TMDL Implementation Plan for Goat Rock Lake in Harris County - Fish Consumption Guidelines

Introduction

Goat Rock Lake is a reservoir on the Chattahoochee River immediately northwest of Columbus, Georgia. The Fish Consumption Guideline for Goat Rock Lake is based on polychlorinated biphenyls ("PCBs") levels found in tissue of fish sampled in the Lake. EPA Region 4 has stated in the TMDL that Georgia has one of the most extensive fish tissue monitoring programs in the Southeast. The Fish Consumption Guidelines for the Lake, along with an explanation of them, are contained in an excerpt of the "Guidelines for Eating Fish from Georgia Waters, 2000 Update" published by the Georgia Department of Natural Resources. That excerpt is attached and is incorporated by reference as a part of this Implementation Plan. Basically, the recommended limits of fish consumption contained in the Fish Consumption Guidelines, have been interpreted as making the Lake not fully supporting its designated use for fishing. That is the basis of why a TMDL was developed for the Lake.

Plan for TMDL Implementation

The Fish Consumption Guideline for PCBs is based on what will protect the health of a person eating fish from the Lake

over a period of 30 years or more. Thus, the Guideline is conservative in the sense that it errs on the side of caution for what constitutes a safe level of fish consumption.

The use of PCBs was banned in the United States in the late 1970s. Before that, it was used primarily as a dielectric fluid, in applications such as electrical transformers, transistors, and carbonless paper. The goal of this Implementation Plan is to remove the Fish Consumption Guideline that presently applies to the Lake.

This goal can be measured by calculating an in-the-water PCB level (also known as the "water column" level with the figurative "column" going from the Lake bottom to the Lake surface) that correlates to the PCB fish tissue level used for the Guideline. The Goat Rock Lake TMDL calculated this in-the-water PCB concentration level as 0.000045 micrograms per liter (µg/l) which can also be expressed as 0.000045 parts per billion, or a concentration of 0.0000000000045%. This is the target for the TMDL development. However, that level of PCBs is below the detection limit in the test methodology used to measure PCBs. Also, the recommended fishing limit stated in the Fish Consumption Guideline is based on fish tissue levels, not water column levels. For both of these reasons, the measurable goal of the Implementation Plan is to meet the PCB level in fish

tissue that will cause the Fish Consumption Guideline for PCBs to be lifted for the Lake.

The TMDL states that PCBs entered the Lake area as a result of stormwater runoff and nonpoint source pollution. When it rained, PCBs on the land were washed into the surface water and were carried downstream by creeks and rivers into lakes and reservoirs. Fish absorb PCBs from the water column, suspended sediments in the water column, or in their food (such as microorganisms, plankton, invertebrates, and other fish).

The TMDL also states that PCBs in the water bodies are decreasing over time due to a combination of factors, including sediment being flushed out of the water bodies, contaminated sediment being buried, and the water column concentrations being volatilized (evaporating). EPA has estimated contaminant decay rates from monitored data of the water bodies impacted in Georgia and from other data.

According to the TMDL for PCBs in Georgia lakes, the PCB loadings (that is, additions of PCBs) have been removed or reduced to zero. The TMDL thus calculated the PCB removal rate for this Lake, looking at flow, volume, and depth of the reservoir, suspended solids concentration, concentration of PCBs, settling velocity, re-suspension velocity, and the toxic decay coefficient for PCBs. While the other factors in this list (besides concentration of PCBs, which will decrease) remain

essentially constant, the higher the amount of suspended solids and re-suspension velocity, the longer it would take to reach the PCB goals when Fish Consumption Guidelines can be lifted. This means, for example, that a program to dredge the Lake sediment that contains PCBs, may have a worsening effect on PCBs in the water column. This is because the nature of dredging causes some of the sediment not to be dredged but instead to move from the Lake bottom into the Lake water (because suspended solids and re-suspension are increased), thus possibly increasing the PCB level in the Lake.

The TMDL estimates that if no such PCB dredging is carried out in the Lake, it is conservatively estimated (that is, erring on the side of underestimating rather than overestimating) that PCB levels will decrease at a rate of 5% per year. At this rate, the TMDL states that the water column PCB concentration and fish tissue PCB concentration goals can be met in 10 to 20 years.

Since it would be counterproductive to dredge Lake sediment, which would result in increasing PCBs in the water column and in fish tissue, such dredging will not be undertaken. Instead, the Georgia Department of Natural Resources (DNR) will continue a progressive sampling program to evaluate problem areas and to protect public health by giving people the information they need to make decisions about eating fish from

Georgia waters. Sampling the same species of fish from the same locations over time will allow DNR to document changes and trends in contamination levels.

A summary of the Implementation Plan is as follows.

A. Source categories, subcategories, or individual sources which must be controlled to implement the load allocations: None.

B. Description of regulatory or voluntary actions, intended to achieve reductions: Continued monitoring at same locations, plus natural attenuation resulting from deposition of new uncontaminated sediment.

C. Description of regulatory or voluntary actions, including management measures or other controls, by governments or individuals, that provide reasonable assurance that reductions will be achieved to meet water quality standards: Continued monitoring at the same locations will be conducted. Natural attenuation caused by new uncontaminated sediment covering the older sediment, is projected to result in full compliance with the fishing use of the Lake.

D. Schedule for implementing the management measures or other control actions as expeditiously as practicable: These actions will continue to be conducted as before.

E. Projected attainment date and basis for it: The projected attainment date is sometime between 2010 and 2020, based on

extrapolation of the declining levels of PCBs in fish tissue sampled.

F. Measurable milestones for determining whether management measures or other control actions are being implemented:

Periodic re-evaluation of PCB data will be undertaken, to confirm or refine the projections. Georgia's surface waters are targeted for monitoring according to the 5-year River Basin Planning and Monitoring schedule. Contaminant levels in fish change relatively slowly and sampling the same species of fish from the same locations over time allows the DNR to document changes and trends in contamination levels. Different species of fish consume food at various levels of the food chain (low end are plankton eaters, high end are predators), and in different habitats (*i.e.* bottom feeders). Different species have different growth rates and life spans. Although growth rates can be highly variable due to fluctuations in the food supply and climatic reasons (growing season), estimates on approximate age based on size can be made. As an example, largemouth bass in lakes with a good food supply may reach 16 inches in length in 5-6 years. Targeting later generations of the same size of a species and comparing residue levels found in the past with new data provides information on the contaminant bioaccumulation rate, and what trend may be evident.

G. Monitoring or modeling plan designed to measure the effectiveness of the management measures or other controls, the progress the water body is making toward attainment, and a process for implementing stronger and more effective management measures if necessary: Periodic monitoring will be conducted using the same methodology and analytical approach as before. There are no presently known stronger management measures that are both effective and feasible.

H. The criteria to determine whether substantial progress toward attainment is being made, and if not, whether the TMDL needs to be revised: The criteria are the analyses of PCB fish tissue data from lake sampling. If subsequent data show that the TMDL needs to be revised, steps will be taken to revise it.

I. Goal of attaining and maintaining the applicable water quality standards within 10 years, where that is practicable: That may be accomplished, based on TMDL projections, but it is not presently known whether that is practicable.

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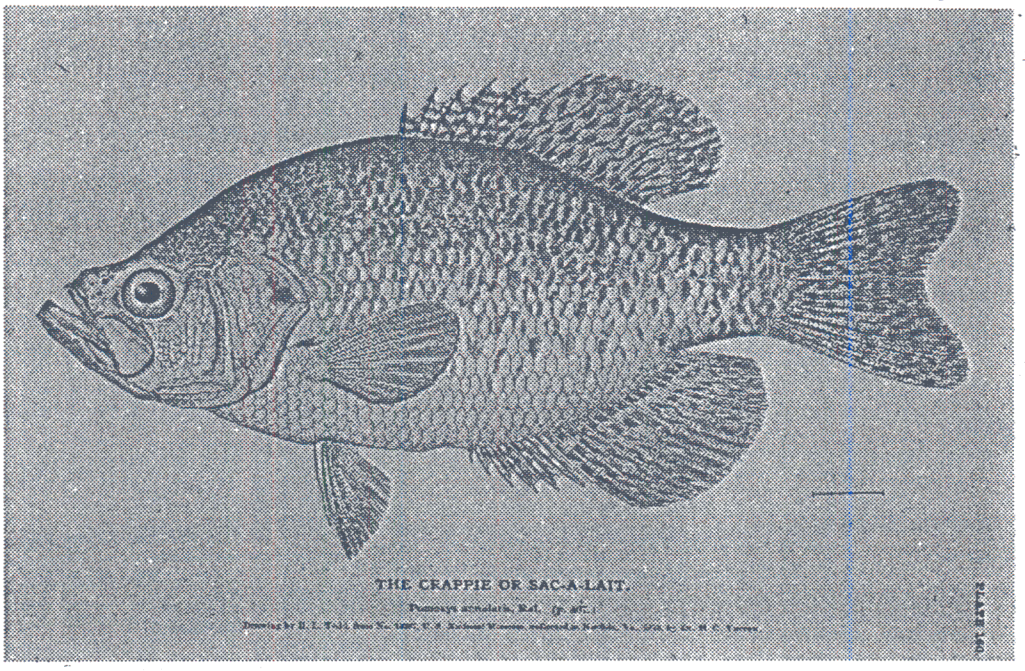
Guidelines for Eating Fish from Georgia Waters



2001 Update

Georgia Department of Natural Resources

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Atlanta, Georgia 30334

Introduction

Fishing is a popular pastime in Georgia. Whether you go alone to relax and enjoy nature, with your friends to enjoy camaraderie and "fish tales" or with your family to pass on a sport you learned as a child, fishing is a fun and rewarding sport enjoyed by many people.

Not only does fishing give people an excuse to get away from the hustle and bustle of daily life, but it can also put a healthy, satisfying meal on the table. Fish is low in saturated fat, high in protein, and can have substantial health benefits when eaten in place of other high-fat foods. The quality of sport fish caught in Georgia is very good; however, polychlorinated biphenyls (PCBs), mercury, chlordane, DDT residues (DDE/DDD), and dieldrin have been found in some fish. In most cases, the levels of these chemicals are low. However, to help ensure the good health of Georgians, the Georgia Department of Natural Resources (DNR) has developed guidelines for how often certain species of fish can be safely eaten. These guidelines are based on the best scientific information and procedures available. As more advanced procedures are developed, these guidelines may change. ***Also, it is important to keep in mind that these calculations are based on eating fish with similar contamination over a period of 30 years or more.***

These guidelines are not intended to discourage people from eating fish, but should be used as a guide for choosing to eat fish from Georgia waters.

The river basin where tested sites are located has been identified in the tables. The fourteen major river basins in Georgia are shown on the map provided on page 8, preceding the consumption guidance tables. The listings for lakes have been divided into those with a surface area of 500 acres or more, and small lakes and ponds less than 500 acres in size. The Georgia rivers have also been divided into freshwater rivers and creeks, and estuarine systems. An index in provided at the back of the booklet for quick page reference to subjects or tested locations.

Are Georgia's Fish Safe to Eat?

Yes. The quality of fish in Georgia is good. This booklet provides you with the guidance and recommendations to use in eating fish in a healthy and informed manner.

The Georgia Department of Natural Resources (DNR) has one of the most progressive fish testing programs in the southeast. A variety of different fish species were tested for 43 separate contaminants, including metals, organic chemicals and pesticides. Many of these contaminants **did not** appear in any fish; however, two contaminants, PCBs and mercury, were frequently detected in significant amounts in a few species from some bodies of water in Georgia. Three additional contaminants, chlordane, DDT residues (DDE/DDD), and dieldrin were also detected infrequently. This publication provides you with information on those five contaminants—PCBs, mercury, chlordane, DDE/DDD and dieldrin.

In some areas, fish are contaminated with low concentrations of PCBs, which stands for polychlorinated biphenyls. It is now illegal to manufacture PCBs; however, in the past, these synthetic oils were used regularly as fluids for electrical transformers, cutting oils, and carbonless paper. Although they were banned in 1976, they do not break down easily and remain in aquatic sediments for years. Over time levels of PCBs are decreasing.

Mercury is a naturally occurring metal that does not break down as it cycles between land, water, and air. As mercury cycles through the environment it is absorbed and ingested by plants and animals. Most of the mercury absorbed or ingested will be returned to the environment but some will remain in the plant and animal tissues. It is not known where the mercury in Georgia's fish originated. Mercury may be present in fish because of the mercury content of soils and rocks in the southeast, from municipal and industrial sources, or from fossil fuel use. Scientific evidence is growing that mercury is transported long distances through the upper atmosphere, making its control a global environmental issue. Although mercury has always been present, scientific research shows that the amount of mercury cycling through the environment has increased significantly following the dawn of the Industrial Revolution in the late 1800s.

Fish at one site had enough chlordane to recommend a restriction in consumption. Chlordane is a man-made pesticide used in the U.S. from the late 1940s to the early 1980s. Historically, chlordane was used as an agricultural pesticide, but in 1978 it was restricted to termite control use only. It is now banned for all uses. Chlordane is persistent in the environment and may remain in aquatic sediments for years.

Fish at one site had enough DDE/DDD residues to recommend a restriction in consumption. The DDE/DDD contaminants are chemical breakdown products of the pesticide DDT. DDT was first synthesized in 1874 and its insecticidal properties were discovered in 1939. In the United States DDT was used extensively until 1969. The U.S. production of DDT was discontinued in 1969. Residues of DDE/DDD are persistent and break down slowly in the environment.

Fish at one site had enough dieldrin to recommend a restriction in consumption. Dieldrin is another chlorinated pesticide like chlordane and DDT, and has been restricted from use in the United States. It was used to control corn and citrus pests, termites, and in moth proofing. Dieldrin is persistent in the environment because of the slow breakdown rate.

Like PCBs, the chlorinated pesticides do not break down easily and remain in aquatic sediments for years. These organic contaminants tend to concentrate in fat and fatty tissues of fish such as the liver and other organs. Over time levels of PCBs and chlorinated pesticides are decreasing.

Some fish in the Savannah River contain the radioactive elements cesium-137 and strontium-90. Exposure to large amounts of these elements may increase the risk of developing cancer.

How Do Georgia's Fish Compare?

Georgia has one of the most extensive fish monitoring programs in the southeast. This is not because Georgia has highly contaminated fish, but because the DNR has made a serious commitment to evaluate fish quality and provide detailed information to the people of Georgia. Review and comparison of data collected nationally on fish tissue contamination that the U.S.EPA has assembled shows that the quality of fish in Georgia is similar to that in surrounding southeastern states.

How Do Fish Become Contaminated?

Contaminants get into water as a result of storm water runoff, industrial and municipal discharges, agricultural practices, nonpoint source pollution and other factors. When it rains, chemicals from the land and in the air are washed into the water. Contaminants are carried downstream by rivers and creeks into lakes, reservoirs, and estuaries.

Contaminants can get into fish in a variety of ways. Fish absorb PCBs, chlordane and other pesticides from either water, suspended sediments, or their food. These

chemicals concentrate in the fat of fish tissue and in fatty fish such as carp and catfish. Cleaning and cooking a fish to remove fat will lower the amount of PCBs, chlordane or other pesticides in a fish meal. Larger, older fish and fish which eat other fish may accumulate more contaminants than smaller, younger fish. Contaminants are not usually detected in panfish such as crappie and bluegill.

Once in the water, mercury is converted to methylmercury by bacteria and other processes. Fish absorb methylmercury from their food and from water as it passes over their gills. Mercury is bound to proteins in fish tissue, including muscle.

What is Being Done?

The DNR is committed to protecting Georgia's rivers, streams, lakes and other waters. Both PCBs and chlordane have been banned and the levels of these chemicals are steadily decreasing over time.

The Department began this progressive program to evaluate problem areas and to protect public health by giving people the information they need to make decisions about eating fish from different waters. The DNR's fish testing program is ongoing. Testing on additional lakes and rivers is balanced with retesting of waters where changes may be occurring. Contaminant levels in fish change very slowly and sampling the same species of fish from the same locations over time will allow the DNR to document changes and trends in contamination levels.

Georgia has more than 70,150 miles of rivers and streams and more than 425,382 acres of lakes, reservoirs and ponds. It will not be possible for the DNR to sample every stream and lake in the state. However, high priority has been placed on the 26 major reservoirs which make up more than 90% of the total lake acreage. Waterways listed in this guide will continue to be sampled as part of a five year rotating schedule of river basin planning and monitoring to track any trends in fish contaminant levels. The Department has also made sampling fish in rivers and streams downstream of urban and/or industrial areas a high priority. The DNR also focuses attention on areas which are frequented by a large number of anglers.

Most lakes and rivers contain a wide variety of fish and selecting which species of fish to test is important. The DNR samples fish that are top predators (high in the food chain) and fish that feed on the bottom. For this reason, largemouth bass and channel catfish are usually the primary species tested. Hybrid bass are also tested in areas with good fisheries for this species. Smaller fish, such as crappie, bluegill and redbreast sunfish, are tested in secondary studies after testing the larger target fish. This is because smaller fish accumulate contaminants more slowly and in smaller amounts than larger fish and bottom feeders.

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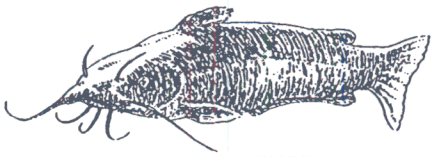
To prevent future contamination, the Department seeks to identify pollution sources and to work with industries, cities, farms and others to reduce the threat posed by pollutants. In many cases this means implementing new technologies or practices that eliminate the use or creation of contaminants and thus the need to dispose of or discharge these chemicals. State laws have tough restrictions and penalties for discharge of toxic substances. The DNR is responsible for enforcing these laws in Georgia and for ensuring compliance with these regulations.

Individuals can play a role in preventing contamination of Georgia's waters by recycling and disposing of chemicals, such as oil, antifreeze, paint, and other wastes properly. Manufacturers are working to reduce the use of mercury in their products, but it is still found in common household products such as thermostats, electrical switches, thermometers, some batteries, and fluorescent and mercury vapor lamps. To protect Georgia's waterways from contamination, individuals, industries, farmers and others must learn to modify their day-to-day activities and work practices to apply new ways to prevent pollution. The DNR will continue to work closely with these groups to improve water quality in Georgia. Planning, regulations, facilities modernization, public education and other activities will play a major role in protecting Georgia's waters for future generations.

Benefits of Eating Fish



Fish has long been recognized as a nutritious "protein food". It's nutritional value as a protein source is greater than that for beef, pork, chicken or milk. Additionally, the types and amounts of dietary fats are generally more "heart healthy" than the fats found in other protein foods. Fish is also an important source of the fatty acids which are critical for the development of the brain and nervous system. Fish is an excellent source of several vitamins, and also contributes appreciable amounts of dietary calcium, iron and zinc. These minerals are essential nutrients that tend to be low in people's diets. Many studies suggest that eating fish regularly may help protect against heart and inflammatory diseases.

These guidelines are based on a range in fish meal size from 4 to 8 ounces (¼ to ½ pound). Where the guidelines recommend only 1 meal per week or month, you may prefer to have two smaller meals over that period.

Risks of Contaminated Fish

These guidelines were designed to protect you from experiencing health problems associated with eating contaminated fish. PCBs, methylmercury, chlordane, DDE/DDD and dieldrin build up in your body over time. It may take months or years of regularly eating contaminated fish to accumulate levels which would affect your health. Keep in mind that these guidelines are based on eating fish with similar contamination over a period of 30 years or more. Current statistics indicate that cancer will affect about one in every four people nationally, primarily due to smoking, diet and hereditary risk factors. If you follow Georgia's consumption guidelines, the contaminants in the fish you eat may not increase your cancer risk at all. At worst, using the United States Environmental Protection Agency's (U.S. EPA) estimates of contaminant potency, your cancer risk from fish consumption should be less than 1 in 10,000.

PCBs, chlordane, DDD/DDE and dieldrin can cause cancer in laboratory animals exposed to large amounts, and may cause cancer in humans. Effects other than cancer from these chemicals may include developmental problems in children whose mothers were exposed to them before or during pregnancy. Studies of people who have been exposed to very large quantities of these chemicals (pesticide workers, etc.), have indicated a relationship between high exposures and health effects on the nervous system, digestive system and liver, and the immune system.

Exposure to methlymercury has not been linked to cancer. Methylmercury is a concern because of it's potential to damage the nervous system, especially in the developing fetus and young child.

The consumption advice provided in this booklet is developed in a conservative manner. It is intended to protect both children and adults from cancer and the other potential toxic effects of these chemicals.

Special Notice for Pregnant Women, Nursing Mothers and Children

If you are pregnant or a nursing mother, or plan to become pregnant soon, you and children under 6 years of age are sensitive to the effects of contaminants such as mercury. DNR's guidelines are designed to be protective for these sensitive groups. This year, U.S. EPA has issued a national advisory recommending that these sensitive groups limit consumption of all freshwater fish to one meal per week due to mercury. People may wish to follow U.S. EPA's recommendation, especially in areas where DNR has not tested fish and offered detailed guidelines. For most other healthy adults, DNR's recommendations may actually be overly conservative.

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Guidelines to Reduce Risk

Keep smaller fish for eating. Generally, larger older fish may be more contaminated than younger, smaller fish. You can minimize your health risk by eating smaller fish (within legal size limits) and releasing the larger fish.

Vary the kinds of fish you eat. Contaminants build up in large predators and bottom-feeding fish, like bass and catfish, more rapidly than in other species. By substituting a few meals of panfish, such as perch, sunfish and crappie, you can reduce your risk.

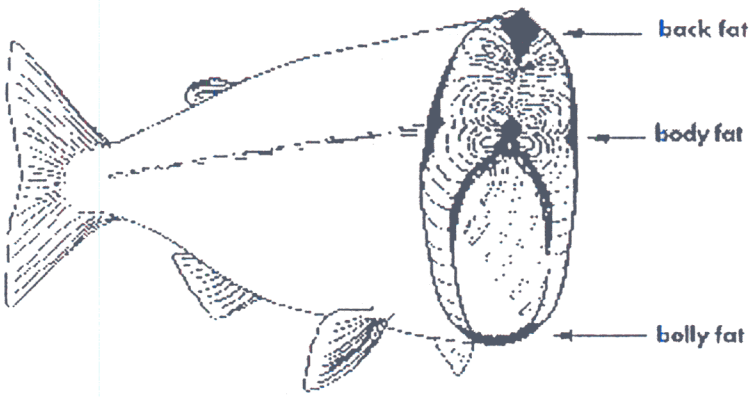
Eat smaller meals when you eat big fish and eat them less often. If you catch a big fish, freeze part of the catch (mark container or wrapping with species and location), and space the meals from this fish over a period of time.

Clean and cook your fish properly. How you clean and cook your fish can reduce the level of contaminants by as much as half in some fish. Some chemicals have a tendency to concentrate in the fatty tissues of fish. By removing the fish's skin and trimming fillets according to the following diagram, you can reduce the level of chemicals substantially. Mercury is bound to the meat of the fish, so these precautions will not help reduce this contaminant.

Remove the skin from fillets or steaks. The internal organs (intestines, liver, roe, and so forth), and skin are often high in fat and contaminants.

Trim off the fatty areas shown in black on the drawing. These include the belly fat, side or body fat, and the flesh along the top of the back. Careful trimming can reduce some contaminants by 25 to 50%.

Cook fish so fat drips away. Broil, bake or grill fish and do not use the drippings. Deep-fat frying removes some contaminants, but you should discard and not reuse the oil for cooking. Pan frying removes few, if any, contaminants.



Using These Guidelines

Check the following pages for the area where you fish. The lakes and rivers on the list are arranged in alphabetical order. If your fish or fishing location is **NOT** in this booklet, follow the suggestions in *Guidelines to Reduce Risk* .

If your fish or fishing location is in the booklet, it does not necessarily mean that there is a contaminants problem, but only that the fish have been tested. Meal advice will depend on what contaminant(s) were found and how much was found in different species and sizes of fish. Follow these instructions carefully.

- Measure fish from the tip of the nose to the end of the tail fin.
- On the charts find your lake (river) and the species and size of fish you caught. If there is no frequency listed for a particular size fish, that size has not been tested or is illegal to keep. For rivers, the size that was tested was the common creel size for that species.
- Listed below are the four different recommended meal frequencies that are possible for different species and sizes of fish.

  no restriction
  1 meal per week
  1 meal per month
  do not eat

- For the purposes of these guidelines, one meal is assumed to range from ¼ to ½ pound of fish (4-8 ounces) for a 150 pound person. Subtract or add 1 ounce of fish to the range for every 20 pound of body weight. For example, one meal is assumed to be 3 - 7 ounces for a 130 pound person and 5 - 9 ounces for a 170 pound person.

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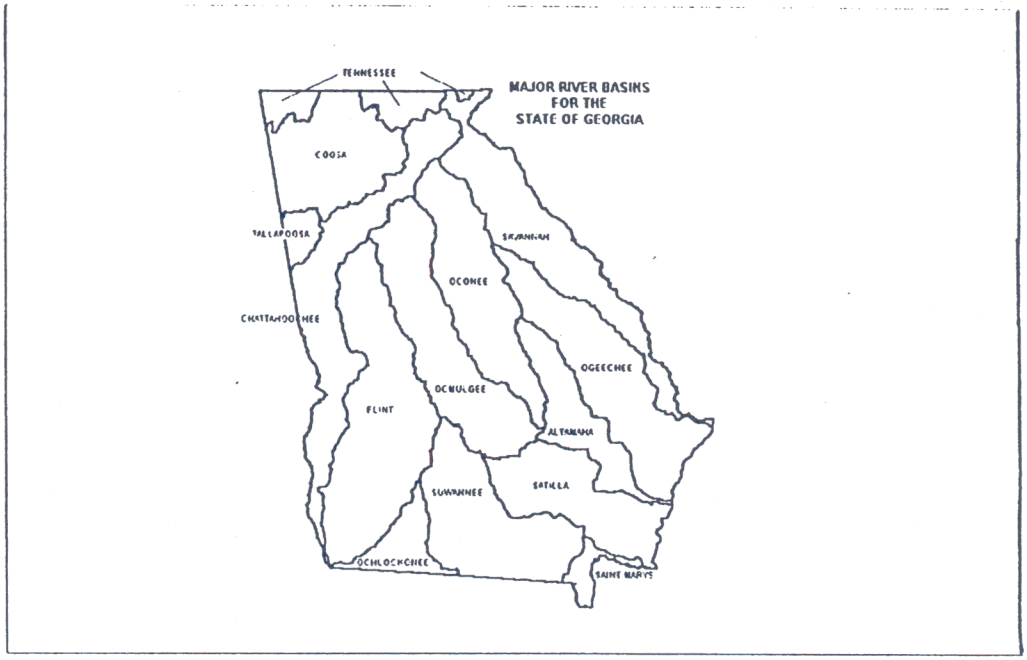

RIVER BASINS OF GEORGIA

Chattahoochee River Basin

Flint River Basin

Coosa River Basin

Tallapoosa River Basin

Tennessee River Basin

Savannah River Basin

Ogeechee River Basin

Ochlockonee River Basin

Suwannee River Basin

Satilla River Basin

St. Marys River Basin

Oconee River Basin

Ocmulgee River Basin

Altamaha River Basin

Coosa River Basin

16"	Chemical
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ennessee River Basin

16"	Chemical
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avannah River Basin

16"	Chemical
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Goat Rock Lake *Chattahoochee River Basin*

Species	Less than 12"	12" - 16"	Over 16"	Chemical
Largemouth Bass		No Restrictions	1 meal/month	PCBs, Mercury
White Bass	1 meal/month	1 meal/month		PCBs
Hybrid Bass	1 meal/week		1 meal/month	PCBs
Spotted Sucker			No Restrictions	
Black Crappie	No Restrictions	No Restrictions		
Channel Catfish		1 meal/week	1 meal/month	PCBs

Lake Harding (Bartletts Ferry) *Chattahoochee River Basin*

Species	Less than 12"	12" - 16"	Over 16"	Chemical
Largemouth Bass		1 meal/week	1 meal/week	PCBs, Mercury
Channel Catfish	1 meal/week	1 meal/week	1 meal/month	PCBs
Crappie	No Restrictions	No Restrictions		
Hybrid Bass	1 meal/week		1 meal/month	PCBs

Lake Hartwell: Tugaloo Arm *Savannah River Basin*

Species	Less than 12"	12" - 16"	Over 16"	Chemical
Largemouth Bass		1 meal/week	1 meal/month	Mercury
Black Crappie	No Restrictions	No Restrictions		
Hybrid/Striped Bass	No Restrictions	1 meal/month	Do Not Eat	PCBs
Channel Catfish	No Restrictions	No Restrictions	1 meal/month	PCBs
Carp			1 meal/week	Mercury