons	6 \pm 1	5 \pm 6
Desired fish or fishing unavailable	4 \pm 1	5 \pm 6
Weather conditions	4 \pm 1	2 \pm 5
Overcrowded fishing sites	3 \pm 1	2 \pm 5
Lack of transportation	2 \pm 1	*
Outside state most of year	2 \pm 1	7 \pm 8
Lack of interest or time	2 \pm 1	2 \pm 5
Bought license to legally assist another person	2 \pm 1	*
License cost too high		

*Too small to be accurately estimated.

-source Kretser and Klatt, 1981

Table 4: Estimated angler harvest in 1976-77 by major fish species/group.

Species Caught	Percent Total Catch	Numbers Caught \pm 95% CI
Panfish*	23	15,011,000 \pm 866,000
Yellow perch	21	13,637,000 \pm 964,000
Trout/Salmon*	14	8,982,000 \pm 453,000
Smelt/Whitefish	12	7,826,000 \pm 1,001,000
Bullheads/Catfish	9	6,046,000 \pm 326,000
Black bass*	9	5,947,000 \pm 263,000
Coarse fish*	4	2,980,000 \pm 254,000
Esocids*	3	2,142,000 \pm 130,000
Walleye/Sauger	3	1,929,000 \pm 207,000
Unidentified spp.	2	1,284,000 \pm 257,000
Eel	1	49,330 \pm 21,270
Shad/Herring	1	46,130 \pm 19,040
Striped bass	1	15,380 \pm 11,230
Total all Species		65,895,000 \pm 2,532,000

*Species included in these groups are:

<u>Panfish</u>	white perch	crappies
	white bass	
	sunfish (including bluegill, pumpkinseed, and rock bass)	
<u>Trout/Salmon</u>	lake trout	chinook salmon
	rainbow trout	kokanee salmon
	brown trout	splake
	brook trout	Atlantic salmon
	unidentified trout	coho salmon
<u>Black bass</u>	smallmouth bass	largemouth bass
<u>Coarse fish</u>	chubs	bowfin
	fallfish	longnose gar
	carp	freshwater drum
	suckers	
<u>Esocids</u>	chain pickerel	norlunge (Tiger musky)
	muskellunge	unidentified esocids
	northern pike	

-source Kretser and Klatt, 1981

Table 5 shows that the commercial harvest of fish from freshwaters of the state is dwarfed by the marine harvest. Commercially harvested freshwater fish comprise less than 10% of the total commercial fish harvest in the state and only 3% of the dockside value of the harvest.

These statistics undoubtedly represent a minimum estimate of the catch and its value. Reporting has been estimated to be only 25-50% of the real catch at least in some of the fisheries, and sizeable quantities of hook-and-line-caught fish (which are not included in the commercial reporting) are entering the marketplace, at least for selected fisheries (e.g. striped bass and bluefish).

Table 5: Commercial harvest of finfish and shellfish from New York State waters in 1983.

Water	Total harvest (pounds)	Dockside value (\$83)	Licensed ¹ fishermen
Lake Erie	133,000 ²	\$184,000	13
Lake Ontario	290,000	111,100	32
Hudson River	554,000	162,900	666
Total freshwater	2,177,000	\$457,900	711
Long Island			
Finfish	22,659,000	\$13,748,000	113
Shellfish meats	15,031,000	24,369,000	5172
Total fish harvest	24,836,000	\$14,205,900	824
Total fish and shellfish	39,867,000	\$38,574,900	5996

¹ Number of 1983 licensed commercial fishermen. Hudson River includes 542 licensed scap netters whose harvest is principally for personal use or bait. Resident marine (Long Island) fishermen (finfish) are not required to have a commercial license and no estimate of numbers is here included. The 113 licensed marine fishermen are out-of-state residents commercially fishing in New York waters.

² The 1983 harvest was 40,000-50,000 pounds less than reported in recent previous years.

D. Fisheries Contamination

Since the mid-1960's, the Division of Fish and Wildlife (Bureau of Environmental Protection) has been assessing the levels of chemical contaminants in fish flesh. Although most of these efforts, particularly in early years, were focused on the potential for these contaminants to adversely affect fish populations and the health of the fish, considerable data have been generated which provide information of value to assess public health risks associated with this contamination (see Section III.A.1).

In 1975 contaminant monitoring efforts were increased with the establishment of the Toxic Substances Monitoring Program administered by the Bureau of Environmental Protection. Currently, fish are collected from approximately 40 waters each year. Standard filets are prepared consisting of a carefully cut entire side of a fish with the skin left on. Chemical analyses of tissue extracts quantify levels of the following contaminants:

DDT and its metabolites	heptachlor epoxide
PCB (as three Aroclors)	endrin
mirex	hexachlorobenzene (HCB)
photomirex	lindane group (HCHs)
chlordane group	mercury
aldrin/dieldrin	

Since 1977 additional extensive monitoring of PCB levels in fish from the Hudson River has been conducted (Horn et al., 1979; Armstrong and Sloan, 1980, 1981; Sloan and Armstrong, 1981; Horn et al., 1983; Sloan, et al., 1983; Horn and Sloan, 1984).

Special studies have also addressed mercury in fish from Adirondack lakes (Sloan and Schofield, 1983) and Onondaga Lake (Sloan and Karcher, 1983), dioxin in fish from Lake Ontario (O'Keefe et al., 1981) and striped bass (O'Keefe et al., 1984), as well as other studies on various waters (NYSDEC 1978, 1979, 1980, 1981, 1982; Sloan et al., 1981) and a number of unreported studies in Lake Champlain, the Finger Lakes, Lake Erie, Niagara River and Nassau Lake/Valatie Kill. Canadian scientists have reported on lead in fish from the St. Lawrence River (Hodson, et al., 1984).

This extensive sampling in New York waters has found that most fish are not contaminated in excess of health standards. However, twenty-five waters in the state have restrictive consumption advisories on fish because of chemical contamination. Appendix IV lists these waters, and the DOH Advisory is also quoted. Where samples have been taken, fish from other waters in the state often have detectable levels of some of these contaminants (particularly PCB), but levels do not exceed the established tolerances.

The sources of these contaminants in fish are varied (Appendix V). Although industrial waste disposal practices predominate, pesticide application and pesticide disposal/storage practices have also contributed. Direct industrial discharges to water account for the contamination of fish in the St. Lawrence by lead (Hodson et al., 1984) and the original contamination of crabs in the Hudson with cadmium (Sloan and Karcher, 1984), of fish in the Hudson with PCB (Spagnoli and Skinner, 1977; Horn et al., 1979), of fish in Onondaga Lake with mercury, and of fish in Lake Ontario and the St. Lawrence River with mirex (Armstrong and Sloan, 1980). Fish remain contaminated in the Hudson primarily as a result of leaching from and resuspension of PCB contaminated river sediments (Brown et al., in press). Contaminated sediments may also contribute to mirex contamination of fish in Lake Ontario. Leaching from solid waste disposal sites (dumps and landfills) has contributed to contamination of fish in Onondaga Lake with mercury and has contaminated fish in Cayuga Creek and Lake Ontario with dioxin and fish in Nassau Lake and the Valatie Kill with PCB.

Fortunately, awareness of the contamination and its sources has led to control of these sources, in some cases with success. In the 1960's lake trout from many waters were discovered to contain alarming DDT levels, with as high as 150 ppm in fish being reported (Burdick et al., 1964). In 1971, DDT use was banned in New York, and today DDT levels rarely exceed 1 ppm. Cessation of use and discharge of PCB into the Hudson in 1977 produced a significant reduction in PCB levels in fish species resident in the upper Hudson (Table 6) and in striped bass caught in the lower Hudson estuary (Figure 2). PCB levels in some fish still far exceed the FDA tolerance, primarily because river sediments downstream of Fort Edward are still heavily contaminated. In 1976, formulation of fire ant bait containing mirex ceased on the Niagara River. Most fish in the Niagara and St. Lawrence Rivers and Lake Ontario remain contaminated, but smallmouth bass collected in 1983 from Lake Ontario no longer exceeded the mirex action level. Thus, once major sources of contaminants to waters are identified, efforts can be launched to address the problem with considerable likelihood of ultimate success.

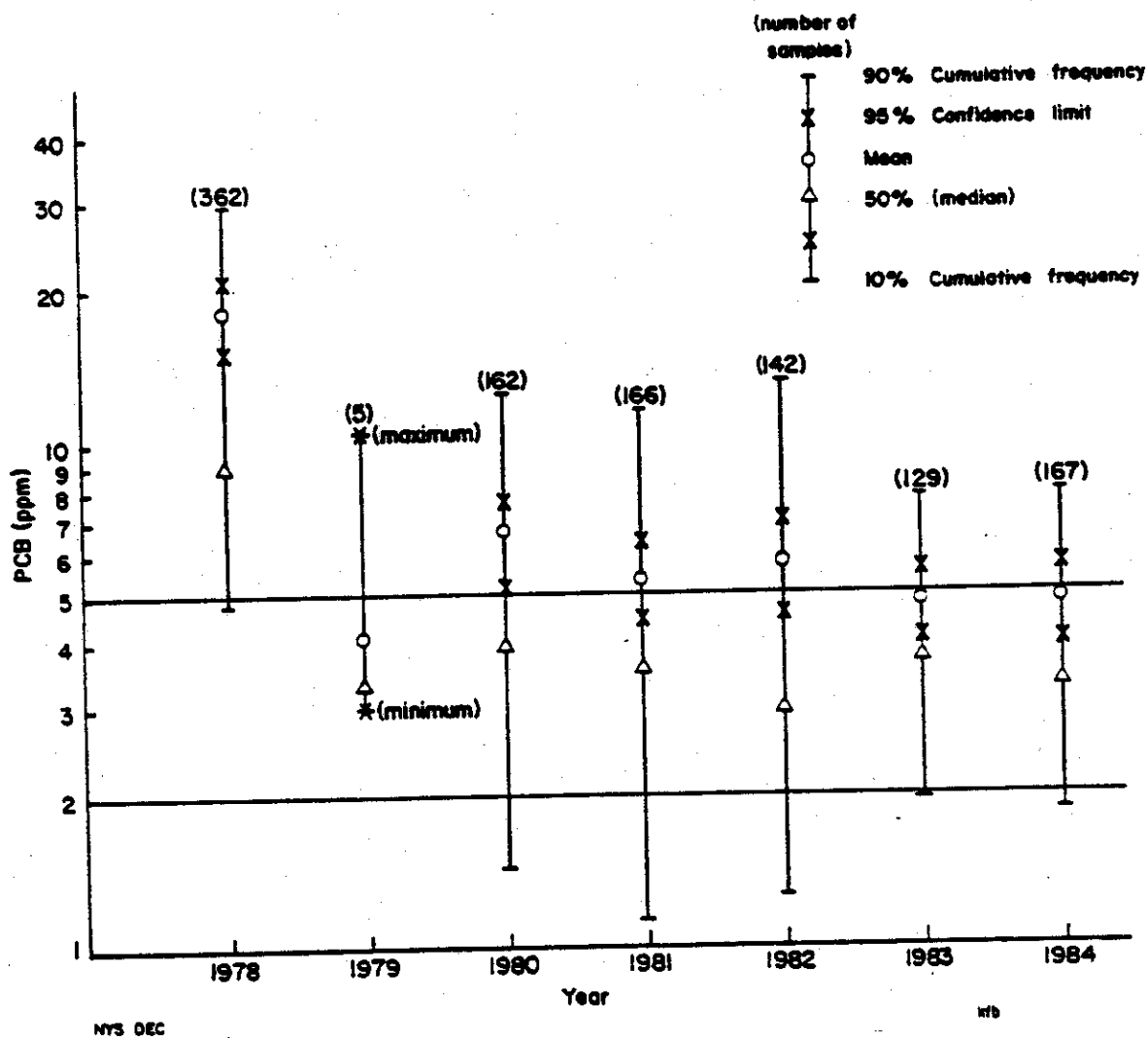
Table 6. Average PCB levels in edible flesh of fish resident in the Hudson River. Number in parenthesis is number of fish analyzed.

Location/Fish species	Average total PCB* and sample size				
	1977	1980	1982	1983	1984
<u>Fort Edward/Thompson Island</u>					
Largemouth bass	73 (19)	32 (18)	-	16 (10)	19 (30)
Goldfish	568 (19)	201 (50)	-	110 (18)	-
Rock bass	-	8 (17)	-	7 (30)	-
Yellow perch	-	21 (24)	-	33 (8)	-
Walleye	-	13 (2)	-	12 (4)	-
Brown bullhead	-	10 (28)	-	15 (24)	-
<u>Stillwater</u>					
Largemouth bass	69 (34)	10 (26)	4 (20)	7 (20)	6 (20)
Goldfish	576 (16)	73 (30)	12 (20)	16 (20)	27 (11)
Yellow perch	12 (30)	1 (7)	5 (2)	-	5 (7)
Brown bullhead	110 (30)	12 (30)	10 (20)	17 (20)	11 (20)
White sucker	21 (17)	-	-	-	-
American eel	-	-	30 (20)	-	-
<u>Albany/Troy</u>					
Smallmouth bass	16 (9)	-	-	-	-
Largemouth bass	18 (2)	18 (1)	-	-	-
Goldfish	-	63 (20)	-	27 (20)	-
Yellow perch	9 (20)	3 (15)	-	1 (14)	-
Walleye	-	6 (4)	-	-	38 (2)
Brown bullhead	39 (30)	2 (21)	5 (10)	8 (24)	3 (19)
White perch	118 (30)	17 (30)	16 (20)	9 (20)	9 (20)
White sucker	16 (10)	-	-	-	-
White catfish	-	14 (10)	-	-	8 (10)
Northern pike	-	2 (2)	-	-	3 (2)
Tiger muskellunge	-	-	-	-	2 (2)

*Reported as ug/g wet weight (ppm)

Figure 2. Total PCB concentrations in striped bass (fish 18" total length) from the Lower Estuary (RM 12-73) of the Hudson River.

Striped Bass $\geq 18"$



III. SIGNIFICANT ENVIRONMENTAL IMPACTS

A. Adverse Impacts

1. Public health risk

As noted above (Section II.D), fish from many waters in New York are contaminated with a variety of chemical pollutants. Monitoring of chemical contaminants in fish by the Division of Fish and Wildlife and studies by others have identified and quantified a number of chlorinated hydrocarbons and heavy metals. Contaminants found at levels exceeding state, federal, or international human health guidelines include the following:

DDT	heptachlor epoxide
PCB	dioxin (TCDD)
mirex	mercury
chlordane	cadmium
dieldrin	lead

A brief summary of the human health concerns associated with these chemicals can be found in Appendix III.

In general, each of these chemicals poses both an acute and chronic risk to human health. The acute risk is generally associated with exposures to large amounts of these chemicals. Fish which exceed FDA or International guidelines established to protect public health generally pose a chronic health risk. Except for the metals, chronic health risks associated with low-level, long-term exposure is extrapolated from experimental animals (e.g. mice and rats) exposed continuously over a significant portion of their life span to relatively high doses. A more extensive discussion of risk assessment and the use of animal studies can be found in Kim and Stone, 1981.

With adoption of this policy, some individuals will catch and eat contaminated fish beyond what is recommended. The number of individuals is difficult to predict, and the overall public health impact cannot be reliably estimated. Using data from the angler survey, in 1976-77 23% of New York residents fished. Approximately 3% of the angler harvest (13% by weight) was probably contaminated. At that time, many of these fisheries were not known to be contaminated although the majority (by weight) probably were. An unknown portion of the harvest was eaten, but probably only a small proportion of anglers account for most of the catch and consumption. Thus, the public health impact of contaminated fish is probably small, particularly if compared to cigarette smoking and alcohol use.

Table 7: Summation of Estimated Value of the Total New York State Fisheries to the Sportsman and Consumer of Commercial Fishery Products in 1978.

Fishery	Estimated Value of Fisheries in 1978 (millions of dollars)		
	Minimum	Closest Approximation	Maximum
<u>Recreational or Sport</u>			
Freshwater	271-315	385-448	522-6056
Marine	610-631	625-646	728-752
Subtotal	882-946	1010-1090	1250-1360
<u>Commercial</u>			
Freshwater	1.2	1.6	2.0
Marine	47.8-54.6	63.7-72.9	79.6-91.0
Subtotal	49.0-55.8	65.3-74.4	81.6-93.0
Total Value	930-1000	1080-1170	1330-1450

-source Skinner, 1979

Consumption of contaminated fish can best be reduced by education and extension efforts rather than by attempting to prevent individuals from fishing in certain waters. Attempts in the past to enforce fishing bans have met with only limited success. Mitigation efforts are discussed further in Section VII.

Commercial fish species may be altered in form (e.g. fileted) prior to entry to the marketplace. As such, the species identity is lost which would avoid the stigma of contaminated fish species and makes enforcement difficult. Where such practices may be proposed, health authorities, DAM, and FDA must be consulted. Even with a policy to close contaminated commercial fisheries, some individuals may be exposed to contaminated fish in the marketplace.

2. Translocation of fish harvesting

Anglers who wish to eat their catch may stop fishing in waters or for fish species known to be contaminated and switch to waters or fish species not known to be contaminated or waters/species known to be relatively uncontaminated. Although there may be adverse consequences to some fisheries from additional fishing pressure, these can be corrected by fish species management actions (e.g. modified seasons, size limits, creel limits, etc.).

A shift in fishing effort and success could potentially increase public health risks if the water or species not known to be contaminated were actually contaminated. Continued contaminant assessments should minimize this potential.

3. Economic impacts

The total value of all New York State fisheries (commercial and recreational) to the consumer and related industry was estimated to be between \$1.08 and \$1.17 billion in 1978 (Skinner, 1979). Table 7 presents a summary of values for recreational and commercial fisheries in freshwaters and the marine environment. It is apparent that the relative mix of fisheries values is predominated by recreational activities (93%) as opposed to commercial fisheries. For commercial fisheries, the marine fisheries comprise 98% of the value.

For 1978, Skinner (1979) estimated that freshwater recreational fisheries were valued at between \$385 and \$448 million. Based on Kretser and Klatt (1981), an independent estimate of this value was derived. Their 1976-77 angler day value of \$24.36 can be expanded to a 1978 value by use of a 6% inflation rate and applied to the total 1976-77 angler days.

16,638,000 angler days X \$25.82/angler day = \$430 million
95% confidence interval = \$418 to \$440 million

The two estimates agree well.

The impact of fisheries closures on recreational or commercial fisheries can be dramatic. Following the 1976 closure of Lake Ontario recreational salmon fisheries due to mirex contamination, fishing on the Salmon River (Oswego County) was reduced by about 60 to 70% (Brown, 1976a, 1976b) even though fish continued to return to the river from stockings of previous years. Based on Brown's (1976b) estimates of angler pressure in 1976 and observations of creel census agents in 1977 and 1978, angler use of the Salmon River above the estuary was expanded by application of estimated angler day values of Skinner (1979). The estimated minimum economic loss for the portion of the Salmon River above the estuary was \$329,500, \$49,000, and \$370,000 for 1976 through 1978, respectively (Skinner, 1979). This area comprises less than one percent of the total available salmonid fishery for Lake Ontario thus the probable annual economic loss for the total fishery was probably in the millions of dollars during the years 1976 through 1978. The impact would be considerably greater today. Even so, the ban on recreational fishing imposed in September 1976 and removed in 1978 clearly depressed the economic value of that fishery by almost 90% even though the fish were still present. Removal of the ban restored the economic value.

The impact of health advice is anticipated to be less dramatic because the angler is allowed to make a decision on whether or not to pursue a contaminated fishery. Unfortunately, no firm data are available to estimate the impact of the advisories. Capital expenditures (e.g. boats, tackle) comprise approximately 65% of total fisheries expenditures (Kretser and Klatt, 1981) and would probably be unaffected by health advisories. The remaining expenditures are non-capital (e.g. lodging, meals, travel) and may be lost from local economies through displacement to other areas, other activities, or non-expenditures of funds. Some impact on related commerce (i.e. travel, lodging, restaurants) is probable, particularly on the local commerce where contaminated fisheries are known and publicized. However, it is conceivable that the overall state economy may not suffer a total loss as anglers may simply shift their effort (and expenditures) to other waters.

B. Beneficial Impacts

1. Recreational and economic benefits

The 1976-77 angler survey in New York State asked anglers why they fished (Table 2, p. 12). Only 36% of responding anglers included "for food" in their answer. Throughout the state, bass tournaments are no-kill contests with the majority of fish being returned to the wild. As proposed, this policy would encourage non-consumptive recreational angling in contaminated waters.

Opening the upper Hudson River to recreational fishing with an appropriate health advisory could increase business throughout the local economy (e.g. bait and tackle shops, marinas, boat yards, hotels and motels, restaurants, etc.). In 1984, the Capital District Bassmasters requested permission to hold a bass tournament in the upper Hudson. These tournaments are always a financial success for the communities involved.

2. Public credibility and support

In the 1976-77 survey of anglers (Kretser and Klatt, 1981) only 12% of the respondents thought prohibiting fishing was a desirable response to the discovery of contaminated fisheries (Table 1, p. 4). However, 83% of the anglers recognized the need for restrictions or warnings of health risk. Thus, the public appears to view the closing of contaminated recreational fisheries as excessive regulation but supports the concept of appropriate health warnings.

As noted in section I.C., recreational anglers and local politicians have become concerned with apparent inconsistent department policy regarding closure of contaminated fisheries. Indeed, they have requested rescission of fisheries bans for the upper Hudson River (Appendix I) and Onondaga Lake. Since the recent contaminants data no longer clearly support the current fisheries closures, re-evaluation of the current regulations on these fisheries is warranted.

This policy will provide the necessary direction for consistent decision-making and provide the basis for modification of existing or future restrictions/warnings.

3. Scoflaws reduced

Anecdotal evidence and aerial observations by DEC staff suggests that anglers fish in the upper Hudson despite the regulation closing that portion of the river to fishing. Limited anecdotal information suggests that some fishing occurs on Onondaga Lake. When Lake Ontario was closed to fishing in 1976, compliance was quickly recognized to be a problem (see Introduction, p.2). Once individuals discover that regulations banning fishing because of fish contamination are not being enforced, they are encouraged to violate other fishing regulations. Adoption of this policy would remove the regulations prohibiting fishing except when contaminated fish pose a severe public health threat.

IV. ADVERSE IMPACTS WHICH CANNOT BE AVOIDED.

A. Public Health Risks

Some individuals will catch and eat contaminated fish regardless of governmental efforts to prevent this. Some unknown level of additional public health risk will result by allowing fishing while providing appropriate health advisories. The additional risks can be minimized by education, extension, and public information efforts of the Department and others.

B. Economic Impacts

Tourists and anglers may decide not to visit waters publicized as containing contaminated fish. This may adversely affect local economies dependent on tourists and anglers. Public information should be careful not to inappropriately frighten residents or tourists while adequately informing anglers of health risks from eating fish.

V. ALTERNATIVES TO PROPOSED POLICY

A. Commercial Fisheries

1. No action - allow FDA or DAM to intercept fish in the market

Advantages of this approach include:

- DEC would not be viewed as usurping authority or prejudging response of FDA or DAM to fish contamination.

- No questions would exist about potential differences in analytical procedure, sampling, or other technical matters between FDA, DAM and DEC.

Disadvantages include:

- The public will be exposed to chemical contaminants in excess of public health standards.

- Confiscation and destruction of contaminated fish is a wasteful use of the resource. Such destruction would undoubtedly precede a request by FDA or DAM to close a fishery.

- Publicity about contamination could adversely affect uncontaminated fisheries by creating fear among consumers that all fish (at least of the same species) in the marketplace are contaminated. This action reduces protection of the marketplace and consumers.

2. Use same threshold for opening and closing fishery

Where sufficient data are available, the variability of contamination in a fishery is quite high. It is common for contamination to span an order of magnitude or more (e.g. 0.1-1.0 ppm, 2.0-20 ppm, etc.) for a single species caught at any particular location. With such variability, even two large samples of fish taken at the same time and place would not have the same average level of contamination. One sample may be above and one below the threshold. From year to year, when the average is close to the threshold, such a policy would potentially result in frequent opening and closing of a fishery. This is undesirable and inappropriate.

3. Use other contaminant criteria for decision making

The commercial fisheries in New York exist in the Marine District, Hudson River and Lake Ontario. These waters and their fisheries are shared with neighboring states, Canada, and foreign fishermen. If other, more stringent criteria are used, New York commercial fishermen would be placed at a competitive disadvantage to their competitors fishing the same resource. If criteria less stringent than the federally accepted ones were used, FDA or DAM would be forced to exercise their authority.

4. Issue advisories or mark fish from contaminated waters before marketing

This is not practical. The source of fish in the marketplace is hard to trace after the fisherman first sells it. Providing consumers with enough information to determine the contaminant status of fish would be virtually impossible. If contaminated fish could be marked there would probably be no market for them, particularly if uncontaminated fish of the same species were also available.

The sale of commercial fish species is often by generic names, e.g. "whitefish" may be used for a variety of fish species having fine textured white flesh. This practice disguises the true identity of the species marketed and creates enforcement difficulty particularly at the marketplace.

B. Recreational Fisheries

1. No action - have no policy

Effectively, the no action alternative is to have no policy and to deal with each discovery of fish contamination individually. Public reaction to such a position can be expected to be adverse. The Department has fifteen years of experience responding to the knowledge of chemical contamination of fisheries throughout the State. Inconsistencies in responding to this knowledge have developed, and these inconsistencies confuse and anger the public.

2. Prohibit fishing when "eat no fish" is recommended.

When fisheries are found to be contaminated, actions should be taken to commensurate with the magnitude of the health risks. As discussed above (p. 6-8, 22), evaluating the health risks associated with eating contaminated fish is not a routine procedure and requires scientific judgement. In many circumstances, the potential health effects and the contaminant levels found in a given species present a health risk to an individual sufficiently high to warrant a no consumption advisory. However, conditions may not be so severe as to deny the benefits of recreational fishing.

Secondary issues arise when evaluating if recreational fishing should be prohibited wherever a no consumption advisory exists. In some waters, only some species have a no consumption advisory; closing recreational fishing in this situation has two implications. First, the health risks are likely to be less than for a situation in which a no consumption advisory exists for all species. Secondly, enforcing a closed fishery for some species but not others is difficult if not impossible. In some cases, a water body is shared with adjacent states or provinces which may not prohibit the same recreational fishery; as such, enforcement and

public acceptance of the regulations present major problems. Also, the benefits of recreational fishing can differ depending on fish species and water body. Moreover, experience in New York State has demonstrated a lack of acceptance and support for the regulations which have prohibited fishing in waters containing contaminated fisheries.

Closing a recreational fishery has many implications and removes many benefits to the individual and general public. However, if the health risks are severe, as determined by the Department of Health, recreational fishing will be prohibited as necessary to protect the public health.

3. Alternatives to prohibiting recreational fishing when extremely high levels of chemical contamination are discovered.

a. Enforced catch-and-release fishing

Currently, the Department has enforced catch-and-release fishing in six segments of five high-quality trout waters in the state for species management purposes. In general, anglers accept and respect the intent of these regulations. Effectiveness of the regulations is dependent on considerable peer pressure (i.e. self-policing) in support of the enforcement staff of the Department.

Anglers in New York have demonstrated a lack of acceptance and support for the regulations which have prohibited fishing in waters containing severely contaminated fisheries. Enforcement of these regulations has been difficult at best, and enforcement of catch-and-release fishing is not expected to be much more successful.

The options of either closing recreational fishing or enforcing a catch-and-release fishery would be undertaken only if the health risks associated with consuming the fish are severe. The recreational benefits to individuals exist if a catch-and-release fishery were chosen over a closure. However, enforcing such a regulation is extremely difficult and would probably lead to an increased exposure to those anglers who disregard the regulation. For any fishery in which the potential health risks are severe, the appropriate action would be to ensure, to the extent feasible, that the public is not exposed unnecessarily to this increased health risk. Because an enforced catch-and-release program is not the strongest action that could be taken to minimize the seriousness of contaminant exposure and associated health risks, the appropriate policy in cases of severe health risks is closing the recreational fishery.

b. Require a special permit for catch-and-release fishing.

The benefit of tournament registration as an opportunity to inform every angler of health risk factors could essentially be obtained under a catch-and-release regulation which included a special permit requirement. Such permits would be issued by the Department. They would involve an application form which includes application signature on an affidavit stating that he has read the specific health advisory information, that he understands such information, and that he will fully comply with the catch-and-release regulations.

Such a regulation would add an administrative burden in the form of preparing and processing permit applications that would also be an aggravation to the public. More importantly, such a system would still have the same public health objectives as enforced catch-and-release fishing without a special permit.

c. Allow catch-and-release tournament fishing only.

Structured tournaments would provide an opportunity to provide each registered angler with information about the health risks of the contamination and would be easier to "police" the catch-and-release fishing. However, the nature, frequency and extent of such tournaments would probably require regulation to ensure that such control of information and fishing is effective.

Such a regulation would allow competitive catch-and-release fishing but prohibit the same fishing if practiced strictly "for fun". Anglers would be required to join tournaments (usually paying fees) in order to fish. The Department has been and wishes to remain neutral on the subject of competitive tournament fishing. To adopt this alternative would significantly change that posture to support of competitive fishing.

Adoption of a tournament only regulation would directly favor the small minority of anglers who belong to organized, tournament-oriented fishing organizations. It would clearly discriminate against individual anglers who do not want to (or cannot) meet tournament fishing criteria. Anglers who personally dislike the concept of competitive fishing would have to compromise their position or stand by while others obtain the resource/benefits to their exclusion. A tournament only regulation would, in practical terms, place private organizations in the position of determining which individuals will enjoy the benefits of a public resource.

The Department has very deliberately attempted to avoid any discrimination in providing or controlling use of recreational fishing resources in the State. Each licensed angler (or one legally allowed to fish without a license) has an equal opportunity to utilize the public resource. Where

use is necessarily limited, it is allocated on a first-come, first-served basis without consideration of residency or organizational affiliation. A tournament-only regulation would clearly contravene this allocation philosophy. It would further aggravate those non-tournament anglers who desire to, and feel they should be allowed to, enjoy the recreational benefits of sportfishing without keeping their catch. Many fisherman would consider a tournament-only regulation as an unacceptable, unreasonable and unfair attempt to satisfy special interest groups. This would promote and aggravate violations to the law and would reduce the credibility of this Department as to its professional, unbiased implementation of sportfishing regulations.

4. DEC develop advisories

Currently, DEC relies upon DOH to develop advisories. DEC gathers the information and distributes it to the public. DEC could also develop the advisories, thereby reducing the need for consultation and the potential delay which can arise as a result of this consultation.

The public health risks associated with fish contaminated by chemicals is still a controversial subject. As such there is no consensus on how these risks should be measured. Considerable professional judgement is still required. In New York, the DOH has responsibility and expertise for assessing public health risks associated with chemical contamination of the environment. Therefore, it is appropriate that DOH make the judgements regarding the nature of appropriate advisories. DEC must be consulted, as it generates most of the contaminant information, knows the characteristics of anglers and the fisheries, and has well-established means to communicate directly with anglers.

Additionally, DEC is charged with the lead responsibility in the state for natural resource management. This means that DEC must develop and carry out programs which develop and promote fisheries in the state. Were it also charged with developing advisories for the public of hazards associated with the use of this resource, many in the public would sense a conflict of interest or potential hypocrisy, and the credibility of the agency in conducting both actions would suffer (Duttweiler, 1983). The active participation of DOH in this process is necessary to help offset such perceptions.

5. Provide additional public information

In the rationale and premises established for the policy (Section I.F, page 6-9) it was noted that DEC is clearly responsible for informing the public of any known fish contamination and the public health risks associated with consumption of contaminated fish. It was also noted that the Department must try to make these health risks understandable to the general public. Section VII.B. describes the general policy of the Department on this matter and describes current efforts to inform the public.

DEC could post signs with the Health Advisory at points of access to waters containing contaminated fish. The rationale for restricting the posting of waters is presented in Appendix VI.

VI. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Implementation of the policy will not irreversibly or irretrievably commit resources. However, where chemically contaminated fisheries are identified, commitment of financial resources will be necessary to identify contaminant sources and conduct appropriate remedial activities, where possible.

VII. MITIGATION MEASURES TO MINIMIZE ENVIRONMENTAL IMPACT

A. Abatement of Chemical Contaminant Sources

To truly mitigate the public health threat posed by contamination of fish from waters in New York requires elimination or abatement of discharges to acceptably low levels of the chemicals currently contaminating fish. Environmental permitting programs in DEC rely on water quality standards to prevent accumulation of contaminants in fish to levels exceeding FDA tolerances or other appropriate food guidelines.

In DEC, the Division of Water has established a Priority Water Problem list which recognizes the existence of restrictive consumption advisories in the ranking of water problems. Waters are classified as "use sustained", "use impaired", and "use precluded". Use is precluded on any water with an advisory to eat no fish. Where restrictive advisories allow some consumption (no more than a meal per month) use is impaired. Attention is then focused on identifying potential sources of these contaminants and abating them when they are discovered.

Controls on pesticide use also consider the existence of contaminated fish and wildlife.

B. Public Information/Education

The purpose of public information and education programs is to inform individuals about public health risks associated with consuming contaminated fish and to encourage them to follow the advisories promulgated by the DOH. The advisories are complex, and the information and issues are highly technical and controversial. Therefore, considerable attention is needed to ensure that the methods and channels of communication will disseminate the information to those who most need it and will promote understanding and acceptance of the message by each target audience (Duttweiler, 1983).

Low income and ethnic minority groups, especially those who do not speak English, are particularly difficult to reach and ensure comprehension. Cooperation with other agencies such as Cooperative Extension (Cornell University) has been successful in reaching some of these individuals. DOH and DEC staff have worked with Cooperative Extension staff to prepare material for teaching extension agents who are routinely communicating with low income, migrant worker groups (Ryan, 1984a, 1984b, 1984c). Other efforts include the following:

1. The Health Advisory is published annually on the inside front cover of the Fishing, Small Game Hunting, and Trapping Regulations Guide. This Guide is provided to each individual who purchases a fishing license in the state and is available free of charge to anyone who requests it from the Department.
2. Press releases are distributed to every major newspaper in New York. At or near the beginning of the fishing season, a press release is prepared to announce any changes in the Health Advisory resulting from review of contaminant data from the previous year and to remind anglers of the Advisory.
3. Scientific and popular articles have been periodically prepared to discuss contamination of fisheries in New York. The existence of the Health Advisory and its content is always mentioned in popular articles.
4. Levels of PCB, mirex, and possibly other contaminants can be reduced by removing the skin and fatty portions along the back, sides, and belly of some fish species. A pamphlet describing this method is available from any DEC office and its availability is noted in the Guide.

VIII. EFFECTS ON USE AND CONSERVATION OF ENERGY RESOURCES

Implementation of the policy on contaminants in fish may cause minor changes in energy usage by the public. Automobile and boat travel may be reduced with the imposition of fisheries closures or health advisories. Conversely, as a fishery is reopened or health advisories removed, limited increases in energy usage are likely if anglers travel or use boats to a greater extent. The extent of these changes is dependent on the action taken. Since the public normally has alternative waters or species readily available, the extent of impacts is probably minimal.

IX. GROWTH INDUCING IMPACTS

Growth of fisheries usage would only occur when a fisheries closure is removed or, to a much lesser extent, a health advisory becomes more lenient. The primary impact would be on support industries such as lodging, restaurants, and fuel stations. To a lesser degree sales of fishing tackle, boats, and other equipment might be affected. These latter impacts would be most significant if major fisheries were involved.

In New York State, only two recreational fisheries are currently totally closed to fishing, i.e. Onondaga Lake and the upper Hudson River from Fort Edward to the Troy Dam. Reopening both of these fisheries, although retaining restrictive human health advisories, would produce local growth of fishing related industry as described above (p. 23-25). The extent of such growth can only be surmised.

The closure of the Lake Ontario salmonid fishery resulted in a 90% reduction in the fishing related economy in the Salmon River region (p. 24). The fisheries usage and economic value rebounded when the ban was lifted and expanded significantly beyond levels experienced prior to closure when stocking efforts created a more extensive fishery.

Recreational fishing has contributed a major economic benefit to many communities in the Salmon River area and along the entire Lake Ontario shoreline. The value of Great Lakes salmonid fisheries had grown to an estimated \$44 million by 1980. This is an increase of \$42.8 million in fisheries value compared with 1975. The estimated number of angler trips increased from 61,600 (extrapolated from Brown, 1976a and Kretser and Klatt, 1981) to 2.4 million (U.S. Fish and Wildlife Service and Bureau of Census, 1982) in that period.

Obviously, return of smaller fisheries is unlikely to be so dramatic. However, the growth impacts could be significant locally and proportional to the size of the fishery and prestige of the species involved.

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