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June 11, 2009

State of Tennessee
Department of Environment and Conservation
Division of Water Pollution Control
Enforcement & Compliance Section
6th Floor, L & C Annex
401 Church Street
Nashville, Tennessee 37243-1534

Dear Mr. Patrick Cromer:

SEQUOYAH NUCLEAR PLANT - 2008 BIOLOGICAL MONITORING REPORT

Enclosed is the "Biological Monitoring of the Tennessee River Near Sequoyah Nuclear Plant Discharge Autumn 2008" Report. This report is submitted in accordance with Part III, Section F of the TVA - Sequoyah Nuclear Plant NPDES Permit No. TN0026450. If you have any questions or need additional information, please contact Ann Hurt at (423) 843-6714 or Stephanie Howard at (423) 843-6700 of Sequoyah's Environmental staff.

Sincerely,

Timothy P. Cleary
Site Vice President
Sequoyah Nuclear Plant

Enclosure
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Biological Monitoring of the Tennessee River Near Sequoyah Nuclear Plant Discharge Autumn 2008

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May 2009

Tennessee Valley Authority
Aquatic Monitoring and Management
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Acronyms and Abbreviations

BIP	Balanced Indigenous Population
CCW	Condenser cooling water
CFS	Cubic feet per second
MW	Megawatts
NPDES	National Pollutant Discharge Elimination System
PSD	Proportional Stock Density
QA	Quality Assurance
RBI	Reservoir Benthic Macroinvertebrate Index
RFAI	Reservoir Fish Assemblage Index
RSD	Relative Stock Density
RSDM	Relative Stock Density of Memorable-sized
RSDP	Relative Stock Density of Preferred-sized
RSDT	Relative Stock Density of Trophy-sized
SAHI	Shoreline Assessment Habitat Index
SQN	Sequoyah Nuclear Plant
SSS	Spring Sport Fish Survey
TRM	Tennessee River Mile
TVA	Tennessee Valley Authority
VS	Vital Signs
Wr	Relative Weight

Introduction

Section 316(a) of the Clean Water Act (CWA) authorizes alternative thermal limits (ATL) for the control of the thermal component of a discharge from a point source so long as the limits will assure the protection of Balanced Indigenous Populations (BIP) of aquatic life. The term "balanced indigenous population," as defined in EPA's regulations implementing Section 316(a), means a biotic community that is typically characterized by:

(1) diversity appropriate to ecoregion;
(2) the capacity to sustain itself through cyclic seasonal changes;
(3) the presence of necessary food chain species; and
(4) lack of domination by pollution-tolerant species.

Prior to 1999, the Tennessee Valley Authority's (TVA) Sequoyah Nuclear Plant (SQN) was operating under a 316(a) ATL that had been continued with each permit renewal based on studies conducted in the mid-1970s. In 1999, EPA Region IV began requesting additional data in conjunction with NPDES permit renewal applications to verify that BIP was being maintained at TVA's thermal plants with ATLs. TVA proposed that its existing Vital Signs (VS) monitoring program, supplemented with additional fish and benthic macroinvertebrate community monitoring upstream and downstream of thermal plants with ATLs, was appropriate for that purpose. The VS monitoring program began in 1990 in the Tennessee River System. This program was implemented to evaluate ecological health conditions in major reservoirs as part of TVA's stewardship role. One of the 5 indicators used in the VS program to evaluate reservoir health is the Reservoir Fish Assemblage Index (RFAI) methodology. RFAI has been thoroughly tested on TVA and other reservoirs and published in peer-reviewed literature (Jennings, et al., 1995; Hickman and McDonough, 1996; McDonough and Hickman, 1999). Fish communities are used to evaluate ecological conditions because of their importance in the aquatic food web and because fish life cycles are long enough to integrate conditions over time. Benthic macroinvertebrate populations are assessed using the Reservoir Benthic Index (RBI) methodology. Because benthic macroinvertebrates are relatively immobile, negative impacts to aquatic ecosystems can be detected earlier in benthic macroinvertebrate communities than in fish communities. These data are used to supplement RFAI results to provide a more thorough examination of differences in aquatic communities upstream and downstream of thermal discharges.

TVA initiated a study to evaluate fish and benthic macroinvertebrate communities in areas immediately upstream and downstream of SQN during 1999-2008 using RFAI and RBI multi-metric evaluation techniques. This report presents the results of autumn 2008 RFAI and RBI data collected upstream and downstream of SQN with comparisons to RFAI and RBI data collected at these sites during autumn 1999-2007.

TVA's Spring Sport Fish Survey (SSS) data from 2008 is also included as supplemental information on the overall health of sport fisheries in Chickamauga Reservoir. The TVA SSS is conducted to evaluate the sport fish population of TVA Reservoirs. The results of the survey are used by state agencies to protect, improve and assess the quality of sport fisheries. Predominant habitat types in the reservoir are surveyed to determine sport fish abundance. In addition to

accommodating TVA and state databases, this surveying method aligns with TVA Watershed Team and TVA's Reservoir Operations Study objectives. Sample sites are selected using the shoreline habitat characteristics employed by the Watershed Teams. The survey predominantly targets three species of black bass (largemouth, smallmouth, and spotted bass) and black and white crappie. These species are the predominant sport fish sought after by fishermen.

Plant Description

Sequoyah Nuclear Power Plant (SQN) is located on the right (west) bank of Chickamauga Reservoir at Tennessee River Mile (TRM) 484.5. SQN is about 18 miles northeast of Chattanooga, TN and about 13 river miles upstream of Chickamauga dam (Figure 1).

SQN Unit 1 began commercial operation in on July 1, 1981, and Unit 2 began commercial operation on June 1, 1982. Net operating capacity is about 2,300 MW of electricity. Waste heat load is about 4,800 MW of thermal energy.

Waste heat is transferred to the condenser cooling water (CCW), pumped from the river at TRM 485.1 (Figure 2). This heat is then dissipated either to the atmosphere using two natural-draft cooling towers, to the river through a two-leg submerged multiport diffuser located at TRM 483.6, or by a combination of the two. With both units operating at maximum power, maximum water demand is 2558 cfs.

Methods

Fish and Benthic Macroinvertebrate Sample Locations Upstream and Downstream of SQN

Two sample locations, one upstream and one downstream of the plant discharge, were selected in Chickamauga Reservoir. The SQN discharge enters the Tennessee River TRM 483.6. For the fish community, the downstream site was centered at TRM 482.0 (Figure 3) and the upstream sample site was centered at TRM 490.5 (Figure 4). For the benthic macroinvertebrate community, transects across the full width of the reservoir were established at TRM 482.0 (downstream) and TRM 490.5 (upstream).

Fish Community Sampling Methods and Data Analysis for Sites Upstream and Downstream of SQN

Fish sampling methods included boat electro-fishing and gill netting (Hubert, 1996; Reynolds, 1996). Electro-fishing methodology consisted of fifteen electro-fishing boat runs near the shoreline, each 300 meters long with a duration of approximately 10 minutes each. The total near-shore area sampled is approximately 4,500 meters (15,000 feet).

Experimental gill nets (so called because of their use for research as opposed to commercial fishing) are used as an additional gear type to collect fish from deeper habitats not effectively sampled by electro-fishing. Each experimental gill net consists of five-6.1 meter panels for a total length of 30.5 meters (100.1 feet). The distinguishing characteristic of experimental gill nets is mesh size that varies between panels. For this application, each net has panels with mesh sizes of 2.5, 5.1, 7.6, 10.2, and 12.7 cm. Experimental gill nets are typically set perpendicular to

river flow extending from near-shore to the main channel of the reservoir. Ten overnight experimental gill net sets were used at each area.

Fish collected were identified by species, counted, and examined for anomalies (such as disease, deformations, or hybridization). The resulting data were analyzed using RFAI methodology.

The RFAI uses 12 fish community metrics from four general categories: Species Richness and Composition; Trophic Composition; Abundance; and Fish Health. Individual species can be utilized for more than one metric. Together, these 12 metrics provide a balanced evaluation of fish community integrity. The individual metrics are shown below, grouped by category:

Species Richness and Composition

1. **Total number of species** -- Greater numbers of species are considered representative of healthier aquatic ecosystems. As conditions degrade, numbers of species at an area decline.
2. **Number of centrarchid species** -- Sunfish species (excluding black basses) are invertivores and a high diversity of this group is indicative of reduced siltation and suitable sediment quality in littoral areas.
3. **Number of benthic invertivore species** -- Due to the special dietary requirements of this species group and the limitations of their food source in degraded environments, numbers of benthic invertivore species increase with better environmental quality.
4. **Number of intolerant species** -- This group is made up of species that are particularly intolerant of physical, chemical, and thermal habitat degradation. Higher numbers of intolerant species suggest the presence of fewer environmental stressors.
5. **Percentage of tolerant individuals** (excluding Young-of-Year) -- This metric signifies poorer water quality with increasing proportions of individuals tolerant of degraded conditions.
6. **Percentage dominance by one species** -- Ecological quality is considered reduced if one species inordinately dominates the resident fish community.
7. **Percentage of non-native species** -- Based on the assumption that non-native species reduce the quality of resident fish communities.
8. **Number of top carnivore species** -- Higher diversity of piscivores is indicative of the availability of diverse and plentiful forage species and the presence of suitable habitat.

Trophic Composition

9. **Percent of individuals as top carnivores** -- A measure of the functional aspect of top carnivores which feed on major planktivore populations.
10. **Percentage of individuals as omnivores** -- Omnivores are less sensitive to environmental stresses due to their ability to vary their diets. As trophic links are disrupted due to degraded conditions, specialist species such as insectivores decline while opportunistic omnivorous species increase in relative abundance.

Abundance

11. **Average number per run** -- (number of individuals) -- This metric is based upon the assumption that high quality fish assemblages support large numbers of individuals.

Fish Health

12. **Percentage individuals with anomalies** -- Incidence of diseases, lesions, tumors, external parasites, deformities, blindness, and natural hybridization are noted for all fish measured, with higher incidence indicating less favorable environmental conditions.

RFAI methodology addresses all four attributes or characteristics of a "balanced indigenous population" defined by the CWA, as described below:

(1) **A biotic community characterized by diversity appropriate to the ecoregion**: Diversity is addressed by the metrics in the Species Richness and Composition category, especially metric 1 – Total number of species. Determination of reference conditions based on the inflow zones of lower mainstem Tennessee River reservoirs (as described below) ensures appropriate species expectations for the ecoregion.

(2) **The capacity for the community to sustain itself through cyclic seasonal change**: TVA uses an autumn data collection period for biological indicators, both VS and upstream/downstream monitoring. Autumn monitoring is used to document condition or health after being subjected to the wide variety of stressors throughout the year. One of the main benefits of using biological indicators is their ability to integrate stressors through time. Examining the condition or health of a community at the end of the "biological year" (i.e., autumn) provides insights into how well the community has dealt with the stresses through an annual seasonal cycle. Likewise, evaluation of the condition of individuals in the community (in this case, individual fish as reflected in Metric 12) provides insights into how well the community can be expected to withstand stressors through winter. Further, multiple sampling years during the permit renewal cycle adds to the evidence of whether or not the autumn monitoring approach has correctly demonstrated the ability of the community to sustain itself through repeated seasonal changes.

(3) **The presence of necessary food chain species**: Integrity of the food chain is measured by the Trophic Composition metrics, with support from the Abundance metric and Species Richness and Composition metrics. Existence of a healthy fish community indicates presence of necessary food chain species because the fish community is comprised of species that utilize multiple feeding mechanisms that transcend various levels in the aquatic food web. Basing evaluations on a sound multi-metric system such as the RFAI enhances the ability to discern alterations in the aquatic food chain.

(4) **A lack of domination by pollution-tolerant species**: Domination by pollution-tolerant species is measured by metrics 3 (Number of benthic invertivore species), 4 (Number of intolerant species), 5 (Percentage of tolerant individuals), 6 (Percentage dominance by one species), and 10 (Percentage of individuals as omnivores).

Scoring categories are based on "expected" fish community characteristics in the absence of human-induced impacts other than impoundment of the reservoir. These categories were developed from historical fish assemblage data representative of transition zones from upper mainstem Tennessee River reservoirs (Hickman and McDonough, 1996). Attained values for each of the 12 metrics were compared to the scoring criteria and assigned scores to represent relative degrees of degradation: least degraded (5); intermediate degraded (3); and greatest degraded (1). Scoring criteria for upper mainstem Tennessee River reservoirs is shown in Table 1.

If a metric was calculated as a percentage (e.g., Percent tolerance individuals), the data from electro-fishing and gill netting were scored separately and allotted half the total score for that individual metric. Individual metric scores for a sampling area (i.e., upstream or downstream) are summed to obtain the RFAI score for the area.

TVA uses RFAI results to determine maintenance of BIP using 2 approaches. One is "absolute" in that it compares the RFAI scores and individual metrics to predetermined values. The other is "relative" in that it compares RFAI scores attained downstream to the upstream control site. The "absolute" approach is based on Jennings et al. (1995) who suggested that favorable comparisons of the attained RFAI score from the potential impact zone to a predetermined criterion can be used to identify the presence of normal community structure and function and hence existence of BIP. For multi-metric indices, TVA uses two criteria to ensure a conservative screening of BIP. First, if an RFAI score reaches 70% of the highest attainable score of 60 (adjusted upward to include sample variability as described below), and second, if fewer than half of RFAI metrics receive a low (1) or moderate (3) score, then normal community structure and function would be present indicating that BIP had been maintained, thus no further evaluation would be needed.

RFAI scores range from 12 to 60. Ecological health ratings (12-21 ["Very Poor"], 22-31 ["Poor"], 32-40 ["Fair"], 41-50 ["Good"], or 51-60 ["Excellent"]) are then applied to scores. As discussed in detail below, the average variation for RFAI scores in TVA reservoirs is 6 ($\pm$ 3). Therefore, any location that attains an RFAI score of 45 (42 plus the upward sample variation of 3) or higher would be considered to have BIP. It must be stressed that scores below this threshold do not necessarily reflect an adversely impacted fish community. The threshold is used to serve as a conservative screening level; i.e., any fish community that meets these criteria is obviously not adversely impacted. RFAI scores below this level would require a more in-depth look to determine if BIP exists. An inspection of individual RFAI metric results and species of fish used in each metric would be an initial step to help identify if operation of SQN is a contributing factor. This approach is appropriate because a validated multi-metric index is being used and scoring criteria applicable to the zone of study are available.

A difference in RFAI scores attained at the downstream area compared to the upstream (control) area is used as one basis for determining presence or absence of impacts on the resident fish community from SQN's operations. The definition of "similar" is integral to accepting the validity of these interpretations. The Quality Assurance (QA) component of the Vital Signs monitoring program deals with how well the RFAI scores can be repeated and is accomplished by collecting a second set of samples at 15%-20% of the areas each year. Comparison of paired-sample QA data collected over seven years shows that the difference in RFAI index scores

ranges from 0 to 18 points. The mean difference between these 54 paired scores is 4.6 points with 95% confidence limits of 3.4 and 5.8. The 75th percentile of the sample differences is 6, and the 90th percentile is 12. Based on these results, a difference of 6 points or less in the overall RFAI scores is the value selected for defining "similar" scores between upstream and downstream fish communities. That is, if the downstream RFAI score is within 6 points of the upstream score and if there are no major differences in overall fish community composition, then the two locations are considered similar. It is important to bear in mind that differences greater than 6 points can be expected simply due to method variation (i.e., 25% of the QA paired sample sets exceeded a difference of 6). An examination of the 12 metrics (with emphases on fish species used for each metric) is conducted to determine any difference in scores and the potential for the difference to be thermally related.

Benthic Macroinvertebrate Community Sampling Methods and Data Analysis for Sites Upstream and Downstream of SQN

Ten benthic grab samples were collected at equally spaced points along the upstream and downstream transects. A Ponar sampler was used for most samples but a Peterson sampler was used when heavier substrate was encountered. Collection and processing techniques followed standard VS procedures. Bottom sediments were washed on a 533μ screen; organisms were then picked from the screen and remaining substrate and identified in the field to Order or Family level without magnification. Benthic community results were evaluated using seven community characteristics or metrics. Results for each metric were assigned a rating of 1, 3, or 5 depending upon how they scored based on reference conditions developed for VS reservoir inflow sample sites. The ratings for the seven metrics were summed to produce a benthic score for each sample site. Potential scores ranged from 7 to 35. Ecological health ratings (7-12 "Very Poor", 13-18 "Poor", 19-23 "Fair", 24-29 "Good", or 30-35 "Excellent") are then applied to scores.

A similar or higher benthic index score at the downstream site compared to the upstream site is used as basis for determining absence of impact on the benthic macroinvertebrate community related to SQN's thermal discharge. The QA component of VS monitoring shows that the comparison of benthic index scores from 49 paired sample sets collected over the past seven years range from 0 to 14 points, the 75th percentile is 4, the 90th percentile is 6. The mean difference between these 49 paired scores is 3.1 points with 95% confidence limits of 2.2 and 4.1. Based on these results, a difference of 4 points or less is the value selected for defining "similar" scores between upstream and downstream benthic communities. That is, if the downstream benthic score is within 4 points of the upstream score, the communities will be considered similar and it will be concluded that SQN has had no effect. Once again, it is important to bear in mind that differences greater than 4 points can be expected simply due to method variation (25% of the QA paired sample sets exceeded that value). When such occurs, a metric-by-metric examination will be conducted to determine what caused the difference in scores and the potential for the difference to be thermally related.

Spring Sport Fish Survey

A spring sportfish survey was conducted on Chickamauga Reservoir March 18-20, 2008. Sampling was conducted using boat mounted electrofishing gear at twelve sites in Harrison Bay and Sale Creek. Typically, there are three locations sampled on Chickamauga Reservoir, but due to inclement weather conditions, the Ware Branch site was not sampled during 2008. Sampling

effort at each site consisted of thirty minutes of continuous electrofishing in the littoral zones of prominent habitat types present. After being stunned, fish were collected with dip nets, counted, weighed, measured, and then released unharmed.

Results of the SSS monitoring were calculated using Shoreline Assessment Habitat Index (SAHI), Relative Stock Density (RSD), Proportional Stock Density (PSD), and Relative Weight (Wr). Habitat type is evaluated using the SAHI metric and is a critical component incorporated into the SSS. The resultant habitat designations ("Good", "Fair", and "Poor") are correlated to black bass abundance (numbers/hour). RSD is the number of fish greater than a minimum preferred length in a stock divided by the number of fish greater than or equal to a minimum stock size. PSD is the number of fish greater than or equal to a minimum quality length in a sample divided by the number of fish greater than or equal to a minimum stock length. Wr is an index that quantifies fish condition and the preferred range value is 90%-105% for moderate density bass populations such as those found in the Tennessee Valley latitudes.

Results and Discussion

Fish Community

In 2008, fish community RFAI scores of 38 ("Fair") and 34 ("Fair") were observed at the downstream and upstream stations, respectively (Table 2). Neither site met BIP screening criteria, but were within the 6 point range of acceptable variation and are considered similar.

An examination of the autumn 2008 RFAI showed that all or a portion of three metrics (number of species, number of intolerant species, and the electrofishing portion of percent omnivores) scored lower at the upstream site while the downstream site scored lower for a portion of one metric (electrofishing portion of percent anomalies) (Table 2).

A discussion of the individual metric scores follows (refer to Tables 2, 3, and 4):

1. Total number of Species: At the sampling areas downstream of SQN, 30 species were collected, while 27 species were collected at areas upstream of SQN. Six native species (longnose gar, bluntnose minnow, mooneye, brook silverside, steelcolor shiner, and sauger) and one non-native species (common carp) were collected at the downstream area that were not encountered at the upstream area, while three native species (green sunfish, smallmouth buffalo, and bullhead minnow) were collected at the upstream area that were not encountered at the site downstream of SQN. The downstream site received the highest score for this metric while the upstream site received the mid-range score.

2. Number of Centrarchid Species (less Micropterus): Seven centrarchid species were collected at the downstream site while eight centrarchid species were collected at the upstream site (2 green sunfish were collected upstream but not downstream). Both sites received the highest score for this metric.

3. Number of benthic invertivore species: The same three benthic invertivore species were collected upstream and downstream of SQN. Both sites received the lowest score for this metric.

4. Number of intolerant species: Five intolerant species were encountered at the downstream site, while 3 intolerant species were collected upstream of SQN (brook silverside and mooneye were collected downstream but not upstream). The downstream site received the highest score for this metric, while the upstream site received the mid-range score.

5. Percent tolerant individuals: Both sites received the lowest score for the electrofishing and gill net portions of this metric. Low scores were the result of high percentages of bluegill and gizzard shad in the electrofishing samples and gizzard shad in the gill net samples at both sites.

6. Percent dominance by one species: Both sites received the lowest score for the electrofishing and gill net portions of this metric. Low scores were the result of high percentages of bluegill in the electrofishing samples and gizzard shad in the gill net samples at both sites.

7. Percent non-native fish: Both the upstream and downstream sites received the lowest score for the electrofishing portion of this metric primarily due to collection of inland silversides. No non-native species were collected in gill net samples at either site.

8. Number of top carnivores: Eleven species of top carnivores were collected downstream of SQN while nine species were collected upstream (longnose gar and sauger were collected downstream but not upstream). Both sites received the highest score for this metric.

9. Percent top carnivores: Both sites received the lowest score for the electrofishing portion of this sample due to low percentages of top carnivore species. Gill net samples at both sites contained considerably higher percentages of top carnivores and both sites received the mid-range score for this portion of the metric.

10. Percent of omnivore species: The downstream site had a much lower percentage of omnivores in the electrofishing samples resulting in the highest score for this portion of the metric. The upstream site scored 1 point lower due to a higher percentage of gizzard shad. Both sites received the lowest score for the gill net portion of this metric, predominately due to high percentages of gizzard shad.

11. Overall fish abundance: This metric is measured by the average number of fish caught for each electro-fishing and gill net effort. Average catch per unit effort was low at both sites in electrofishing and gill net samples. Both sites received the lowest score for the electrofishing portion and the mid-range score for the gill net portion of the metric.

12. Percent anomalies: Both the upstream and downstream sites received the highest score for the gill net portion of this metric due to a low percentage of observed anomalies (i.e. visible lesions, bacterial and fungal infections parasites, muscular and skeletal deformities, and hybridization). The downstream site had 1% more anomalies in the electrofishing samples resulting in a one point lower score for this portion of the metric.

As discussed above, RFAI scores have an intrinsic variability of ±3 points. This variability comes from various sources, including annual variations in air temperature and stream flow;

variations in pollutant loadings from nonpoint sources; changes in habitat, such as extent and density of aquatic vegetation; natural population cycles and movements of the species being measured (TWRC, 2006). Another source of variability arises from the fact that nearly any practical measurement, lethal or non-lethal, of a biological community is a sample rather than a measurement of the entire population. As long as the score is within the 6-point range, there is no certainty that any real change has taken place beyond method variability.

It is important to note that the upstream site is scored with transition criteria and the downstream site is scored using forebay criteria (Table 1). More accurate comparisons can be made between sites that are located in the same reservoir zone (i.e., transition to transition). Due to the location of SQN, it is not possible to have an upstream and downstream site within the same reservoir zone. SQN is located at the downstream end of the transition zone on Chickamauga Reservoir; therefore the downstream site is located in the upstream section of the forebay. The physical and chemical composition of a forebay is different than that of a transition; consequently, inherent differences exist among the aquatic communities (e.g. species diversity is often higher in a transition than a forebay zone).

Over the ten sample years, the upstream site has averaged a score of 45 ("Good") while the downstream site has averaged a score of 42 ("Good"), indicating the sites were similar annually and that the SQN heated effluent is not adversely affecting the fish community in the vicinity of the plant (Table 5). During 2008, the upstream site scored ten points lower than the previous year while the downstream score remained the same. This was the only site in Chickamauga Reservoir that exhibited a RFAI score decrease. RFAI scores are presented for the Chickamauga Reservoir inflow site (TRM 529.0), the forebay site (TRM 472.3), and the Hiwassee River embayment site (HiRM 8.5) to provide additional information of the health of the fish community throughout the reservoir; however, aquatic communities at these sites are not affected by SQN temperature effects and are not used to determine BIP in relation to SQN (Table 5). The average RFAI scores at these three sites over all sampling years have remained in the "Good" range.

Individual metric scores and overall RFAI scores for the upstream and downstream sampling sites of SQN for sample years 1999-2007 are listed in Appendix 1 (A-I). Species collected and catch per effort during electrofishing and gill netting at the upstream and downstream sampling sites of SQN for sample years 1999-2007 are listed in Appendix 2 (A-R).

Benthic Macroinvertebrate Community

Benthic macroinvertebrate data collected during autumn 2008 from TRM 482.0 downstream of SQN and from TRM 490.5 upstream of SQN resulted in a RBI scores of 25 ("Good") and 17 ("Poor"), respectively (Table 6). With the exception of 2000, the downstream site has scored in the "Good" to "Excellent" ecological health range for all sampling years (Table 7). The upstream site has received it lowest scores during 2007 and 2008. A difference of 4 points or less between upstream and downstream stations is used to define "similar" conditions between the two sites. Scores for these two sites exceeded a difference of 4 points during 2001 and 2008 when the downstream site received a >4 point higher score. These data indicate that a healthy benthic macroinvertebrate community exists in the downstream vicinity of SQN and that the plant is not adversely impacting this fauna.

Table 8 provides density by taxon from the 2008 samples at these sites. There were distinct differences in the benthic macroinvertebrate communities between the two sites during 2008. The downstream site contained a much higher proportion of taxa that are considered long-lived (8 Hexagenia mayflies $\geq$ 10 mm, 17 snails, 2 mussels, and 13 Corbicula $\geq$ 10 mm). Oligochaetes and chironomids, considered tolerant of poor water quality, were the most abundant organisms at the upstream site. Both the benthic macroinvertebrate and fish communities in the upstream vicinity of Sequoyah Nuclear Plant exhibit an impact. Because a decrease in RFAI and RBI scores were observed upstream from SQN but not downstream, it is probable that an impact unrelated to the SQN heated discharge is causing this decline.

RBI scores for the inflow, forebay, and Hiwassee River embayment sites are included to provide additional data on the overall health of the benthic macroinvertebrate community in Chickamauga Reservoir (Table 7). RBI scores have averaged "Good" for the inflow and forebay sites and "Fair" for the Hiwassee River embayment over all sample years.

Spring Sport Fish Survey

A total of 12 hours of electrofishing resulted in collection of 750 largemouth bass, 89 spotted bass, and 20 smallmouth bass; of these, 72.4% were harvestable size ($\geq$10 inches). Overall catch rate (71.5 fish/hour) was higher than the 2007 catch rate (61.1) and substantially more than the long term average (Table 9). The largest black bass collected was a 9.5 pound largemouth bass taken from Sale Creek. Large bass were well represented with 59 bass greater than three pounds, 33 greater than four pounds, and 17 over five pounds. Length frequency histograms illustrated a bimodal distribution of black bass with the dominant size classes being the 7-8 inch and 11-14 inch groups (Figure 5). All size classes up to 24 inches were represented in the population.

Habitat type is derived from the SAHI which was developed by TVA's Resource Stewardship Program. The resultant habitat designations (Good, Fair, and Poor) are correlated to black bass abundance (numbers/hour). Among the two areas sampled, the correlations at Harrison Bay were positive (96, 67 and 44 at good, fair and poor habitat types, respectively) whereas Sale Creek showed some variability among habitat types, *i.e.*, the catch rates (abundance) did not align with the habitat designation types (Table 10). Overall catch rates for the reservoir were 86, 79 and 47 fish/hour at the good, fair and poor habitats, respectively, illustrating a positive correlation of black bass density to habitat type reservoir-wide.

The following results describe the quality and condition of black bass collected in Chickamauga Reservoir during spring 2008: The RSD value (22) was within the desirable range (10-25) (Figure 6). The PSD value (65) was also within the preferred range (40-70) (Figure 7). Wr values shown in Figure 8 are designated by inch groups which reflect the classical categories, i.e., 0-7 = substock, 8-11 = stock, 12-14 = quality, 15-19 = preferred, 20-24 = memorable and 25+ = trophy. All categories, except trophy, fell within the desired range, which indicates a balanced population structure. Largemouth bass length frequency histograms illustrated a bimodal distribution with the 8 inch size class (age-2) and 11 and 12 inch class (age-3) being the dominant size classes (Figure 5).

Only 152 crappie (122 black and 30 white crappie) were collected during the survey. Crappie were collected predominantly from tree tops, stumps and other physical structures in shallow water. Optimum water temperatures for crappie spawning occurred earlier in the spring of 2008.

Chickamauga Reservoir Flow and Temperature Near SQN

Average weekly flows from Watts Bar Dam from October 2007 to October 2008 are shown in Figure 9. Weekly average flows were less than the 30-year long-term weekly average during the majority of the year. During 2007, the Tennessee Valley experienced the most extreme drought conditions recorded during the past 118 years. Even with the low flow conditions, 2008 aquatic monitoring downstream from SQN resulted in higher scores for both fish and benthic macroinvertebrates compared to the site located upstream from SQN.

Daily average water temperatures recorded upstream of the SQN intake and downstream of SQN discharge, October 2007 through October 2008, are shown in Figure 10. Water temperatures remained within permitted limits throughout the year.

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Table 1. Scoring criteria (2002) for forebay, transition, and inflow sections of Upper Mainstream Tennessee River reservoirs. Upper Mainstream reservoirs include Chickamauga, Fort Loudoun, Melton Hill, Nickajack, Tellico, and Watts Bar.

		Scoring Criteria								
		Forebay			Transition			Inflow		
Metric	Gear	1	3	5	1	3	5	1	3	5
1. Total species	Combined	<14	14-27	>27	<15	15-29	>29	<14	14-27	>27
2. Total Centrarchid species	Combined	<2	2-4	>4	<2	2-4	>4	<3	3-4	>4
3. Total benthic invertivores	Combined	<4	4-7	>7	<4	4-7	>7	<3	3-6	>6
4. Total intolerant species	Combined	<2	2-4	>4	<2	2-4	>4	<2	2-4	>4
5. Percent tolerant individuals	Electrofishing	>62%	31-62%	<31%	>62%	31-62%	<31%	>58%	29-58%	<29%
	Gill netting	>28%	14-28%	<14%	>32%	16-32%	<16%			
6. Percent dominance by 1 species	Electrofishing	>50%	25-50%	<25%	>40%	20-40%	<20%	>46%	23-46%	<23%
	Gill netting	>29%	15-29%	<15%	>28%	14-28%	<14%			
7. Percent non-native species	Electrofishing	>4%	2-4%	<2%	>6%	3-6%	<3%	>17%	8-17%	<8%
	Gill netting	>16%	8-16%	<8%	>9%	5-9%	<5%			
8. Total top carnivore species	Combined	<4	4-7	>7	<4	4-7	>7	<3	3-6	>6
9. Percent top carnivores	Electrofishing	<5%	5-10%	>10%	<6%	6-11%	>11%	<11%	11-22%	>22%
	Gill netting	<25%	25-50%	>50%	<26%	26-52%	>52%			
10. Percent omnivores	Electrofishing	>49%	24-49%	<24%	>44%	22-44%	<22%	>55%	27-55%	<27%
	Gill netting	>34%	17-34%	<17%	>46%	23-46%	<23%			
11. Average number per run	Electrofishing	<121	121-241	>241	<105	105-210	>210	<51	51-102	>102
	Gill netting	<12	12-24	>24	<12	12-24	>24			
12. Percent anomalies	Electrofishing	>5%	2-5%	<2%	>5%	2-5%	<2%	>5%	2-5%	<2%
	Gill netting	>5%	2-5%	<2%	>5%	2-5%	<2%			

Table 2. Individual Metric Scores and the Overall RFAI Scores Downstream (TRM 482.0) and Upstream (TRM 490.5) of Sequoyah Nuclear Plant Discharge, Autumn 2008.

Autumn 2008	TRM 482.0		TRM 490.5	
Metric	**Obs**	**Score**	**Obs**	**Score**
A. Species richness and composition				
1. Number of species (Tables 3 and 4)	**30 species**	**5**	**27 species**	**3**
2. Number of centrarchid species (less Micropterus)	**7 species** Bluegill Redbreast sunfish Longear sunfish Redear sunfish Warmouth Black crappie White crappie	**5**	**8 species** Green sunfish Bluegill Redbreast sunfish Longear sunfish Redear sunfish Warmouth Black crappie White crappie	**5**
3. Number of benthic invertivore species	**3 species** Spotted sucker Freshwater drum Logperch	**1**	**3 species** Spotted sucker Freshwater drum Logperch	**1**
4. Number of intolerant species	**5 species** Spotted sucker Longear sunfish Smallmouth bass Brook silverside Mooneye	**5**	**3 species** Spotted sucker Longear sunfish Smallmouth bass	**3**

Table 2. (Continued)

Autumn 2008 Metric		TRM 482.0 Obs	Score	TRM 490.5 Obs	Score
5. Percent tolerant individuals	Electrofishing	**80.7%** Bluegill 58.2% Gizzard shad 9.0% Redbreast sunfish 7.8% Largemouth bass 1.8% Spotfin shiner 1.7% Bluntnose minnow 1.2% Golden shiner 0.9% Common carp 0.2%	**0.5**	**86.7%** Bluegill 54.0% Gizzard shad 27.6% Redbreast sunfish 1.9% Largemouth bass 1.6% Spotfin shiner 0.5% Golden shiner 1.1% Green sunfish 0.2%	**0.5**
	Gill Netting	**41.9%** Gizzard shad 38.2% Largemouth bass 2.1% White crappie 0.5% Longnose gar 0.5%	**0.5**	**47.5%** Gizzard shad 44.2% Largemouth bass 2.8% White crappie 0.6%	**0.5**
6. Percent dominance by one species	Electrofishing	**58.2%** Bluegill	**0.5**	**53.9%** Bluegill	**0.5**
	Gill Netting	**38.2%** Gizzard shad	**0.5**	**44.2%** Gizzard shad	**0.5**
7. Percent non-native species	Electrofishing	**2.3%** Inland silverside 1.9% Yellow perch 0.2% Common carp 0.2%	**1.5**	**4%** Inland silverside 3.9% Yellow perch 0.08%	**1.5**
	Gill Netting	**0%**	**2.5**	**0%**	**2.5**

Table 2. (Continued)

Autumn 2008		TRM 482.0		TRM 490.5	
Metric		**Obs**	**Score**	**Obs**	**Score**
8. Number of top carnivore species		**11 species** Spotted gar Longnose gar Largemouth bass Spotted bass Smallmouth bass White bass Yellow bass Flathead catfish White crappie Black crappie Sauger	**5**	**9 species** Spotted gar Largemouth bass Spotted bass Smallmouth bass White bass Yellow bass Flathead catfish White crappie Black crappie	**5**
B. Trophic composition					
9. Percent top carnivores	Electrofishing	**4.7%** Largemouth bass 1.8% Spotted bass 1.7% Smallmouth bass 0.2% Spotted gar 0.8% Black crappie 0.3%	**0.5**	**5.4%** Largemouth bass 1.6% Spotted bass 1.1% Smallmouth bass 0.6% Spotted gar 0.9% Black crappie 0.6% Flathead catfish 0.6%	**0.5**
	Gill Netting	**47.1%** Largemouth bass 2.1% Spotted bass 23.0% White bass 1.6% Yellow bass 7.3% Flathead catfish 1.0% White crappie 0.5% Black crappie 10.5% Sauger 0.5% Longnose gar 0.5%	**1.5**	**40.3%** Largemouth bass 2.8% Spotted bass 1.1% White bass 1.1% Yellow bass 20.4% Flathead catfish 2.2% White crappie 0.6% Black crappie 12.2%	**1.5**

Table 2. (Continued)

Autumn 2008 Metric		TRM 482.0 Obs	Score	TRM 490.5 Obs	Score
10. Percent omnivores	Electrofishing	**13.1%** Gizzard shad 9.0% Golden shiner 0.9% Channel catfish 1.5% Bluntnose minnow 1.2% Blue catfish 0.3% Common carp 0.2%	**2.5**	**29%** Gizzard shad 27.6% Golden shiner 1.1% Channel catfish 0.2% Smallmouth buffalo 0.8%	**1.5**
	Gill Netting	**47.1%** Gizzard shad 38.2% Blue catfish 6.3% Channel catfish 2.6%	**0.5**	**49.2%** Gizzard shad 44.2% Blue catfish 3.9% Channel catfish 1.1%	**0.5**
C. Fish abundance and health					
11. Average number per run	Electrofishing	**79.7**	**0.5**	**86.3**	**0.5**
	Gill Netting	**19.1**	**1.5**	**18.1**	**1.5**
12. Percent anomalies	Electrofishing	**2.1%**	**1.5**	**1.1%**	**2.5**
	Gill Netting	**0%**	**2.5**	**0%**	**2.5**
Overall RFAI Score			**38** **Fair**		**34** **Fair**

*TRM 482 scored with forebay criteria, TRM 490.5 scored with transition criteria (Refer to Table 1).
RFAI Scores: 12-21 ("Very Poor"), 22-31 ("Poor"), 32-40 ("Fair"), 41-50 ("Good"), or 51-60 ("Excellent")

Table 3. Species Collected, Trophic level, Native and Tolerance Classification, Catch Per Effort During Electrofishing and Gill Netting at Areas Downstream of Sequoyah Nuclear Plant Discharge, Autumn 2008.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Longnose gar	*Lepisosteus osseus*	TC	.	X	TOL	.	.	.	0.10	1	1
Gizzard shad	*Dorosoma cepedianum*	OM	.	X	TOL	7.20	30.08	108	7.30	73	181
Common carp	*Cyprinus carpio*	OM	.	.	TOL	0.13	0.56	2	.	.	2
Golden shiner	*Notemigonus crysoleucas*	OM	.	X	TOL	0.73	3.06	11	.	.	11
Spotfin shiner	*Cyprinella spiloptera*	IN	.	X	TOL	1.33	5.57	20	.	.	20
Bluntnose minnow	*Pimephales notatus*	OM	.	X	TOL	0.93	3.90	14	.	.	14
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	6.20	25.91	93	0.10	1	94
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	46.33	193.59	695	.	.	695
Largemouth bass	*Micropterus salmoides*	TC	.	X	TOL	1.40	5.85	21	0.40	4	25
White crappie	*Pomoxis annularis*	TC	X	X	TOL	.	.	.	0.10	1	1
Mooneye	*Hiodon tergisus*	IN	.	X	INT	.	.	.	0.10	1	1
Spotted sucker	*Minytrema melanops*	BI	.	X	INT	0.33	1.39	5	0.10	1	6
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	1.27	5.29	19	.	.	19
Smallmouth bass	*Micropterus dolomieu*	TC	.	X	INT	0.13	0.56	2	.	.	2
Brook silverside	*Labidesthes sicculus*	IN	.	X	INT	0.07	0.28	1	.	.	1
Emerald shiner	*Notropis atherinoides*	IN	.	X	TOL	0.27	1.11	4	.	.	4
Spotted gar	*Lepisosteus oculatus*	TC	.	X	.	0.60	2.51	9	.	.	9
Threadfin shad	*Dorosoma petenense*	PK	.	X	.	1.47	6.13	22	0.10	1	23
Steelcolor shiner	*Cyprinella whipplei*	IN	.	X	.	0.07	0.28	1	.	.	1
Blue catfish	*Ictalurus furcatus*	OM	.	X	.	0.27	1.11	4	1.20	12	16
Channel catfish	*Ictalurus punctatus*	OM	.	X	.	1.20	5.01	18	0.50	5	23
Flathead catfish	*Pylodictis olivaris*	TC	.	X	.	.	.	.	0.20	2	2
White bass	*Morone chrysops*	TC	.	X	.	.	.	.	0.30	3	3
Yellow bass	*Morone mississippiensis*	TC	.	X	.	.	.	.	1.40	14	14
Warmouth	*Lepomis gulosus*	IN	X	X	.	0.07	0.28	1	.	.	1
Redear sunfish	*Lepomis microlophus*	IN	X	X	.	5.73	23.96	86	.	.	86
Spotted bass	*Micropterus punctulatus*	TC	.	X	.	1.33	5.57	20	4.40	44	64
Hybrid bass	*Hybrid micropterus sp.*	TC	.	X	.	0.07	0.28	1	.	.	1
Black crappie	*Pomoxis nigromaculatus*	TC	X	X	.	0.20	0.84	3	2.00	20	23
Yellow perch	*Perca flavescens*	IN	.	.	.	0.13	0.56	2	.	.	2
Freshwater drum	*Aplodinotus grunniens*	BI	.	X	.	0.40	1.67	6	0.70	7	13
Sauger	*Sander canadensis*	TC	.	X	.	.	.	.	0.10	1	1
Logperch	*Percina caprodes*	BI	.	X	.	0.27	1.11	4	.	.	4
Inland silverside	*Menidia beryllina*	IN	.	.	.	1.53	6.41	23	.	.	23
Total						79.66	332.87	1195	19.1	191	1386
Number Samples						15			10		
Species Collected						27			17		

Table 4. Species Collected, Trophic level, Native and Tolerance Classification, Catch Per Effort During Electrofishing and Gill Netting at Areas Upstream of Sequoyah Nuclear Plant Discharge, Autumn 2008.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Gizzard shad	*Dorosoma cepedianum*	OM		X	TOL	23.80	116.67	357	8.00	80	437
Golden shiner	*Notemigonus crysoleucas*	OM		X	TOL	0.93	4.58	14			14
Spotfin shiner	*Cyprinella spiloptera*	IN		X	TOL	0.40	1.96	6			6
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	1.60	7.84	24			24
Green sunfish	*Lepomis cyanellus*	IN	X	X	TOL	0.13	0.65	2			2
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	46.53	228.10	698			698
Largemouth bass	*Micropterus salmoides*	TC		X	TOL	1.40	6.86	21	0.50	5	26
White crappie	*Pomoxis annularis*	TC	X	X	TOL				0.10	1	1
Spotted sucker	*Minytrema melanops*	BI		X	INT	0.13	0.65	2			2
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	0.07	0.33	1			1
Smallmouth bass	*Micropterus dolomieu*	TC		X	INT	0.53	2.61	8			8
Spotted gar	*Lepisosteus oculatus*	TC		X		0.73	3.59	11			11
Threadfin shad	*Dorosoma petenense*	PK		X		0.20	0.98	3			3
Emerald shiner	*Notropis atherinoides*	IN		X		0.20	0.98	3			3
Bullhead minnow	*Pimephales vigilax*	IN		X		0.60	2.94	9			9
Smallmouth buffalo	*Ictiobus bubalus*	OM		X		0.07	0.33	1			1
Blue catfish	*Ictalurus furcatus*	OM		X					0.70	7	7
Channel catfish	*Ictalurus punctatus*	OM		X		0.20	0.98	3	0.20	2	5
Flathead catfish	*Pylodictis olivaris*	TC		X		0.53	2.61	8	0.40	4	12
White bass	*Morone chrysops*	TC		X					0.20	2	2
Yellow bass	*Morone mississippiensis*	TC		X					3.70	37	37
Warmouth	*Lepomis gulosus*	IN	X	X		0.07	0.33	1			1
Redear sunfish	*Lepomis microlophus*	IN	X	X		2.80	13.73	42	1.30	13	55
Spotted bass	*Micropterus punctulatus*	TC		X		0.93	4.58	14	0.20	2	16
Black crappie	*Pomoxis nigromaculatus*	TC	X	X		0.53	2.61	8	2.20	22	30
Yellow perch	*Perca flavescens*	IN				0.07	0.33	1			1
Logperch	*Percina caprodes*	BI		X		0.27	1.31	4			4
Freshwater drum	*Aplodinotus grunniens*	BI		X		0.13	0.65	2	0.60	6	8
Inland silverside	*Menidia beryllina*	IN				3.40	16.67	51			51
Total						86.25	422.87	1294	18.1	181	1475
Number Samples						15			10		
Species Collected						25			12		

Table 5. Summary of RFAI Scores from Sites Located Directly Upstream and Downstream of Sequoyah Nuclear Plant as Well as Scores from Sampling Conducted During 1993-2008 as Part of the Vital Signs Monitoring Program in Chickamauga Reservoir.

Station	Location	1993	1994	1995	1997	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Average
Inflow	TRM 529.0	52	52	44	44	42	44	46	48	48	42	42	42	42	44	45
Transition SQN Upstream	TRM 490.5	49	40	46	39	45	46	45	51	42	49	48	47	44	34	45
Forebay SQN Downstream	TRM 482.0	---	---	---	---	41	48	46	43	45	41	39	37	38	38	42
Forebay	TRM 472.3	44	44	47	39	45	45	48	46	43	43	46	43	41	41	44
Hiwassee River Embayment	ERM 8.5	47	39	39	40	43	43	47	---	36	42	45	---	41	---	42

RFAI Scores: 12-21 ("Very Poor"), 22-31 ("Poor"), 32-40 ("Fair"), 41-50 ("Good"), or 51-60 ("Excellent")

Table 6. Individual Metric Ratings and the Overall RBI Field Scores for Upstream and Downstream Sampling Sites Near Sequoyah Nuclear Plant, Chickamauga Reservoir, Autumn 2008.

	Downstream TRM 482.0		Upstream TRM 490.5	
Metric	**Obs**	**Rating**	**Obs**	**Rating**
1. Average number of taxa	5.8	5	5.4	5
2. Proportion of samples with long-lived organisms	0.6	3	0.3	1
3. Average number of EPT taxa	0.6	3	0.1	1
4. Average proportion of oligochaete individuals	21.7	3	16.7	3
5. Average proportion of total abundance comprised by the two most abundant taxa	83.9	3	95	1
6. Average density excluding chironomids and oligochaetes	166.7	3	31.7	1
7. Zero-samples – proportion of samples containing no organisms	0	5	0	5
Benthic Index Score		**25**		**17**
		Good		**Poor**

Reservoir Benthic Index Scores: 7-12 ("Very Poor"), 13-18 ("Poor"), 19-23 ("Fair"), 24-29 ("Good"), 30-35 ("Excellent")

Table 7. Summary of RBI Scores from Sites Located Directly Upstream and Downstream of Sequoyah Nuclear Plant as Well as Scores from Sampling Conducted During 1993-2008 as Part of the Vital Signs Monitoring Program in Chickamauga Reservoir.

Station	Location	1994	1995	1997	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Average
Inflow	TRM 527.4	---	---	---	---	---	29	27	33	35	31	---	23	23	29
Inflow	TRM 518.0	19	31	25	21	23	29	23	27	35	29	33	25	---	27
Transition SQN Upstream	TRM 490.5	33	29	31	31	23	25	25	31	31	31	27	21	17	27
Forebay SQN Downstream	TRM 482.0	---	---	---	---	23	31	29	29	33	31	31	25	25	29
Forebay	TRM 472.3	31	27	29	25	27	27	21	27	29	27	29	19	25	26
Hiwassee River Embayment	HiRM 8.5	17	27	25	21	---	21	---	31	---	25	---	13	---	23

Reservoir Benthic Index Scores: 7-12 ("Very Poor"), 13-18 ("Poor"), 19-23 ("Fair"), 24-29 ("Good"), 30-35 ("Excellent")

Table 8. Average Mean Density Per Square Meter of Benthic Taxa Collected at Upstream and Downstream Sites Near Sequoyah Nuclear Plant, Chickamauga Reservoir, Autumn 2008.

Taxa	Downstream TRM 482.0	Upstream TRM 490.5
Tubellaria		
Tricladida		
Planariidae	5	---
Oligocheata		
Oligochaetes	133	93
Hirudinea	35	3
Crustacea		
Amphipoda		
Isopoda		
Insecta		
Ephemeroptera		
Mayflies other than Hexagenia		
Ephemeridae		
Hexagenia (≤10 mm)	8	---
Hexagenia (>10 mm)	7	2
Odonata		
Trichoptera		
Caddisflies	15	---
Plecotera		
Stoneflies		
Coeleoptera		
Diptera		
Ceratopogonidae		
Chironomidae		
Chironomids	238	352
Gastropoda		
Snails	17	3
Basommatophora		
Ancylidae		
Bivalvia		
Unionoida		
Unionidae		
Mussels	2	---
Veneroida		
Corbiculidae		
Corbicula (≤10mm)	48	2
Corbicula (>10mm)	13	---
Sphaeriidae		
Fingernail clams	8	20
Dreissenidae		
Dreissena polymorpha	8	---
Density of organisms per meter²	**537**	**475**
Number of samples	**10**	**10**
Total area sampled (meter²)	**0.6**	**0.6**

Table 9. Electrofishing Catch Rates and Population Characteristics of Black Bass Collected During Spring Sport Fish Surveys on Chickamauga Reservoir, 1995-2008.

Year	EF Catch Rate (#/hr.)	Mean Weight (lbs.)	% Harvestable	Bass >4 lbs.	Bass >5 lbs.	Largest bass (lbs.)
2008	71.5	1.6	72.4	33	17	9.5
2007	61.1	1.5	63.2	20	8	6.7
2006	39.4	1.3	71.7	14	7	7.1
2005	72.6	1.3	36.9	15	9	6.2
2004	40.9	1.3	60.2	13	6	6.6
2003	62.0	1.3	65.8	23	8	6.4
2002	57.4	1.1	59.4	9	4	6.6
2001	34.5	0.8	45.2	0	0	2.8
2000	34.4	1	51.2	3	0	4.8
1999	10.6	1.3	60.7	3	1	6.1
1998	37.2	1.1	44.5	9	2	6.6
1997	40.2	1	70.1	8	4	8.7
1996	51	1.2	42.6	13	9	7.9
1995	62	1.2	61.8	28	12	8.3
Average	**48.2**	**1.2**	**57.6**	**14**	**6**	**6.7**

Table 10. Black Bass Catch Per Hour Compared to Habitat Types by Location During Spring Sport Fish Surveys on Chickamauga Reservoir, 2008.

Site	Habitat Designation		
	Good	Fair	Poor
Harrison Bay	96(4)	67(4)	44(4)
Sale Creek	75(4)	90(4)	50(4)

Catch per hour = number of fish collected per hour
( ) = number of transects sampled at each location

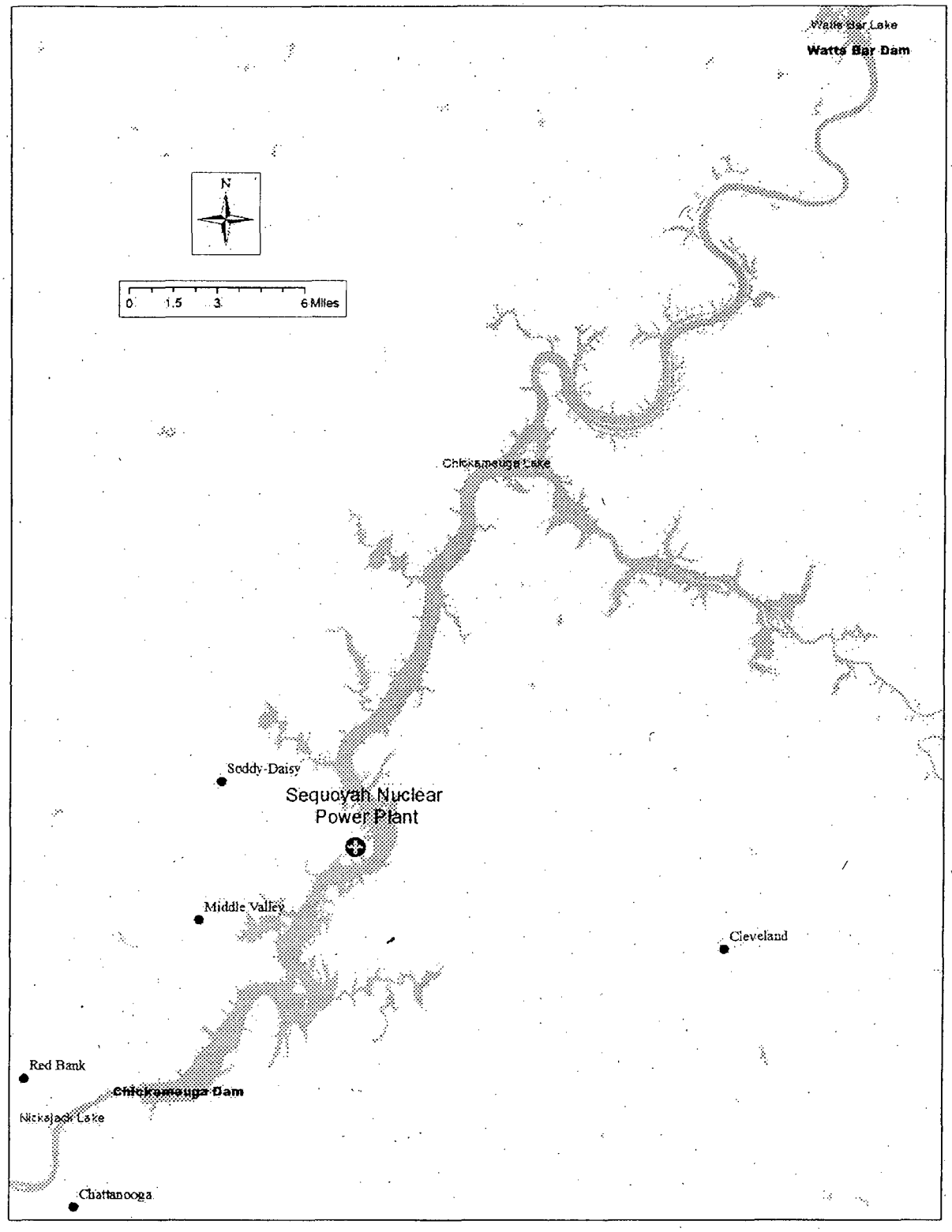


Figure 1. Sequoyah Nuclear Power Plant is located on the west side of Chickamauga Reservoir near the town of Soddy-Daisy at Tennessee River Mile 484.5.

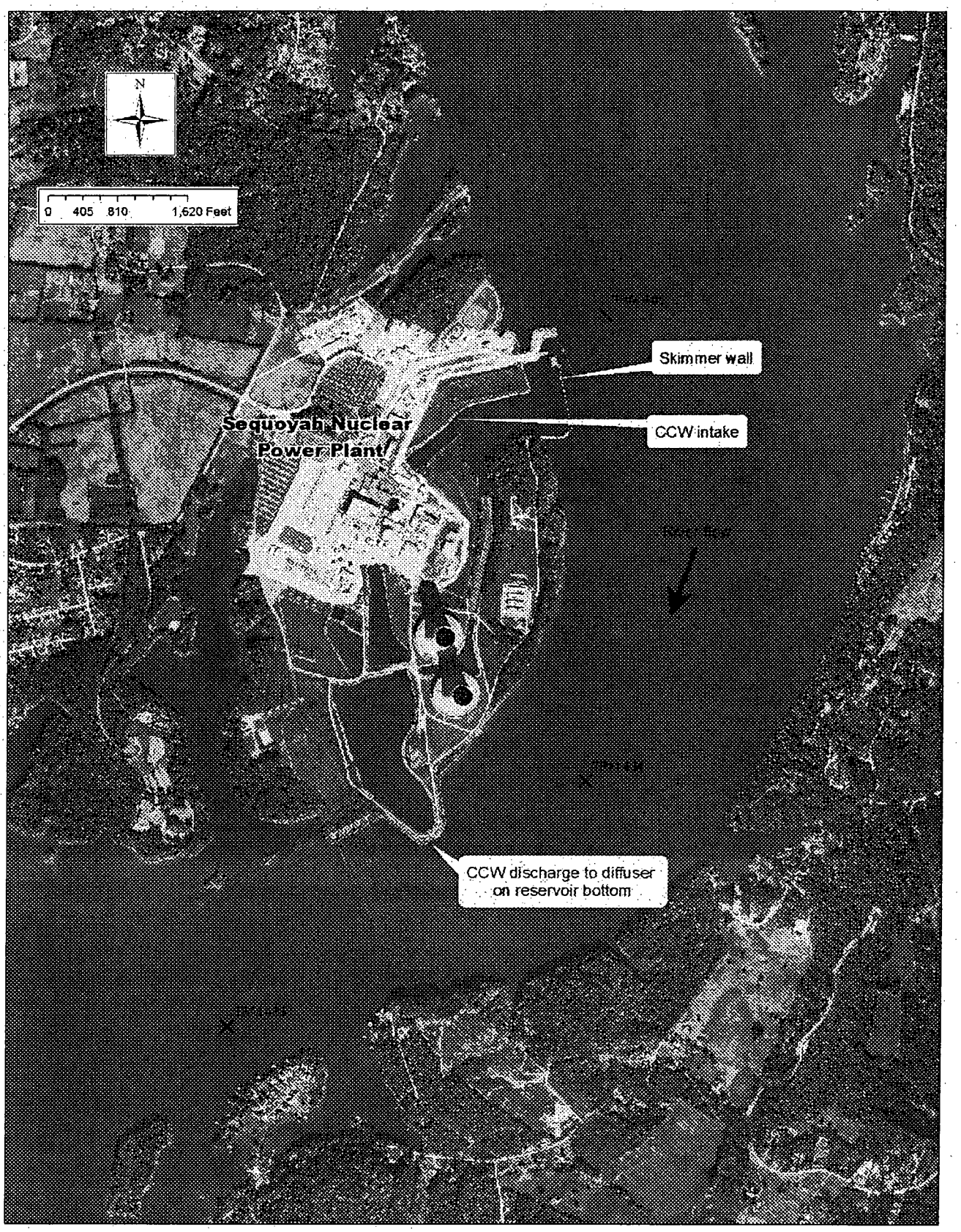
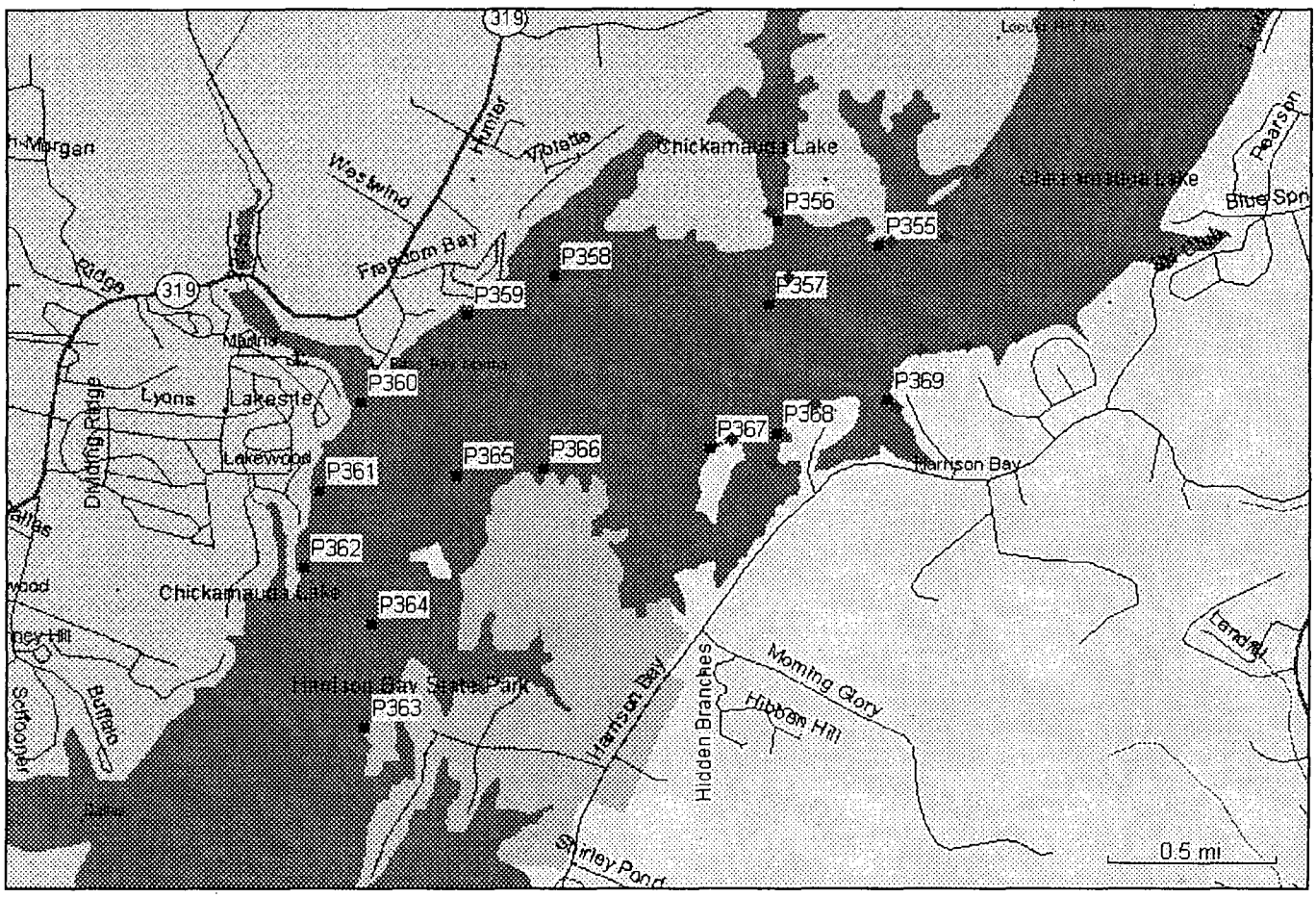
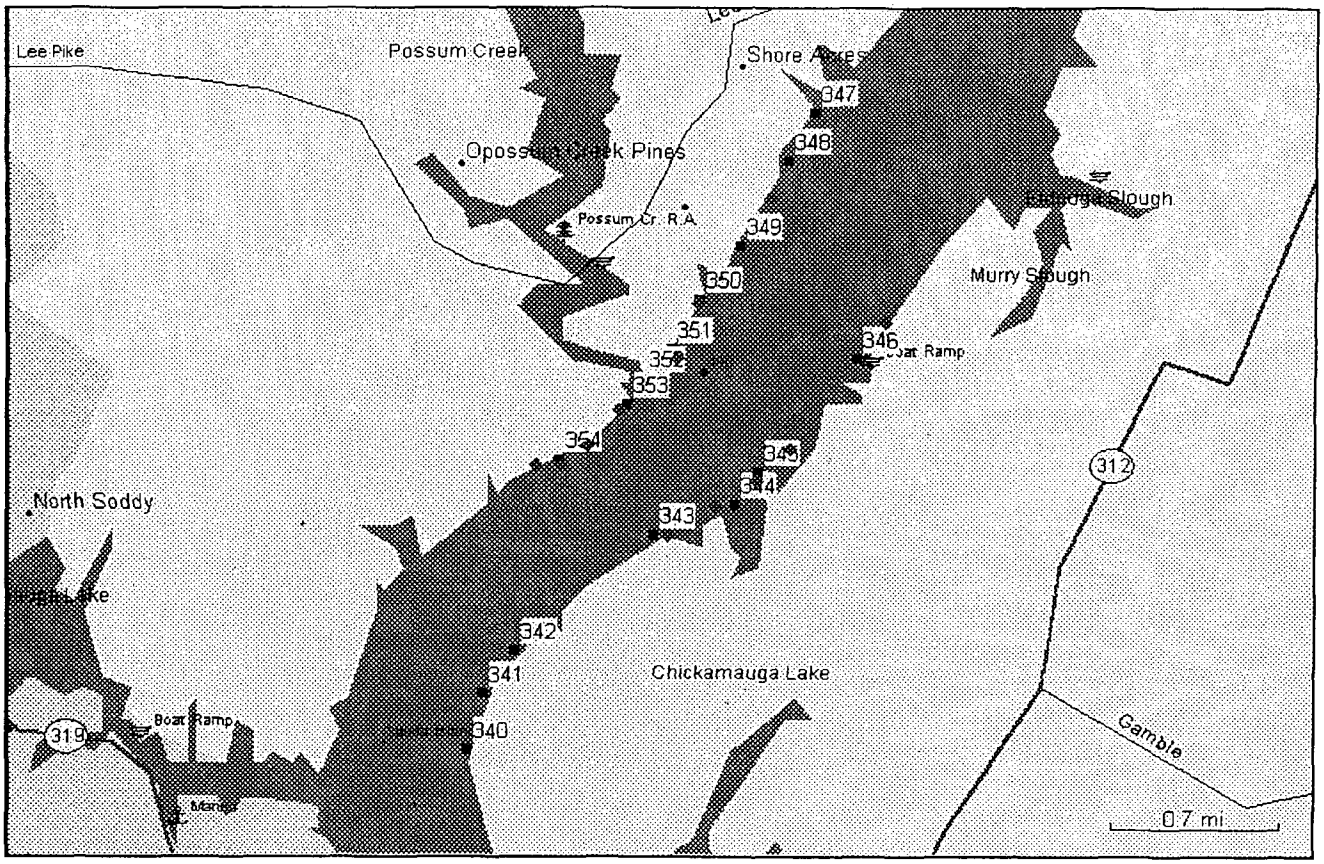


Figure 2. Map of SQN showing location of CCW intake and discharge.



Electrofishing locations				Gill net locations	
P355	N35 12.950	W85 05.569		N35 13.142	W85 05.270
P356	N35 13.017	W85 05.890		N35 12.977	W85 05.366
P357	N35 12.800	W85 05.916		N35 12.966	W85 05.533
P358	N35 12.875	W85 06.586		N35 13.045	W85 05.914
P359	N35 12.775	W85 06.863		N35 12.875	W85 05.860
P360	N35 12.545	W85 07.194		N35 12.448	W85 06.032
P361	N35 12.316	W85 07.325		N35 12.386	W85 05.903
P362	N35 12.115	W85 07.373		N35 12.538	W85 05.775
P363	N35 11.699	W85 07.178		N35 12.532	W85 05.520
P364	N35 11.968	W85 07.161		N35 12.684	W85 05.442
P365	N35 12.355	W85 06.891		N35 12.698	W85 05.293
P366	N35 12.372	W85 06.615		N35 12.720	W85 05.139
P367	N35 12.424	W85 06.096			
P368	N35 12.461	W85 05.889			
P369	N35 12.550	W85 05.543			

Figure 3. RFAI electrofishing and gill net locations downstream of Sequoyah Nuclear Plant. Black squares represent electrofishing locations; red diamonds represent gill net locations.



Electrofishing locations				Gill net locations	
340	N35 16.138	W85 05.848		N35 16.958	W85 04.968
341	N35 16.350	W85 05.781		N35 17.068	W85 04.762
342	N35 16.514	W85 05.641		N35 17.165	W85 04.575
343	N35 16.958	W85 05.028		N35 17.288	W85 04.427
344	N35 17.078	W85 04.674		N35 17.763	W85 04.008
345	N35 17.195	W85 04.573		N35 18.230	W85 04.520
346	N35 17.620	W85 04.139		N35 17.837	W85 04.837
347	N35 18.553	W85 04.326		N35 17.628	W85 04.937
348	N35 18.371	W85 04.437		N35 17.435	W85 05.190
349	N35 18.047	W85 04.654		N35 17.298	W85 05.328
350	N35 17.848	W85 04.828		N35 17.228	W85 05.447
351	N35 17.656	W85 04.953		N35 17.227	W85 05.550
352	N35 17.549	W85 05.083			
353	N35 17.452	W85 05.147			
354	N35.17.247	W85 05.444			

Figure 4. RFAI electrofishing and gill net locations upstream of Sequoyah Nuclear Plant. Black squares represent electrofishing locations; red diamonds represent gill net locations.

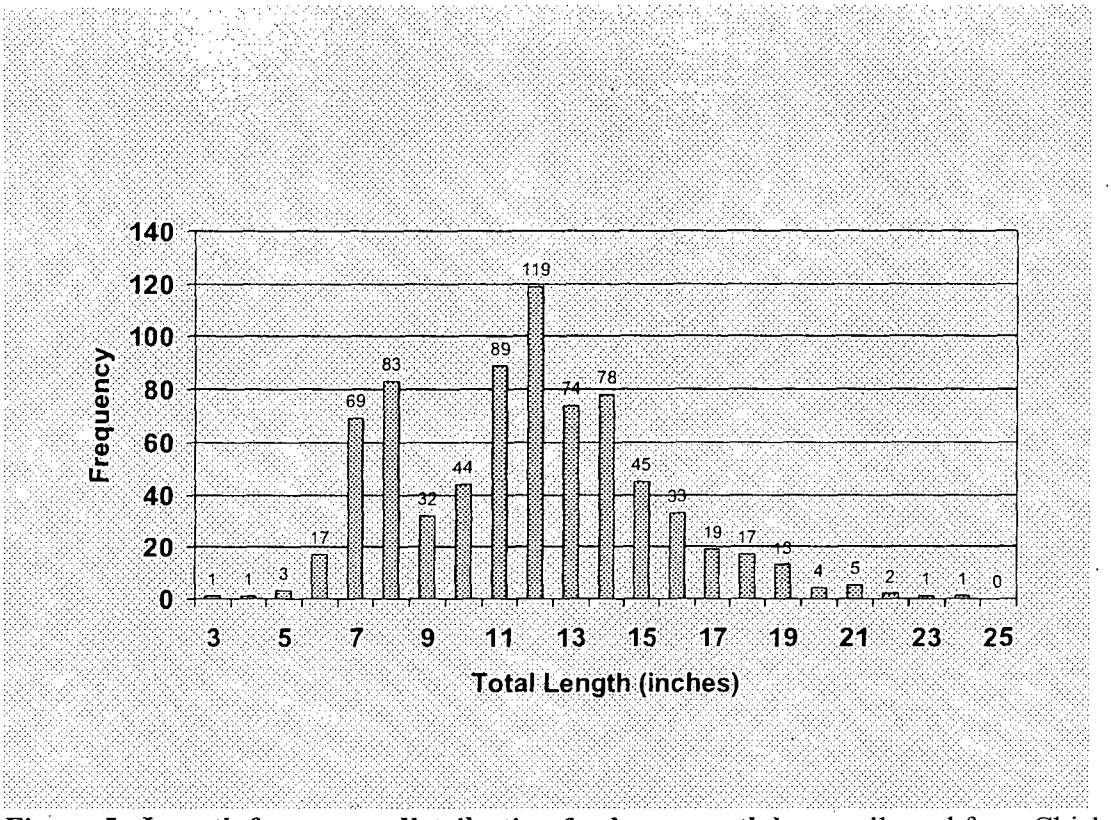


Figure 5. Length frequency distribution for largemouth bass collected from Chickamauga Reservoir (both sites) during the Spring Sport Fish Survey, 2008.

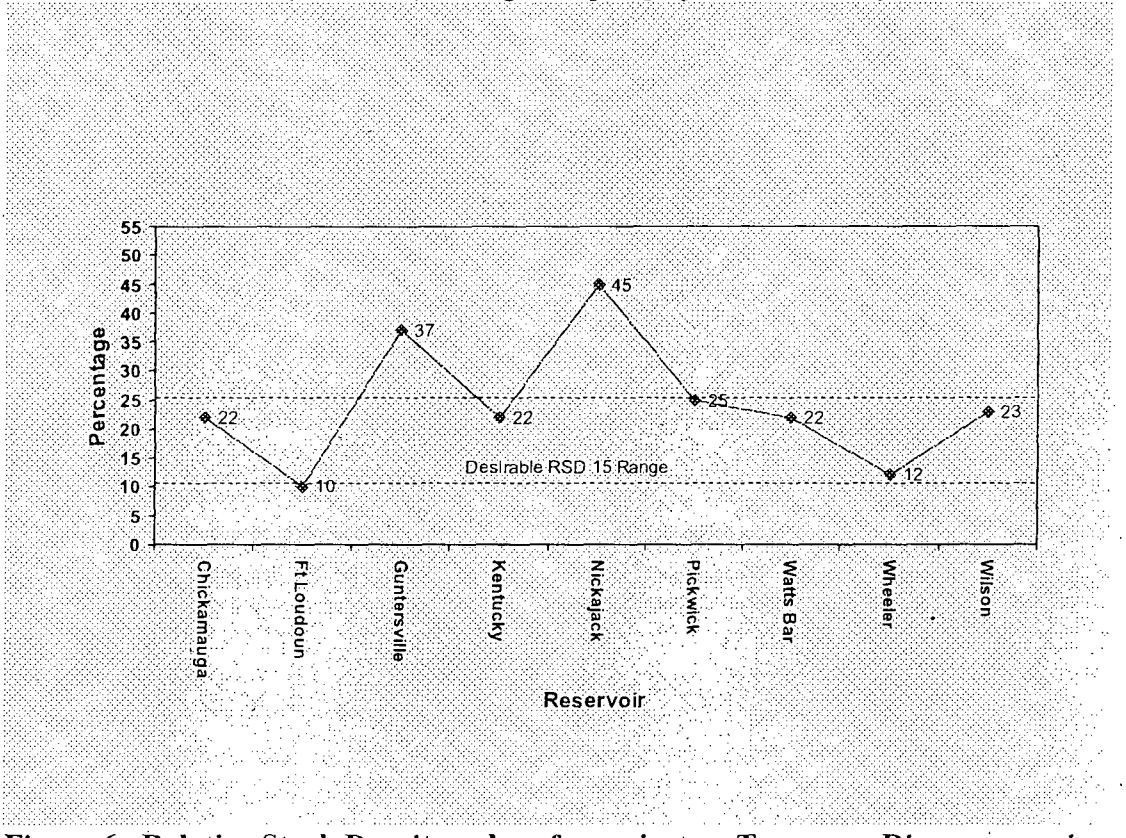


Figure 6. Relative Stock Density values for mainstem Tennessee River reservoirs calculated from 2008 Spring Sport Fish Survey samples.

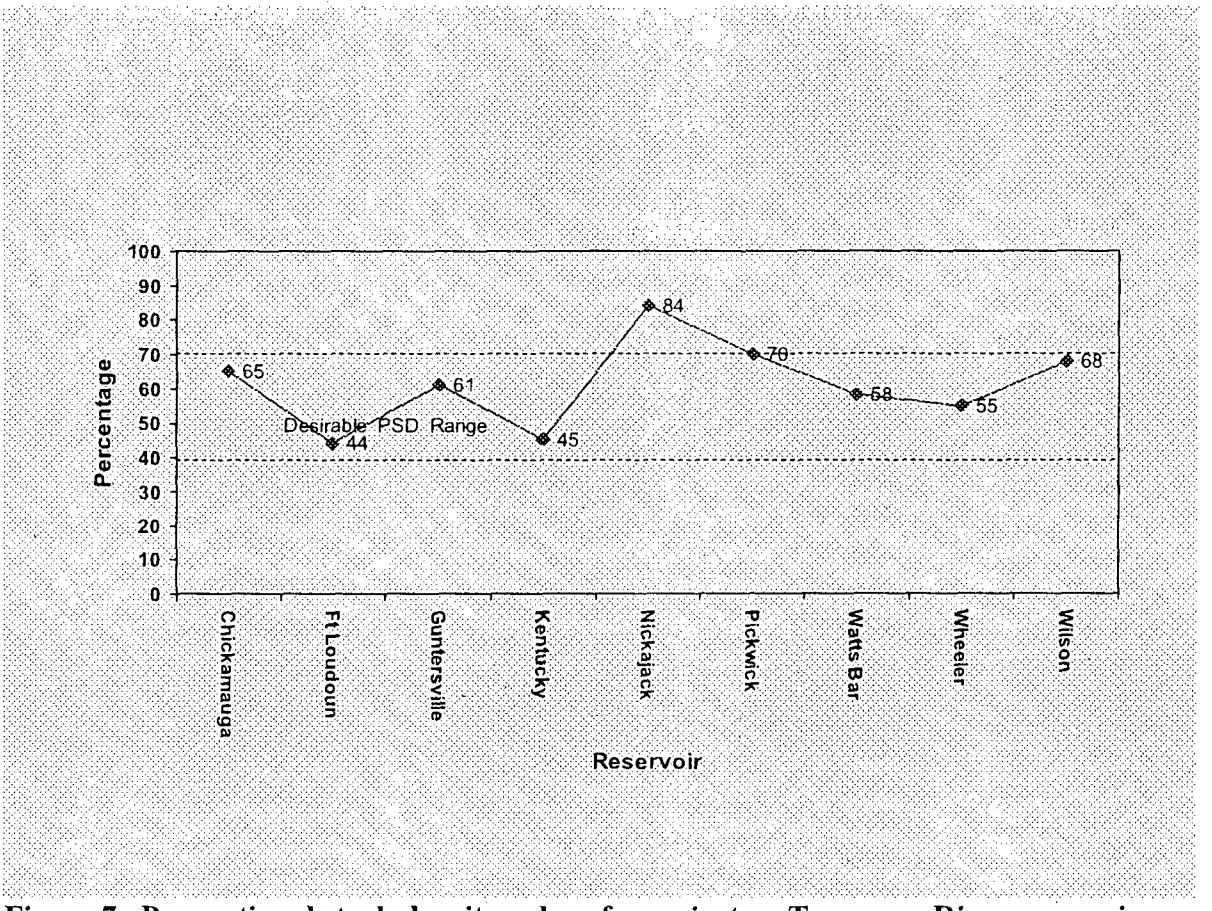


Figure 7. Proportional stock density values for mainstem Tennessee River reservoirs calculated from 2008 Spring Sport Fish Survey samples.

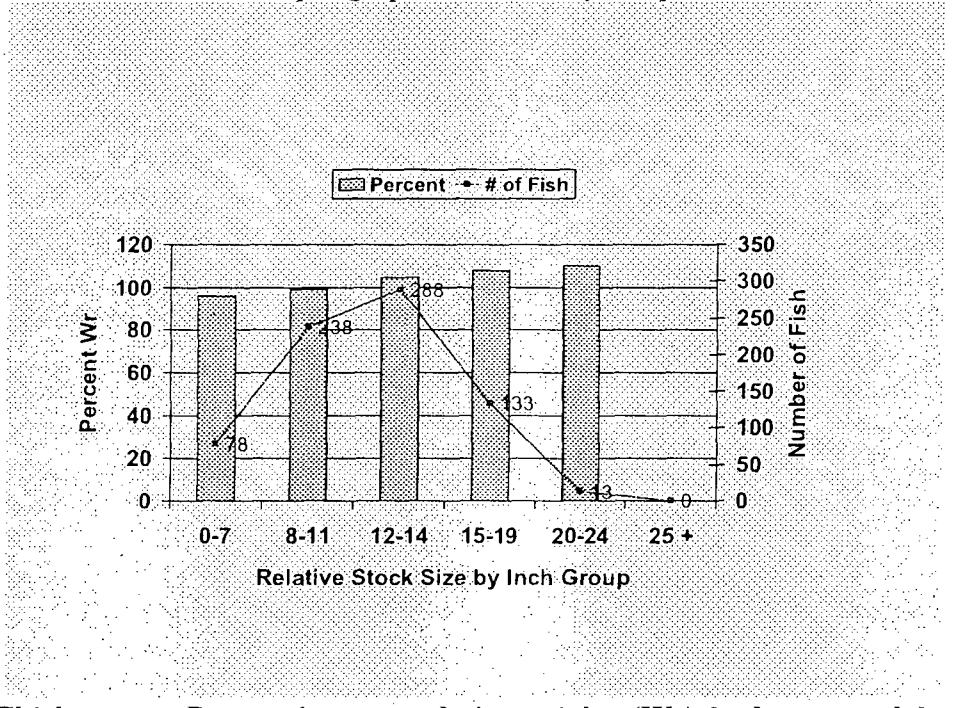


Figure 8. Chickamauga Reservoir mean relative weights (Wr) for largemouth bass by RSD category and number of fish during 2008.

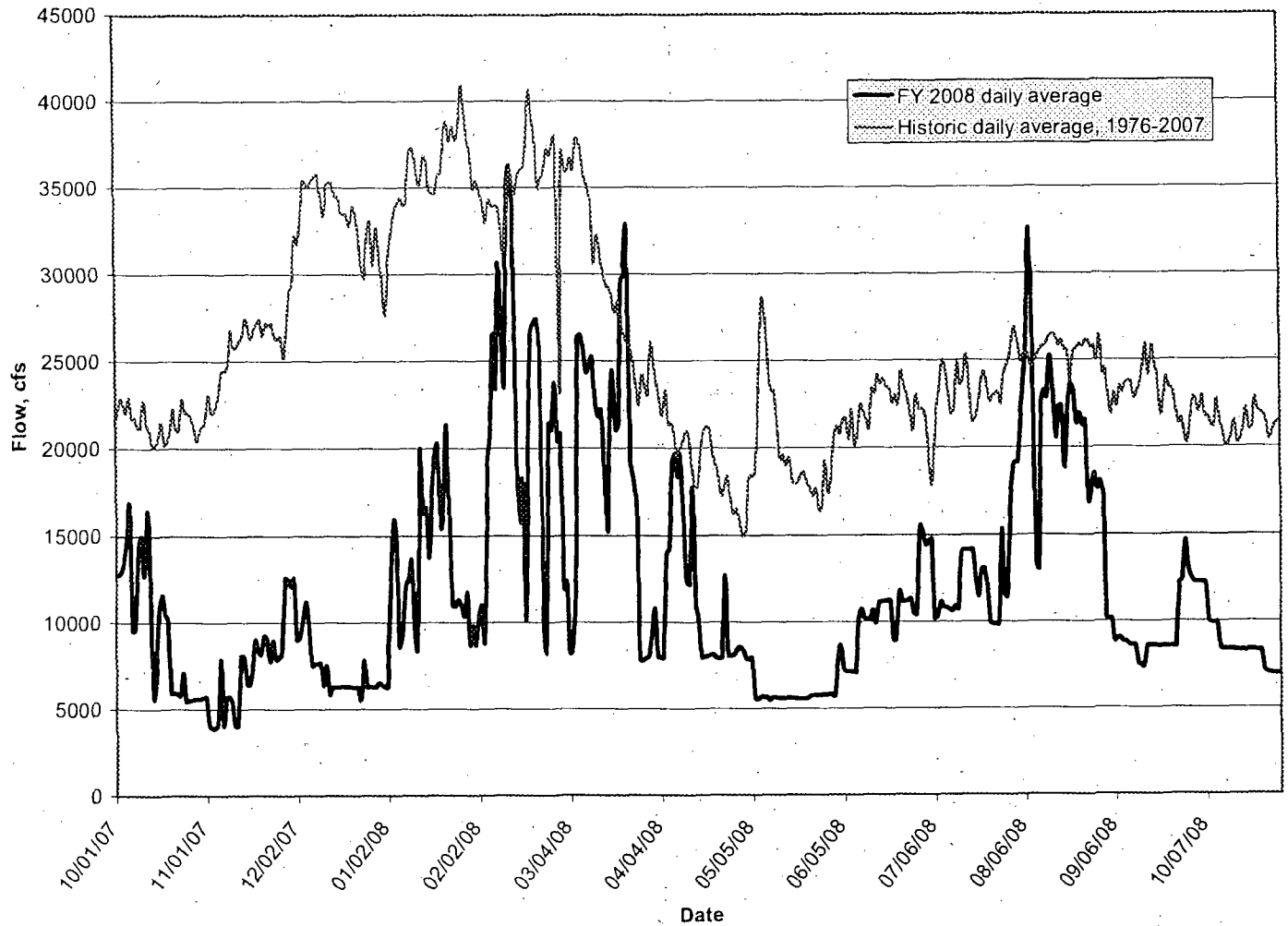


Figure 9. Daily average flows (cfs) from Watts Bar Dam, October 2007 through November 2008 and historic daily flows averaged for the period 1976 through 2007.

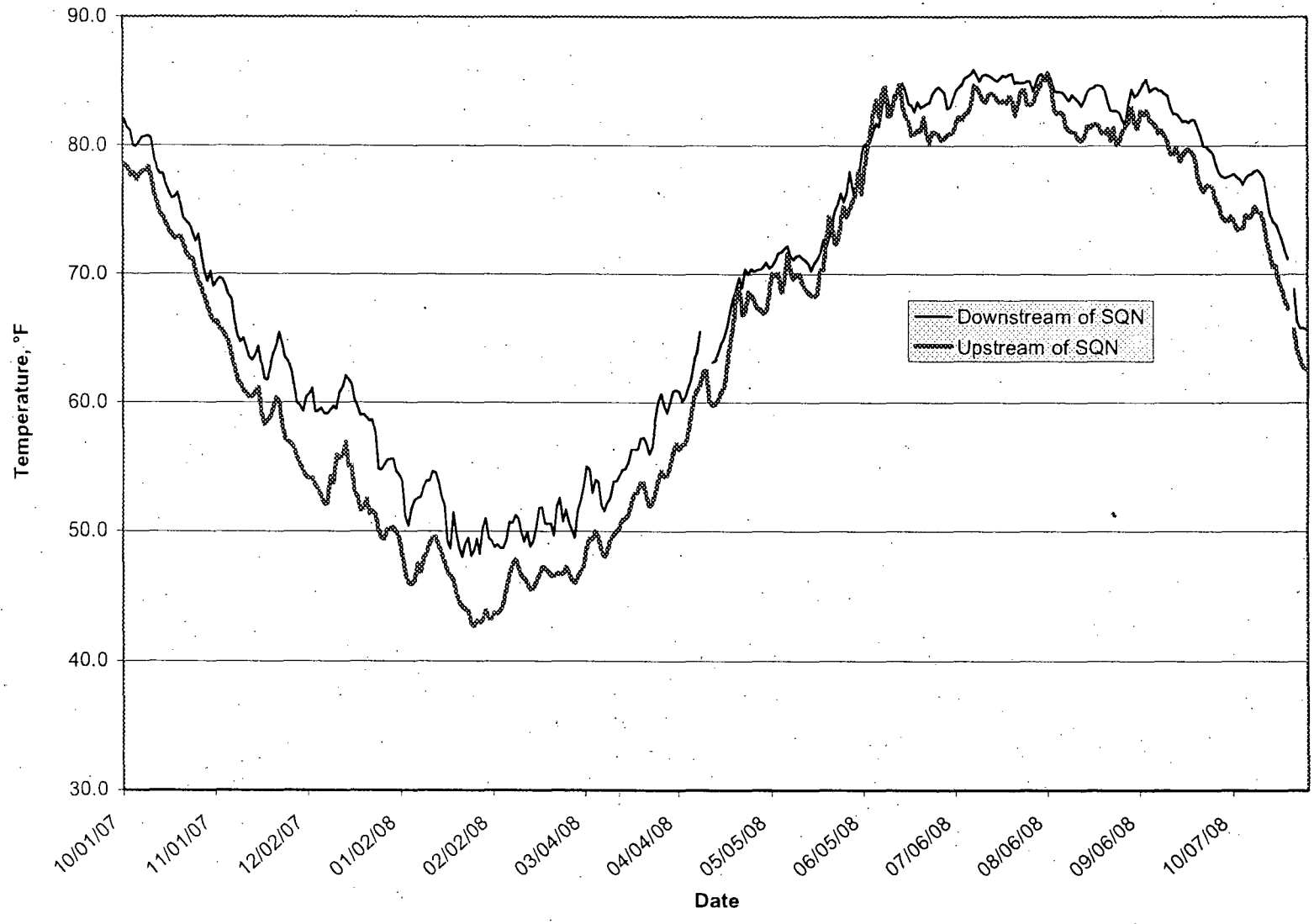


Figure 10. Daily average water temperatures at a depth of five feet, recorded upstream of SQN intake and downstream of SQN discharge, October 2007 through November 2008.

Appendix 1: Historical RFAI Scores

Historical Metric Scores and the Overall RFAI Scores for Areas Upstream and Downstream of Sequoyah Nuclear Plant Discharge, 1999-2007.

Appendix 1-A. Individual Metric Scores and the Overall RFAI Scores for Sites Upstream and Downstream of Sequoyah Nuclear Plant Discharge, Autumn 2007.

Autumn 2007		Downstream TRM 482.0		Upstream TRM 490.5	
Metric		**Obs**	**Score**	**Obs**	**Score**
A. Species richness and composition					
1. Number of species		26	3	31	5
2. Number of centrarchid species		6	5	8	5
3. Number of benthic invertivores		3	1	3	1
4. Number of intolerant species		4	3	4	3
5. Percent tolerant individuals	Electrofishing	75.7	0.5	76.5	0.5
	Gill Netting	37.7	0.5	29	1.5
6. Percent dominance by 1 species	Electrofishing	36.3	1.5	29.7	1.5
	Gill Netting	31.6	0.5	27.7	1.5
7. Percent non-native species	Electrofishing	0.7	2.5	1	2.5
	Gill Netting	0.4	2.5	0	2.5
8. Number of top carnivore species		9	5	11	5
B. Trophic composition					
9. Percent top carnivores	Electrofishing	6.4	1.5	10.7	1.5
	Gill Netting	40.4	1.5	62	2.5
10. Percent omnivores	Electrofishing	22	2.5	33.9	1.5
	Gill Netting	51.3	0.5	27.7	1.5
C. Fish abundance and health					
11. Average number per run	Electrofishing	37.3	0.5	54.9	0.5
	Gill Netting	22.8	1.5	32.1	2.5
12. Percent anomalies	Electrofishing	1.4	2.5	1.6	2.5
	Gill Netting	1.3	2.5	0.6	2.5
Overall RFAI Score			**38**		**44**
			Fair		**Good**

Appendix 1-B. Individual Metric Scores and the Overall RFAI Scores for Sites Upstream and Downstream of Sequoyah Nuclear Plant Discharge, Autumn 2006.

Autumn 2006		Downstream TRM 482.0		Upstream TRM 490.5	
Metric		**Obs**	**Score**	**Obs**	**Score**
A. Species richness and composition					
1. Number of species		27	3	31	5
2. Number of centrarchid species		6	5	7	5
3. Number of benthic invertivores		3	1	4	3
4. Number of intolerant species		3	3	5	5
5. Percent tolerant individuals	Electrofishing	72.4	0.5	70.1	0.5
	Gill Netting	29.6	0.5	30	1.5
6. Percent dominance by 1 species	Electrofishing	33.6	1.5	35.3	1.5
	Gill Netting	22.5	1.5	25.2	1.5
7. Percent non-native species	Electrofishing	0	2.5	0	2.5
	Gill Netting	0	2.5	0	2.5
8. Number of top carnivore species		8	5	10	5
B. Trophic composition					
9. Percent top carnivores	Electrofishing	6.5	1.5	8.3	1.5
	Gill Netting	40.8	1.5	51.2	1.5
10. Percent omnivores	Electrofishing	24.6	1.5	37.2	1.5
	Gill Netting	47.9	0.5	27.2	1.5
C. Fish abundance and health					
11. Average number per run	Electrofishing	60.9	0.5	49.1	0.5
	Gill Netting	14.2	1.5	25	2.5
12. Percent anomalies	Electrofishing	0.4	2.5	0.3	2.5
	Gill Netting	3.5	1.5	0.4	2.5
Overall RFAI Score			**37**		**47**
			Fair		**Good**

Appendix 1-C. Individual Metric Scores and the Overall RFAI Scores for Sites Upstream and Downstream of Sequoyah Nuclear Plant Discharge, Autumn 2005.

Autumn 2005		Downstream TRM 482.0		Upstream TRM 490.5	
Metric		**Obs**	**Score**	**Obs**	**Score**
A. Species richness and composition					
1. Number of species		27	3	30	5
2. Number of centrarchid species		7	5	7	5
3. Number of benthic invertivores		3	1	4	3
4. Number of intolerant species		5	5	7	5
5. Percent tolerant individuals	Electrofishing	70.2	0.5	76.2	0.5
	Gill Netting	43.4	0.5	23	1.5
6. Percent dominance by 1 species	Electrofishing	25.1	1.5	39.4	1.5
	Gill Netting	41	0.5	19.8	1.5
7. Percent non-native species	Electrofishing	0.2	2.5	0.2	2.5
	Gill Netting	0	2.5	0	2.5
8. Number of top carnivore species		9	5	9	5
B. Trophic composition					
9. Percent top carnivores	Electrofishing	7.3	1.5	14.2	2.5
	Gill Netting	34	1.5	45.2	1.5
10. Percent omnivores	Electrofishing	26	1.5	19.9	2.5
	Gill Netting	58	0.5	37.3	1.5
C. Fish abundance and health					
11. Average number per run	Electrofishing	58.5	0.5	41.8	0.5
	Gill Netting	21.5	1.5	12.6	1.5
12. Percent anomalies	Electrofishing	0.9	2.5	0.8	2.5
	Gill Netting	0	2.5	0	2.5
Overall RFAI Score			**39**		**48**
			Fair		**Good**

Appendix 1-D. Individual Metric Scores and the Overall RFAI Scores for Sites Upstream and Downstream of Sequoyah Nuclear Plant Discharge, Autumn 2004.

Autumn 2004		Downstream TRM 482.0		Upstream TRM 490.5	
Metric		**Obs**	**Score**	**Obs**	**Score**
A. Species richness and composition					
1. Number of species		27	3	32	5
2. Number of centrarchid species		6	5	8	5
3. Number of benthic invertivores		3	1	4	3
4. Number of intolerant species		5	5	5	5
5. Percent tolerant individuals	Electrofishing	58.8	1.5	55.1	1.5
	Gill Netting	45.9	0.5	22.9	1.5
6. Percent dominance by 1 species	Electrofishing	30.4	1.5	29.6	1.5
	Gill Netting	29.6	0.5	20.7	1.5
7. Percent non-native species	Electrofishing	0.9	2.5	0.8	2.5
	Gill Netting	0.6	2.5	0.5	2.5
8. Number of top carnivore species		9	5	11	5
B. Trophic composition					
9. Percent top carnivores	Electrofishing	9.6	1.5	19.9	2.5
	Gill Netting	39.6	1.5	50.5	1.5
10. Percent omnivores	Electrofishing	19.4	2.5	15.0	2.5
	Gill Netting	48.4	0.5	33.0	1.5
C. Fish abundance and health					
11. Average number per run	Electrofishing	60.8	0.5	49.3	0.5
	Gill Netting	15.9	1.5	18.8	1.5
12. Percent anomalies	Electrofishing	1.5	2.5	1.2	2.5
	Gill Netting	0	2.5	0.5	2.5
Overall RFAI Score			**41**		**49**
			Good		**Good**

Appendix 1-E. Individual Metric Scores and the Overall RFAI Scores for Sites Upstream and Downstream of Sequoyah Nuclear Plant Discharge, Autumn 2003.

Autumn 2003		Downstream TRM 482.0		Upstream TRM 490.5	
Metric		**Obs**	**Score**	**Obs**	**Score**
A. Species richness and composition					
1. Number of species		25	3	29	3
2. Number of centrarchid species		6	5	8	5
3. Number of benthic invertivores		3	1	3	1
4. Number of intolerant species		5	5	5	5
5. Percent tolerant individuals	Electrofishing	54.7	1.5	67.0	0.5
	Gill Netting	26.4	1.5	29.7	1.5
6. Percent dominance by 1 species	Electrofishing	24.8	2.5	31.2	1.5
	Gill Netting	19.6	1.5	28.1	0.5
7. Percent non-native species	Electrofishing	0.3	2.5	1.1	2.5
	Gill Netting	0.7	2.5	0.8	2.5
8. Number of top carnivore species		11	5	10	5
B. Trophic composition					
9. Percent top carnivores	Electrofishing	11.2	2.5	11.8	2.5
	Gill Netting	37.2	1.5	31.3	1.5
10. Percent omnivores	Electrofishing	20.4	2.5	20.8	2.5
	Gill Netting	39.2	0.5	44.2	1.5
C. Fish abundance and health					
11. Average number per run	Electrofishing	45.7	0.5	41.3	0.5
	Gill Netting	14.8	1.5	24.9	2.5
12. Percent anomalies	Electrofishing	0.3	2.5	1.0	2.5
	Gill Netting	0.7	2.5	6.4	0.5
Overall RFAI Score			**45**		**42**
			Good		**Good**

Appendix 1-F. Individual Metric Scores and the Overall RFAI Scores for Sites Upstream and Downstream of Sequoyah Nuclear Plant Discharge, Autumn 2002.

Autumn 2002		Downstream TRM 482.0		Upstream TRM 490.5	
Metric		**Obs**	**Score**	**Obs**	**Score**
A. Species richness and composition					
1. Number of species		24	3	30	5
2. Number of centrarchid species		7	5	8	5
3. Number of benthic invertivores		3	1	5	3
4. Number of intolerant species		5	5	6	5
5. Percent tolerant individuals	Electrofishing	70.3	0.5	57.9	1.5
	Gill Netting	6.2	2.5	9.8	2.5
6. Percent dominance by 1 species	Electrofishing	30.6	1.5	32.0	1.5
	Gill Netting	42.0	0.5	34.8	0.5
7. Percent non-native species	Electrofishing	0.5	2.5	0.8	2.5
	Gill Netting	3.7	2.5	2.3	2.5
8. Number of top carnivore species		10	5	10	5
B. Trophic composition					
9. Percent top carnivores	Electrofishing	14.3	2.5	16.3	2.5
	Gill Netting	67.9	2.5	81.1	2.5
10. Percent omnivores	Electrofishing	33.5	1.5	18.0	2.5
	Gill Netting	17.3	1.5	11.4	2.5
C. Fish abundance and health					
11. Average number per run	Electrofishing	38.8	0.5	75.3	0.5
	Gill Netting	8.1	0.5	13.2	1.5
12. Percent anomalies	Electrofishing	0.9	2.5	0.6	2.5
	Gill Netting	0	2.5	0	2.5
Overall RFAI Score			**43**		**51**
			Good		**Excellent**

Appendix 1-G. Individual Metric Scores and the Overall RFAI Scores for Sites Upstream and Downstream of Sequoyah Nuclear Plant Discharge, Autumn 2001.

Autumn 2001		Downstream TRM 482.0		Upstream TRM 490.5	
Metric		**Obs**	**Score**	**Obs**	**Score**
A. Species richness and composition					
1. Number of species		29	5	31	5
2. Number of centrarchid species		7	5	8	5
3. Number of benthic invertivores		3	1	3	1
4. Number of intolerant species		5	5	5	5
5. Percent tolerant individuals	Electrofishing	67.7	0.5	60	1.5
	Gill Netting	29.5	0.5	34	0.5
6. Percent dominance by 1 species	Electrofishing	45.4	1.5	17.5	2.5
	Gill Netting	23.6	1.5	28.1	0.5
7. Percent non-native species	Electrofishing	0.1	2.5	2	2.5
	Gill Netting	0	2.5	0.2	2.5
8. Number of top carnivore species		11	5	10	5
B. Trophic composition					
9. Percent top carnivores	Electrofishing	7.4	1.5	13.5	2.5
	Gill Netting	56.8	2.5	49.4	1.5
10. Percent omnivores	Electrofishing	11.4	2.5	28.6	1.5
	Gill Netting	32.4	1.5	32.9	1.5
C. Fish abundance and health					
11. Average number per run	Electrofishing	59.5	0.5	37	0.5
	Gill Netting	35.2	2.5	44.1	2.5
12. Percent anomalies	Electrofishing	1.5	2.5	2.5	1.5
	Gill Netting	1.7	2.5	0	2.5
Overall RFAI Score			**46**		**45**
			Good		**Good**

Appendix 1-H. Individual Metric Scores and the Overall RFAI Scores for Sites Upstream and Downstream of Sequoyah Nuclear Plant Discharge, Autumn 2000.

Autumn 2000		Downstream TRM 482.0		Upstream TRM 490.5	
Metric		Obs	Score	Obs	Score
A. Species richness and composition					
1. Number of species		28	5	23	3
2. Number of centrarchid species		7	5	7	5
3. Number of benthic invertivores		2	1	2	1
4. Number of intolerant species		5	5	5	5
5. Percent tolerant individuals	Electrofishing	66.5	0.5	54.4	1.5
	Gill Netting	4.9	2.5	8	2.5
6. Percent dominance by 1 species	Electrofishing	37.5	1.5	25.1	1.5
	Gill Netting	23	1.5	25.5	1.5
7. Percent non-native species	Electrofishing	0.2	2.5	4.5	1.5
	Gill Netting	1.6	2.5	3.6	2.5
8. Number of top carnivore species		9	5	10	5
B. Trophic composition					
9. Percent top carnivores	Electrofishing	11.2	2.5	23.3	2.5
	Gill Netting	57.4	2.5	78.1	2.5
10. Percent omnivores	Electrofishing	21.4	2.5	20.5	2.5
	Gill Netting	14.8	2.5	4.4	2.5
C. Fish abundance and health					
11. Average number per run	Electrofishing	55.3	0.5	22.1	0.5
	Gill Netting	6.1	0.5	13.7	1.5
12. Percent anomalies	Electrofishing	1.7	2.5	3	1.5
	Gill Netting	1.6	2.5	1.5	2.5
Overall RFAI Score			**48**		**46**
			Good		**Good**

Appendix 1-I. Individual Metric Scores and the Overall RFAI Scores for Sites Upstream and Downstream of Sequoyah Nuclear Plant Discharge, Autumn 1999.

Autumn 2000		Downstream TRM 482.0		Upstream TRM 490.5	
Metric		**Obs**	**Score**	**Obs**	**Score**
A. Species richness and composition					
1. Number of species		25	3	28	3
2. Number of centrarchid species		5	5	6	5
3. Number of benthic invertivores		3	1	4	3
4. Number of intolerant species		5	5	5	5
5. Percent tolerant individuals	Electrofishing	26.3	2.5	38	1.5
	Gill Netting	45.3	0.5	49.2	0.5
6. Percent dominance by 1 species	Electrofishing	21	2.5	16.3	2.5
	Gill Netting	42	0.5	48.4	0.5
7. Percent non-native species	Electrofishing	7.4	0.5	2.4	2.5
	Gill Netting	0	2.5	0	2.5
8. Number of top carnivore species		9	5	10	5
B. Trophic composition					
9. Percent top carnivores	Electrofishing	9.9	1.5	17.8	2.5
	Gill Netting	27.1	1.5	38.1	1.5
10. Percent omnivores	Electrofishing	15.6	2.5	17.8	2.5
	Gill Netting	59.7	0.5	51.2	0.5
C. Fish abundance and health					
11. Average number per run	Electrofishing	16.2	0.5	13.9	0.5
	Gill Netting	18.1	1.5	24.4	2.5
12. Percent anomalies	Electrofishing	0.8	2.5	2.9	1.5
	Gill Netting	0.6	2.5	0	2.5
Overall RFAI Score			**41**		**45**
			Good		**Good**

Appendix 2: Historical Fish Species List

Species Collected and Catch Per Unit Effort During Electrofishing at Areas Upstream and Downstream of Sequoyah Nuclear Plant Discharge, 1999-2007.

Appendix 2-A. Species Collected, Trophic Level, Native and Tolerance Classification, and Catch Per Unit Effort During Electrofishing and Gill Netting Downstream (TRM 482.0) of Sequoyah Nuclear Plant Discharge, Autumn 2007.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Longnose gar	*Lepisosteus osseus*	TC		X	TOL				0.10	1	1
Gizzard shad	*Dorosoma cepedianum*	OM		X	TOL	7.27	34.49	109	7.20	72	181
Common carp	*Cyprinus carpio*	OM			TOL				0.10	1	1
Golden shiner	*Notemigonus crysoleucas*	OM		X	TOL				0.10	1	1
Spotfin shiner	*Cyprinella spiloptera*	IN		X	TOL	1.33	6.33	20			20
Bluntnose minnow	*Pimephales notatus*	OM		X	TOL	0.07	0.32	1			1
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	4.53	21.52	68	0.10	1	69
Green sunfish	*Lepomis cyanellus*	IN	X	X	TOL	0.20	0.95	3			3
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	13.53	64.24	203	0.80	8	211
Largemouth bass	*Micropterus salmoides*	TC		X	TOL	1.33	6.33	20	0.20	2	22
Skipjack herring	*Alosa chrysochloris*	TC		X	INT				1.80	18	18
Spotted sucker	*Minytrema melanops*	BI		X	INT	0.53	2.53	8			8
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	0.60	2.85	9			9
Smallmouth bass	*Micropterus dolomieu*	TC		X	INT	0.07	0.32	1	0.10	1	2
Spotted gar	*Lepisosteus oculatus*	TC		X		0.27	1.27	4	0.10	1	5
Threadfin shad	*Dorosoma petenense*	PK		X		0.13	0.63	2	0.10	1	3
Hybrid shad	*Hybrid dorosoma*	OM		X					0.30	3	3
Emerald shiner	*Notropis atherinoides*	IN		X		2.67	12.66	40			40
Bullhead minnow	*Pimephales vigilax*	IN		X		0.20	0.95	3			3
Golden redhorse	*Moxostoma erythrurum*	BI		X		0.07	0.32	1			1
Blue catfish	*Ictalurus furcatus*	OM		X		0.07	0.32	1	3.20	32	33
Channel catfish	*Ictalurus punctatus*	OM		X		0.80	3.80	12	0.80	8	20
Flathead catfish	*Pylodictis olivaris*	TC		X		0.07	0.32	1	0.40	4	5
Yellow bass	*Morone mississippiensis*	TC		X					3.20	32	32
Redear sunfish	*Lepomis microlophus*	IN	X	X		2.67	12.66	40	0.30	3	43
Spotted bass	*Micropterus punctulatus*	TC		X		0.60	2.85	9	1.20	12	21
Black crappie	*Pomoxis nigromaculatus*	TC	X	X		0.07	0.32	1	2.10	21	22
Yellow perch	*Perca flavescens*	IN				0.13	0.63	2			2
Freshwater drum	*Aplodinotus grunniens*	BI		X					0.60	6	6
Inland silverside	*Menidia beryllina*	IN				0.13	0.63	2			2
Total						37.34	177.24	560	22.80	228	788
Number Samples						15			10		
Species Collected						23			20		

Appendix 2-B. Species Collected, Trophic Level, Native and Tolerance Classification, and Catch Per Unit Effort During Electrofishing and Gill Netting Upstream (TRM 490.5) of Sequoyah Nuclear Plant Discharge, Autumn 2007.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Longnose gar	*Lepisosteus osseus*	TC		X	TOL				0.10	1	1
Gizzard shad	*Dorosoma cepedianum*	OM		X	TOL	16.33	71.64	245	7.70	77	322
Common carp	*Cyprinus carpio*	OM			TOL	0.27	1.17	4			4
Golden shiner	*Notemigonus crysoleucas*	OM		X	TOL	1.67	7.31	25	0.20	2	27
Spotfin shiner	*Cyprinella spiloptera*	IN		X	TOL	0.60	2.63	9			9
Bluntnose minnow	*Pimephales notatus*	OM		X	TOL	0.20	0.88	3			3
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	6.27	27.49	94			94
Green sunfish	*Lepomis cyanellus*	IN	X	X	TOL	0.33	1.46	5			5
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	15.20	66.67	228	0.30	3	231
Largemouth bass	*Micropterus salmoides*	TC		X	TOL	1.13	4.97	17	0.90	9	26
White crappie	*Pomoxis annularis*	TC	X	X	TOL				0.10	1	1
Skipjack herring	*Alosa chrysochloris*	TC		X	INT				3.20	32	32
Spotted sucker	*Minytrema melanops*	BI		X	INT	0.13	0.58	2	0.30	3	5
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	0.87	3.80	13			13
Smallmouth bass	*Micropterus dolomieu*	TC		X	INT	0.33	1.46	5			5
Spotted gar	*Lepisosteus oculatus*	TC		X		1.67	7.31	25	0.10	1	26
Threadfin shad	*Dorosoma petenense*	PK		X		0.07	0.29	1			1
Emerald shiner	*Notropis atherinoides*	IN		X		2.40	10.53	36			36
Bullhead minnow	*Pimephales vigilax*	IN		X		0.07	0.29	1			1
Smallmouth buffalo	*Ictiobus bubalus*	OM		X		0.07	0.29	1	0.10	1	2
Blue catfish	*Ictalurus furcatus*	OM		X					0.70	7	7
Channel catfish	*Ictalurus punctatus*	OM		X		0.07	0.29	1	0.20	2	3
Flathead catfish	*Pylodictis olivaris*	TC		X		1.07	4.68	16	0.10	1	17
White bass	*Morone chrysops*	TC		X					0.20	2	2
Yellow bass	*Morone mississippiensis*	TC		X		0.13	0.58	2	8.90	89	91
Warmouth	*Lepomis gulosus*	IN	X	X		0.27	1.17	4			4
Redear sunfish	*Lepomis microlophus*	IN	X	X		2.93	12.87	44	1.20	12	56
Spotted bass	*Micropterus punctulatus*	TC		X		1.27	5.56	19	0.70	7	26
Hybrid bass	*Hybrid micropterus sp.*	TC		X		0.13	0.58	2			2
Black crappie	*Pomoxis nigromaculatus*	TC	X	X		0.13	0.58	2	5.60	56	58
Yellow perch	*Perca flavescens*	IN				0.07	0.29	1			1
Logperch	*Percina caprodes*	BI		X		0.47	2.05	7			7
Freshwater drum	*Aplodinotus grunniens*	BI		X		0.60	2.63	9	1.40	14	23
Inland silverside	*Menidia beryllina*	IN				0.20	0.88	3			3
Chestnut lamprey	*Ichthyomyzon castaneus*	PS		X					0.10	1	1
Total						54.95	240.93	824	32.10	321	1,145
Number Samples						15			10		
Species Collected						29			20		

Appendix 2-C. Species Collected, Trophic Level, Native and Tolerance Classification, and Catch Per Unit Effort During Electrofishing and Gill Netting Downstream (TRM 482.0) of Sequoyah Nuclear Plant Discharge, Autumn 2006.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Longnose gar	*Lepisosteus osseus*	TC		X	TOL				0.20	2	2
Gizzard shad	*Dorosoma cepedianum*	OM		X	TOL	12.53	54.65	188	3.20	32	220
Golden shiner	*Notemigonus crysoleucas*	OM		X	TOL	0.27	1.16	4	0.20	2	6
Spotfin shiner	*Cyprinella spiloptera*	IN		X	TOL	2.53	11.05	38			38
Bluntnose minnow	*Pimephales notatus*	OM		X	TOL	2.00	8.72	30			30
Western mosquitofish	*Gambusia affinis*	IN		X	TOL	0.07	0.29	1			1
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	4.67	20.35	70			70
Green sunfish	*Lepomis cyanellus*	IN	X	X	TOL	0.07	0.29	1			1
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	20.47	89.24	307	0.50	5	312
Largemouth bass	*Micropterus salmoides*	TC		X	TOL	1.53	6.69	23	0.10	1	24
Skipjack herring	*Alosa chrysochloris*	TC		X	INT				2.10	21	21
Spotted sucker	*Minytrema melanops*	BI		X	INT	0.13	0.58	2	0.10	1	3
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	0.73	3.20	11			11
Spotted gar	*Lepisosteus oculatus*	TC		X		0.13	0.58	2			2
Threadfin shad	*Dorosoma petenense*	PK		X		0.33	1.45	5			5
Hybrid shad	*Hybrid dorosoma*	OM		X					0.50	5	5
Emerald shiner	*Notropis atherinoides*	IN		X		1.73	7.56	26			26
Bullhead minnow	*Pimephales vigilax*	IN		X		0.13	0.58	2			2
Blue catfish	*Ictalurus furcatus*	OM		X					1.50	15	15
Channel catfish	*Ictalurus punctatus*	OM		X		0.20	0.87	3	1.40	14	17
Flathead catfish	*Pylodictis olivaris*	TC		X		0.13	0.58	2	0.30	3	5
Yellow bass	*Morone mississippiensis*	TC		X					0.90	9	9
Redear sunfish	*Lepomis microlophus*	IN	X	X		7.47	32.56	112	0.70	7	119
Spotted bass	*Micropterus punctulatus*	TC		X		2.00	8.72	30	0.90	9	39
Black crappie	*Pomoxis nigromaculatus*	TC	X	X		0.13	0.58	2	1.30	13	15
Logperch	*Percina caprodes*	BI		X		1.00	4.36	15			15
Freshwater drum	*Aplodinotus grunniens*	BI		X		0.13	0.58	2	0.30	3	5
Inland silverside	*Menidia beryllina*	IN				2.53	11.05	38			38
Total						60.91	265.69	914	14.20	142	1,056
Number Samples						15			10		
Species Collected						23			16		

Appendix 2-D. Species Collected, Trophic Level, Native and Tolerance Classification, and Catch Per Unit Effort During Electrofishing and Gill Netting Upstream (TRM 490.5) of Sequoyah Nuclear Plant Discharge, Autumn 2006.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Gizzard shad	*Dorosoma cepedianum*	OM	.	X	TOL	17.33	84.14	260	6.30	63	323
Golden shiner	*Notemigonus crysoleucas*	OM	.	X	TOL	0.60	2.91	9	.	.	9
Spotfin shiner	*Cyprinella spiloptera*	IN	.	X	TOL	0.40	1.94	6	.	.	6
Bluntnose minnow	*Pimephales notatus*	OM	.	X	TOL	0.07	0.32	1	.	.	1
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	4.33	21.04	65	.	.	65
Green sunfish	*Lepomis cyanellus*	IN	X	X	TOL	0.07	0.32	1	.	.	1
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	11.40	55.34	171	0.80	8	179
Largemouth bass	*Micropterus salmoides*	TC	.	X	TOL	0.27	1.29	4	0.40	4	8
Skipjack herring	*Alosa chrysochloris*	TC	.	X	INT	.	.	.	3.10	31	31
Northern hog sucker	*Hypentelium nigricans*	BI	.	X	INT	0.07	0.32	1	.	.	1
Spotted sucker	*Minytrema melanops*	BI	.	X	INT	0.33	1.62	5	0.10	1	6
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	1.00	4.85	15	.	.	15
Smallmouth bass	*Micropterus dolomieu*	TC	.	X	INT	1.13	5.50	17	0.10	1	18
Spotted gar	*Lepisosteus oculatus*	TC	.	X	.	0.07	0.32	1	.	.	1
Threadfin shad	*Dorosoma petenense*	PK	.	X	.	3.87	18.77	58	0.10	1	59
Emerald shiner	*Notropis atherinoides*	IN	.	X	.	1.53	7.44	23	.	.	23
Bullhead minnow	*Pimephales vigilax*	IN	.	X	.	0.07	0.32	1	.	.	1
Blue catfish	*Ictalurus furcatus*	OM	.	X	.	.	.	.	0.10	1	1
Channel catfish	*Ictalurus punctatus*	OM	.	X	.	0.27	1.29	4	0.40	4	8
Flathead catfish	*Pylodictis olivaris*	TC	.	X	.	0.20	0.97	3	.	.	3
White bass	*Morone chrysops*	TC	.	X	.	.	.	.	0.80	8	8
Yellow bass	*Morone mississippiensis*	TC	.	X	.	.	.	.	5.50	55	55
Warmouth	*Lepomis gulosus*	IN	X	X	.	0.07	0.32	1	.	.	1
Redear sunfish	*Lepomis microlophus*	IN	X	X	.	2.80	13.59	42	3.70	37	79
Spotted bass	*Micropterus punctulatus*	TC	.	X	.	1.60	7.77	24	1.00	10	34
Black crappie	*Pomoxis nigromaculatus*	TC	X	X	.	0.80	3.88	12	1.80	18	30
Logperch	*Percina caprodes*	BI	.	X	.	0.27	1.29	4	.	.	4
Sauger	*Sander canadensis*	TC	.	X	.	.	.	.	0.10	1	1
Freshwater drum	*Aplodinotus grunniens*	BI	.	X	.	0.20	0.97	3	0.60	6	9
Inland silverside	*Menidia beryllina*	IN	.	.	.	0.40	1.94	6	.	.	6
Chestnut lamprey	*Ichthyomyzon castaneus*	PS	.	X	.	.	.	.	0.10	1	1
Total						49.15	238.46	737	25.00	250	987
Number Samples						15			10		
Species Collected						25			17		

Appendix 2-E. Species Collected, Trophic Level, Native and Tolerance Classification, and Catch Per Unit Effort During Electrofishing and Gill Netting Downstream (TRM 482.0) of Sequoyah Nuclear Plant Discharge, Autumn 2005.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Longnose gar	*Lepisosteus osseus*	TC	.	X	TOL	.	.	.	0.10	1	1
Gizzard shad	*Dorosoma cepedianum*	OM	.	X	TOL	13.53	70.98	203	8.70	87	290
Common carp	*Cyprinus carpio*	OM	.	.	TOL	0.13	0.70	2	.	.	2
Golden shiner	*Notemigonus crysoleucas*	OM	.	X	TOL	1.07	5.59	16	.	.	16
Bluntnose minnow	*Pimephales notatus*	OM	.	X	TOL	0.07	0.35	1	.	.	1
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	10.13	53.15	152	.	.	152
Green sunfish	*Lepomis cyanellus*	IN	X	X	TOL	0.13	0.70	2	.	.	2
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	14.67	76.92	220	0.20	2	222
Largemouth bass	*Micropterus salmoides*	TC	.	X	TOL	1.33	6.99	20	0.20	2	22
Skipjack herring	*Alosa chrysochloris*	TC	.	X	INT	.	.	.	1.70	17	17
Spotted sucker	*Minytrema melanops*	BI	.	X	INT	0.20	1.05	3	0.10	1	4
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	0.80	4.20	12	.	.	12
Smallmouth bass	*Micropterus dolomieu*	TC	.	X	INT	0.07	0.35	1	.	.	1
Brook silverside	*Labidesthes sicculus*	IN	.	X	INT	0.40	2.10	6	.	.	6
Threadfin shad	*Dorosoma petenense*	PK	.	X	.	1.73	9.09	26	.	.	26
Emerald shiner	*Notropis atherinoides*	IN	.	X	.	4.73	24.83	71	.	.	71
Blue catfish	*Ictalurus furcatus*	OM	.	X	.	.	.	.	2.30	23	23
Channel catfish	*Ictalurus punctatus*	OM	.	X	.	0.40	2.10	6	1.30	13	19
Flathead catfish	*Pylodictis olivaris*	TC	.	X	.	0.33	1.75	5	0.80	8	13
White bass	*Morone chrysops*	TC	.	X	.	.	.	.	0.30	3	3
Yellow bass	*Morone mississippiensis*	TC	.	X	.	0.13	0.70	2	1.80	18	20
Warmouth	*Lepomis gulosus*	IN	X	X	.	0.13	0.70	2	.	.	2
Redear sunfish	*Lepomis microlophus*	IN	X	X	.	5.40	28.32	81	0.90	9	90
Spotted bass	*Micropterus punctulatus*	TC	.	X	.	2.00	10.49	30	2.10	21	51
Black crappie	*Pomoxis nigromaculatus*	TC	X	X	.	0.40	2.10	6	0.20	2	8
Logperch	*Percina caprodes*	BI	.	X	.	0.40	2.10	6	.	.	6
Freshwater drum	*Aplodinotus grunniens*	BI	.	X	.	0.20	1.05	3	0.50	5	8
Inland silverside	*Menidia beryllina*	IN	.	.	.	0.13	0.70	2	.	.	2
Total						58.51	307.01	878	21.20	212	1,090
Number Samples						15			10		
Species Collected						24			15		

Appendix 2-F. Species Collected, Trophic Level, Native and Tolerance Classification, and Catch Per Unit Effort During Electrofishing and Gill Netting Upstream (TRM 490.5) of Sequoyah Nuclear Plant Discharge, Autumn 2005.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Gizzard shad	*Dorosoma cepedianum*	OM	.	X	TOL	8.07	42.61	121	2.40	24	145
Common carp	*Cyprinus carpio*	OM	.	.	TOL	0.07	0.35	1	.	.	1
Golden shiner	*Notemigonus crysoleucas*	OM	.	X	TOL	0.07	0.35	1	.	.	1
Spotfin shiner	*Cyprinella spiloptera*	IN	.	X	TOL	0.07	0.35	1	.	.	1
Bluntnose minnow	*Pimephales notatus*	OM	.	X	TOL	0.13	0.70	2	.	.	2
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	4.33	22.89	65	.	.	65
Green sunfish	*Lepomis cyanellus*	IN	X	X	TOL	0.33	1.76	5	.	.	5
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	16.47	86.97	247	0.50	5	252
Largemouth bass	*Micropterus salmoides*	TC	.	X	TOL	2.33	12.32	35	.	.	35
Skipjack herring	*Alosa chrysochloris*	TC	.	X	INT	.	.	.	0.70	7	7
Mooneye	*Hiodon tergisus*	IN	.	X	INT	.	.	.	0.10	1	1
Spotted sucker	*Minytrema melanops*	BI	.	X	INT	0.33	1.76	5	0.20	2	7
Black redhorse	*Moxostoma duquesnei*	BI	.	X	INT	0.07	0.35	1	.	.	1
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	0.80	4.23	12	.	.	12
Smallmouth bass	*Micropterus dolomieu*	TC	.	X	INT	1.60	8.45	24	.	.	24
Brook silverside	*Labidesthes sicculus*	IN	.	X	INT	0.33	1.76	5	.	.	5
Spotted gar	*Lepisosteus oculatus*	TC	.	X	.	0.13	0.70	2	.	.	2
Threadfin shad	*Dorosoma petenense*	PK	.	X	.	0.47	2.46	7	.	.	7
Emerald shiner	*Notropis atherinoides*	IN	.	X	.	1.40	7.39	21	.	.	21
Blue catfish	*Ictalurus furcatus*	OM	.	X	.	.	.	.	1.70	17	17
Channel catfish	*Ictalurus punctatus*	OM	.	X	.	.	.	.	0.60	6	6
Flathead catfish	*Pylodictis olivaris*	TC	.	X	.	0.20	1.06	3	0.20	2	5
Yellow bass	*Morone mississippiensis*	TC	.	X	.	.	.	.	2.50	25	25
Warmouth	*Lepomis gulosus*	IN	X	X	.	0.07	0.35	1	.	.	1
Redear sunfish	*Lepomis microlophus*	IN	X	X	.	2.13	11.27	32	0.80	8	40
Hybrid sunfish	*Hybrid lepomis spp.*	IN	X	X	.	0.13	0.70	2	.	.	2
Spotted bass	*Micropterus punctulatus*	TC	.	X	.	1.47	7.75	22	1.80	18	40
Black crappie	*Pomoxis nigromaculatus*	TC	X	X	.	0.20	1.06	3	0.40	4	7
Logperch	*Percina caprodes*	BI	.	X	.	0.20	1.06	3	.	.	3
Sauger	*Sander canadensis*	TC	.	X	.	.	.	.	0.10	1	1
Freshwater drum	*Aplodinotus grunniens*	BI	.	X	.	0.13	0.70	2	0.60	6	8
Inland silverside	*Menidia beryllina*	IN	.	.	.	0.27	1.41	4	.	.	4
Total						41.80	220.76	627	12.60	126	753
Number Samples						15			10		
Species Collected						26			14		

Appendix 2-G. Species Collected, Trophic Level, Native and Tolerance Classification, and Catch Per Unit Effort During Electrofishing and Gill Netting Downstream (TRM 482.0) of Sequoyah Nuclear Plant Discharge, Autumn 2004.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Gizzard shad	*Dorosoma cepedianum*	OM		X	TOL	9.80	49.16	147	4.70	47	194
Common carp	*Cyprinus carpio*	OM			TOL	0.53	2.68	8			8
Golden shiner	*Notemigonus crysoleucas*	OM		X	TOL	0.20	1.00	3	1.50	15	18
Spotfin shiner	*Cyprinella spiloptera*	IN		X	TOL	0.07	0.33	1			1
Bluntnose minnow	*Pimephales notatus*	OM		X	TOL	0.20	1.00	3			3
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	3.73	18.73	56			56
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	18.47	92.64	277	0.50	5	282
Largemouth bass	*Micropterus salmoides*	TC		X	TOL	2.73	13.71	41	0.40	4	45
White crappie	*Pomoxis annularis*	TC	X	X	TOL				0.20	2	2
Skipjack herring	*Alosa chrysochloris*	TC		X	INT				1.50	15	15
Spotted sucker	*Minytrema melanops*	BI		X	INT	0.40	2.01	6	0.10	1	7
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	0.47	2.34	7			7
Smallmouth bass	*Micropterus dolomieu*	TC		X	INT	0.33	1.67	5			5
Brook silverside	*Labidesthes sicculus*	IN		X	INT	0.67	3.34	10			10
Spotted gar	*Lepisosteus oculatus*	TC		X		0.53	2.68	8			8
Threadfin shad	*Dorosoma petenense*	PK		X		1.07	5.35	16			16
Emerald shiner	*Notropis atherinoides*	IN		X		12.20	61.20	183			183
Smallmouth buffalo	*Ictiobus bubalus*	OM		X		0.07	0.33	1			1
Blue catfish	*Ictalurus furcatus*	OM		X					0.80	8	8
Channel catfish	*Ictalurus punctatus*	OM		X		1.00	5.02	15	0.70	7	22
Flathead catfish	*Pylodictis olivaris*	TC		X					0.20	2	2
Yellow bass	*Morone mississippiensis*	TC		X					1.70	17	17
Striped bass	*Morone saxatilis*	TC							0.10	1	1
Redear sunfish	*Lepomis microlophus*	IN	X	X		5.07	25.42	76	0.80	8	84
Spotted bass	*Micropterus punctulatus*	TC		X		1.93	9.70	29	1.80	18	47
Black crappie	*Pomoxis nigromaculatus*	TC	X	X		0.33	1.67	5	0.40	4	9
Logperch	*Percina caprodes*	BI		X		0.07	0.33	1			1
Freshwater drum	*Aplodinotus grunniens*	BI		X		0.87	4.35	13	0.50	5	18
Chestnut lamprey	*Ichthyomyzon castaneus*	PS		X		0.07	0.33	1			1
Total						60.81	304.99	912	15.90	159	1,071
Number Samples						15			10		
Species Collected						23			16		

Appendix 2-H. Species Collected, Trophic Level, Native and Tolerance Classification, and Catch Per Unit Effort During Electrofishing and Gill Netting Upstream (TRM 490.5) of Sequoyah Nuclear Plant Discharge, Autumn 2004.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Longnose gar	*Lepisosteus osseus*	TC		X	TOL				0.10	1	1
Gizzard shad	*Dorosoma cepedianum*	OM		X	TOL	5.73	29.35	86	3.90	39	125
Common carp	*Cyprinus carpio*	OM			TOL	0.27	1.37	4			4
Golden shiner	*Notemigonus crysoleucas*	OM		X	TOL	0.40	2.05	6	0.10	1	7
Spotfin shiner	*Cyprinella spiloptera*	IN		X	TOL	0.13	0.68	2			2
Bluntnose minnow	*Pimephales notatus*	OM		X	TOL	0.33	1.71	5			5
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	2.87	14.68	43			43
Green sunfish	*Lepomis cyanellus*	IN	X	X	TOL	0.07	0.34	1			1
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	14.60	74.74	219	0.20	2	221
Largemouth bass	*Micropterus salmoides*	TC		X	TOL	2.67	13.65	40			40
White crappie	*Pomoxis annularis*	TC	X	X	TOL	0.13	0.68	2			2
Skipjack herring	*Alosa chrysochloris*	TC		X	INT				2.80	28	28
Spotted sucker	*Minytrema melanops*	BI		X	INT	0.20	1.02	3	0.20	2	5
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	0.87	4.44	13			13
Smallmouth bass	*Micropterus dolomieu*	TC		X	INT	1.20	6.14	18			18
Brook silverside	*Labidesthes sicculus*	IN		X	INT	0.87	4.44	13			13
Spotted gar	*Lepisosteus oculatus*	TC		X		0.53	2.73	8			8
Threadfin shad	*Dorosoma petenense*	PK		X		0.33	1.71	5			5
Emerald shiner	*Notropis atherinoides*	IN		X		4.13	21.16	62			62
Golden redhorse	*Moxostoma erythrurum*	BI		X		0.07	0.34	1	0.10	1	2
Blue catfish	*Ictalurus furcatus*	OM		X					1.50	15	15
Channel catfish	*Ictalurus punctatus*	OM		X		0.67	3.41	10	0.70	7	17
Flathead catfish	*Pylodictis olivaris*	TC		X		0.40	2.05	6	0.40	4	10
Yellow bass	*Morone mississippiensis*	TC		X		0.07	0.34	1	3.10	31	32
Striped bass	*Morone saxatilis*	TC							0.10	1	1
Warmouth	*Lepomis gulosus*	IN	X	X		0.53	2.73	8	0.20	2	10
Redear sunfish	*Lepomis microlophus*	IN	X	X		5.07	25.94	76	1.90	19	95
Spotted bass	*Micropterus punctulatus*	TC		X		3.27	16.72	49	1.80	18	67
Black crappie	*Pomoxis nigromaculatus*	TC	X	X		1.53	7.85	23	1.00	10	33
Yellow perch	*Perca flavescens*	IN				0.13	0.68	2			2
Logperch	*Percina caprodes*	BI		X		0.20	1.02	3			3
Sauger	*Sander canadensis*	TC		X					0.20	2	2
Freshwater drum	*Aplodinotus grunniens*	BI		X		1.27	6.48	19	0.50	5	24
Inland silverside	*Menidia beryllina*	IN				0.67	3.41	10			10
Chestnut lamprey	*Ichthyomyzon castaneus*	PS		X		0.13	0.68	2			2
Total						49.34	252.54	740	18.80	188	928
Number Samples						15			10		
Species Collected						30			18		

Appendix 2-I. Species Collected, Trophic Level, Native and Tolerance Classification, and Catch Per Unit Effort During Electrofishing and Gill Netting Downstream (TRM 482.0) of Sequoyah Nuclear Plant Discharge, Autumn 2003.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Longnose gar	*Lepisosteus osseus*	TC	.	X	TOL	.	.	.	0.10	1	1
Gizzard shad	*Dorosoma cepedianum*	OM	.	X	TOL	8.40	45.32	126	2.90	29	155
Common carp	*Cyprinus carpio*	OM	.	.	TOL	0.13	0.72	2	0.10	1	3
Golden shiner	*Notemigonus crysoleucas*	OM	.	X	TOL	0.40	2.16	6	0.10	1	7
Spotfin shiner	*Cyprinella spiloptera*	IN	.	X	TOL	1.33	7.19	20	.	.	20
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	1.93	10.43	29	.	.	29
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	11.33	61.15	170	0.40	4	174
Largemouth bass	*Micropterus salmoides*	TC	.	X	TOL	1.47	7.91	22	0.20	2	24
White crappie	*Pomoxis annularis*	TC	X	X	TOL	.	.	.	0.10	1	1
Skipjack herring	*Alosa chrysochloris*	TC	.	X	INT	.	.	.	0.70	7	7
Spotted sucker	*Minytrema melanops*	BI	.	X	INT	0.27	1.44	4	0.50	5	9
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	1.93	10.43	29	.	.	29
Smallmouth bass	*Micropterus dolomieu*	TC	.	X	INT	0.13	0.72	2	1.20	12	14
Brook silverside	*Labidesthes sicculus*	IN	.	X	INT	0.93	5.04	14	.	.	14
Spotted gar	*Lepisosteus oculatus*	TC	.	X	.	0.20	1.08	3	.	.	3
Emerald shiner	*Notropis atherinoides*	IN	.	X	.	6.20	33.45	93	.	.	93
Blue catfish	*Ictalurus furcatus*	OM	.	X	.	.	.	.	1.20	12	12
Channel catfish	*Ictalurus punctatus*	OM	.	X	.	0.40	2.16	6	1.50	15	21
Flathead catfish	*Pylodictis olivaris*	TC	.	X	.	0.13	0.72	2	0.30	3	5
Yellow bass	*Morone mississippiensis*	TC	.	X	.	0.13	0.72	2	1.80	18	20
Redear sunfish	*Lepomis microlophus*	IN	X	X	.	6.40	34.53	96	1.60	16	112
Spotted bass	*Micropterus punctulatus*	TC	.	X	.	2.80	15.11	42	0.80	8	50
Black crappie	*Pomoxis nigromaculatus*	TC	X	X	.	0.27	1.44	4	0.10	1	5
Logperch	*Percina caprodes*	BI	.	X	.	0.60	3.24	9	.	.	9
Sauger	*Sander canadensis*	TC	.	X	.	.	.	.	0.20	2	2
Freshwater drum	*Aplodinotus grunniens*	BI	.	X	.	0.33	1.80	5	1.00	10	15
Total						45.71	246.76	686	14.80	148	834
Number Samples						15			10		
Species Collected						21			19		

Appendix 2-J. Species Collected, Trophic Level, Native and Tolerance Classification, and Catch Per Unit Effort During Electrofishing and Gill Netting Upstream (TRM 490.5) of Sequoyah Nuclear Plant Discharge, Autumn 2003.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Gizzard shad	*Dorosoma cepedianum*	OM	.	X	TOL	5.60	28.38	84	7.00	70	154
Common carp	*Cyprinus carpio*	OM	.	.	TOL	0.40	2.03	6	.	.	6
Golden shiner	*Notemigonus crysoleucas*	OM	.	X	TOL	1.67	8.45	25	.	.	25
Spotfin shiner	*Cyprinella spiloptera*	IN	.	X	TOL	1.27	6.42	19	.	.	19
Bluntnose minnow	*Pimephales notatus*	OM	.	X	TOL	0.80	4.05	12	.	.	12
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	3.87	19.59	58	.	.	58
Green sunfish	*Lepomis cyanellus*	IN	X	X	TOL	0.20	1.01	3	.	.	3
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	12.87	65.20	193	.	.	193
Largemouth bass	*Micropterus salmoides*	TC	.	X	TOL	1.00	5.07	15	0.30	3	18
White crappie	*Pomoxis annularis*	TC	X	X	TOL	.	.	.	0.10	1	1
Skipjack herring	*Alosa chrysochloris*	TC	.	X	INT	.	.	.	2.10	21	21
Spotted sucker	*Minytrema melanops*	BI	.	X	INT	0.40	2.03	6	0.30	3	9
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	1.80	9.12	27	.	.	27
Smallmouth bass	*Micropterus dolomieu*	TC	.	X	INT	0.80	4.05	12	.	.	12
Brook silverside	*Labidesthes sicculus*	IN	.	X	INT	0.67	3.38	10	.	.	10
Lake sturgeon	*Acipenser fulvescens*	IN	.	X	.	.	.	.	0.10	1	1
Spotted gar	*Lepisosteus oculatus*	TC	.	X	.	0.07	0.34	1	.	.	1
Threadfin shad	*Dorosoma petenense*	PK	.	X	.	1.13	5.74	17	0.10	1	18
Emerald shiner	*Notropis atherinoides*	IN	.	X	.	1.00	5.07	15	.	.	15
Blue catfish	*Ictalurus furcatus*	OM	.	X	.	.	.	.	2.60	26	26
Channel catfish	*Ictalurus punctatus*	OM	.	X	.	0.13	0.68	2	1.40	14	16
Flathead catfish	*Pylodictis olivaris*	TC	.	X	.	0.33	1.69	5	0.40	4	9
Yellow bass	*Morone mississippiensis*	TC	.	X	.	.	.	.	3.30	33	33
Warmouth	*Lepomis gulosus*	IN	X	X	.	0.93	4.73	14	.	.	14
Redear sunfish	*Lepomis microlophus*	IN	X	X	.	3.00	15.20	45	4.70	47	92
Spotted bass	*Micropterus punctulatus*	TC	.	X	.	1.40	7.09	21	0.70	7	28
Black crappie	*Pomoxis nigromaculatus*	TC	X	X	.	1.27	6.42	19	0.80	8	27
Yellow perch	*Perca flavescens*	IN	.	.	.	0.07	0.34	1	0.20	2	3
Logperch	*Percina caprodes*	BI	.	X	.	0.27	1.35	4	.	.	4
Sauger	*Sander canadensis*	TC	.	X	.	.	.	.	0.10	1	1
Freshwater drum	*Aplodinotus grunniens*	BI	.	X	.	0.33	1.69	5	0.70	7	12
Total						41.28	209.12	619	24.9	249	868
Number Samples						15			10		
Species Collected						25			17		

Appendix 2-K. Species Collected, Trophic Level, Native and Tolerance Classification, and Catch Per Unit Effort During Electrofishing and Gill Netting Downstream (TRM 482.0) of Sequoyah Nuclear Plant Discharge, Autumn 2002.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Gizzard shad	*Dorosoma cepedianum*	OM		X	TOL	11.33	71.13	170	0.30	3	173
Common carp	*Cyprinus carpio*	OM			TOL	0.20	1.26	3			3
Golden shiner	*Notemigonus crysoleucas*	OM		X	TOL	0.07	0.42	1			1
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	1.67	10.46	25			25
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	11.87	74.48	178			178
Largemouth bass	*Micropterus salmoides*	TC		X	TOL	2.13	13.39	32			32
White crappie	*Pomoxis annularis*	TC	X	X	TOL				0.20	2	2
Skipjack herring	*Alosa chrysochloris*	TC		X	INT				0.30	3	3
Spotted sucker	*Minytrema melanops*	BI		X	INT	0.33	2.09	5	0.30	3	8
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	0.53	3.35	8			8
Smallmouth bass	*Micropterus dolomieu*	TC		X	INT	0.53	3.35	8	0.20	2	10
Brook silverside	*Labidesthes sicculus*	IN		X	INT	0.73	4.60	11			11
Emerald shiner	*Notropis atherinoides*	IN		X		1.27	7.95	19			19
Blue catfish	*Ictalurus furcatus*	OM		X		0.53	3.35	8	0.20	2	10
Channel catfish	*Ictalurus punctatus*	OM		X		0.87	5.44	13	0.90	9	22
Flathead catfish	*Pylodictis olivaris*	TC		X		0.20	1.26	3	0.30	3	6
White bass	*Morone chrysops*	TC		X		0.07	0.42	1			1
Yellow bass	*Morone mississippiensis*	TC		X		0.07	0.42	1	0.10	1	2
Striped bass	*Morone saxatilis*	TC							0.30	3	3
Warmouth	*Lepomis gulosus*	IN	X	X		0.27	1.67	4	0.10	1	5
Redear sunfish	*Lepomis microlophus*	IN	X	X		3.33	20.92	50	0.20	2	52
Spotted bass	*Micropterus punctulatus*	TC		X		2.33	14.64	35	3.40	34	69
Black crappie	*Pomoxis nigromaculatus*	TC	X	X		0.20	1.26	3	0.10	1	4
Logperch	*Percina caprodes*	BI		X		0.13	0.84	2			2
Sauger	*Sander canadensis*	TC		X					0.60	6	6
Freshwater drum	*Aplodinotus grunniens*	BI		X		0.13	0.84	2	0.60	6	8
Total						38.79	243.54	582	8.10	81	663
Number Samples						15			10		
Species Collected						22			16		

Appendix 2-L. Species Collected, Trophic Level, Native and Tolerance Classification, and Catch Per Unit Effort During Electrofishing and Gill Netting Upstream (TRM 490.5) of Sequoyah Nuclear Plant Discharge, Autumn 2002.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Gizzard shad	*Dorosoma cepedianum*	OM	.	X	TOL	10.87	61.51	163	1.20	12.00	175
Common carp	*Cyprinus carpio*	OM	.	.	TOL	0.47	2.64	7	.	.	7
Golden shiner	*Notemigonus crysoleucas*	OM	.	X	TOL	1.07	6.04	16	.	.	16
Spotfin shiner	*Cyprinella spiloptera*	IN	.	X	TOL	0.47	2.64	7	.	.	7
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	2.67	15.09	40	.	.	40
Green sunfish	*Lepomis cyanellus*	IN	X	X	TOL	0.27	1.51	4	.	.	4
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	24.07	136.23	361	.	.	361
Largemouth bass	*Micropterus salmoides*	TC	.	X	TOL	3.73	21.13	56	.	.	56
White crappie	*Pomoxis annularis*	TC	X	X	TOL	.	.	.	0.10	1.00	1
Skipjack herring	*Alosa chrysochloris*	TC	.	X	INT	.	.	.	1.50	15.00	15
Northern hog sucker	*Hypentelium nigricans*	BI	.	X	INT	0.07	0.38	1	.	.	1
Spotted sucker	*Minytrema melanops*	BI	.	X	INT	0.27	1.51	4	.	.	4
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	0.93	5.28	14	.	.	14
Smallmouth bass	*Micropterus dolomieu*	TC	.	X	INT	1.93	10.94	29	0.20	2.00	31
Brook silverside	*Labidesthes sicculus*	IN	.	X	INT	0.87	4.91	13	.	.	13
Threadfin shad	*Dorosoma petenense*	PK	.	X	.	8.93	50.57	134	.	.	134
Emerald shiner	*Notropis atherinoides*	IN	.	X	.	3.60	20.38	54	.	.	54
Bullhead minnow	*Pimephales vigilax*	IN	.	X	.	0.07	0.38	1	.	.	1
Golden redhorse	*Moxostoma erythrurum*	BI	.	X	.	0.07	0.38	1	0.10	1.00	2
Channel catfish	*Ictalurus punctatus*	OM	.	X	.	1.13	6.42	17	0.30	3.00	20
Flathead catfish	*Pylodictis olivaris*	TC	.	X	.	0.13	0.75	2	0.30	3.00	5
White bass	*Morone chrysops*	TC	.	X	.	.	.	.	0.40	4.00	4
Yellow bass	*Morone mississippiensis*	TC	.	X	.	1.20	6.79	18	4.60	46.00	64
Striped bass	*Morone saxatilis*	TC	.	.	.	.	.	.	0.20	2.00	2
Hybrid striped x white bass	*Hybrid morone (chrysops x sax)*	TC	.	.	.	.	.	.	0.10	1.00	1
Warmouth	*Lepomis gulosus*	IN	X	X	.	1.60	9.06	24	.	.	24
Redear sunfish	*Lepomis microlophus*	IN	X	X	.	4.73	26.79	71	0.60	6.00	77
Spotted bass	*Micropterus punctulatus*	TC	.	X	.	4.07	23.02	61	2.10	21.00	82
Black crappie	*Pomoxis nigromaculatus*	TC	X	X	.	1.13	6.42	17	0.80	8.00	25
Yellow perch	*Perca flavescens*	IN	.	.	.	0.13	0.75	2	.	.	2
Logperch	*Percina caprodes*	BI	.	X	.	0.07	0.38	1	.	.	1
Sauger	*Sander canadensis*	TC	.	X	.	0.07	0.38	1	0.40	4.00	5
Freshwater drum	*Aplodinotus grunniens*	BI	.	X	.	0.47	2.64	7	0.30	3.00	10
Chestnut lamprey	*Ichthyomyzon castaneus*	PS	.	X	.	0.20	1.13	3	.	.	3
Total						75.29	426.05	1,129	13.20	132	75.29
Number Samples						15			10		15
Species Collected						29			16		29

Appendix 2-M. Species Collected, Trophic Level, Native and Tolerance Classification, and Catch Per Unit Effort During Electrofishing and Gill Netting Downstream (TRM 482.0) of Sequoyah Nuclear Plant Discharge, Autumn 2001.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Longnose gar	*Lepisosteus osseus*	TC		X	TOL				0.30	3	3
Gizzard shad	*Dorosoma cepedianum*	OM		X	TOL	5.07	26.57	76	8.30	83	159
Golden shiner	*Notemigonus crysoleucas*	OM		X	TOL	0.73	3.85	11	0.80	8	19
Spotfin shiner	*Cyprinella spiloptera*	IN		X	TOL	2.73	14.34	41			41
Bluntnose minnow	*Pimephales notatus*	OM		X	TOL	0.27	1.40	4			4
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	2.47	12.94	37	0.20	2	39
Green sunfish	*Lepomis cyanellus*	IN	X	X	TOL	0.07	0.35	1			1
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	27.00	141.61	405	0.30	3	408
Largemouth bass	*Micropterus salmoides*	TC		X	TOL	1.93	10.14	29	0.30	3	32
White crappie	*Pomoxis annularis*	TC	X	X	TOL	0.07	0.35	1	0.20	2	3
Skipjack herring	*Alosa chrysochloris*	TC		X	INT				0.60	6	6
Spotted sucker	*Minytrema melanops*	BI		X	INT	0.13	0.70	2	0.80	8	10
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	3.13	16.43	47	0.20	2	49
Smallmouth bass	*Micropterus dolomieu*	TC		X	INT	0.27	1.40	4			4
Brook silverside	*Labidesthes sicculus*	IN		X	INT	0.40	2.10	6			6
Spotted gar	*Lepisosteus oculatus*	TC		X		0.33	1.75	5			5
Threadfin shad	*Dorosoma petenense*	PK		X		0.07	0.35	1	0.20	2	3
Emerald shiner	*Notropis atherinoides*	IN		X		6.53	34.27	98			98
Smallmouth buffalo	*Ictiobus bubalus*	OM		X		0.07	0.35	1	0.10	1	2
Blue catfish	*Ictalurus furcatus*	OM		X		0.13	0.70	2	1.80	18	20
Channel catfish	*Ictalurus punctatus*	OM		X		0.53	2.80	8	0.40	4	12
Flathead catfish	*Pylodictis olivaris*	TC		X		0.07	0.35	1	0.10	1	2
White bass	*Morone chrysops*	TC		X					0.30	3	3
Yellow bass	*Morone mississippiensis*	TC		X					8.00	80	80
Redear sunfish	*Lepomis microlophus*	IN	X	X		5.13	26.92	77	2.00	20	97
Hybrid sunfish	*Hybrid lepomis spp.*	IN	X	X		0.20	1.05	3			3
Spotted bass	*Micropterus punctulatus*	TC		X		1.73	9.09	26	7.00	70	96
Black crappie	*Pomoxis nigromaculatus*	TC	X	X					3.20	32	32
Yellow perch	*Perca flavescens*	IN				0.07	0.35	1			1
Logperch	*Percina caprodes*	BI		X		0.33	1.75	5			5
Freshwater drum	*Aplodinotus grunniens*	BI		X		0.07	0.35	1	0.10	1	2
Total						59.53	312.26	893	35.20	352	1,245
Number Samples						15			10		
Species Collected						26			21		

Appendix 2-N. Species Collected, Trophic Level, Native and Tolerance Classification, and Catch Per Unit Effort During Electrofishing and Gill Netting Upstream (TRM 490.5) of Sequoyah Nuclear Plant Discharge, Autumn 2001.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Gizzard shad	*Dorosoma cepedianum*	OM		X	TOL	6.20	32.63	93	11.50	115	208
Common carp	*Cyprinus carpio*	OM			TOL	0.73	3.86	11			11
Golden shiner	*Notemigonus crysoleucas*	OM		X	TOL	0.73	3.86	11	0.20	2	13
Spotfin shiner	*Cyprinella spiloptera*	IN		X	TOL	1.40	7.37	21			21
Bluntnose minnow	*Pimephales notatus*	OM		X	TOL	1.40	7.37	21			21
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	2.53	13.33	38			38
Green sunfish	*Lepomis cyanellus*	IN	X	X	TOL	0.67	3.51	10			10
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	6.47	34.04	97	2.30	23	120
Largemouth bass	*Micropterus salmoides*	TC		X	TOL	2.07	10.88	31			31
White crappie	*Pomoxis annularis*	TC	X	X	TOL				1.00	10	10
Skipjack herring	*Alosa chrysochloris*	TC		X	INT				3.90	39	39
Spotted sucker	*Minytrema melanops*	BI		X	INT	0.60	3.16	9	0.10	1	10
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	0.53	2.81	8			8
Smallmouth bass	*Micropterus dolomieu*	TC		X	INT	0.53	2.81	8	0.10	1	9
Brook silverside	*Labidesthes sicculus*	IN		X	INT	0.47	2.46	7			7
Spotted gar	*Lepisosteus oculatus*	TC		X		0.27	1.40	4	0.40	4	8
Threadfin shad	*Dorosoma petenense*	PK		X		0.13	0.70	2	0.20	2	4
Emerald shiner	*Notropis atherinoides*	IN		X		4.60	24.21	69			69
Bullhead minnow	*Pimephales vigilax*	IN		X		0.07	0.35	1			1
Smallmouth buffalo	*Ictiobus bubalus*	OM		X		0.20	1.05	3			3
Black buffalo	*Ictiobus niger*	OM		X		0.20	1.05	3			3
Blue catfish	*Ictalurus furcatus*	OM		X					1.70	17	17
Channel catfish	*Ictalurus punctatus*	OM		X		1.13	5.96	17	1.10	11	28
Flathead catfish	*Pylodictis olivaris*	TC		X		0.20	1.05	3	0.30	3	6
White bass	*Morone chrysops*	TC		X		0.07	0.35	1	0.40	4	5
Yellow bass	*Morone mississippiensis*	TC		X					12.40	124	124
Hybrid striped x white bass	*Hybrid morone (chrysops x sax)*	TC							0.10	1	1
Warmouth	*Lepomis gulosus*	IN	X	X		0.13	0.70	2			2
Redear sunfish	*Lepomis microlophus*	IN	X	X		1.67	8.77	25	3.90	39	64
Hybrid sunfish	*Hybrid Lepomis spp.*	IN	X	X		0.47	2.46	7			7
Spotted bass	*Micropterus punctulatus*	TC		X		1.47	7.72	22	2.70	27	49
Black crappie	*Pomoxis nigromaculatus*	TC	X	X		0.40	2.11	6	0.50	5	11
Logperch	*Percina caprodes*	BI		X		1.53	8.07	23			23
Freshwater drum	*Aplodinotus grunniens*	BI		X		0.13	0.70	2	1.30	13	15
Total						37.00	194.74	555	44.10	441	996
Number Samples						15			10		
Species Collected						29			19		

Appendix 2-O. Species Collected, Trophic Level, Native and Tolerance Classification, and Catch Per Unit Effort During Electrofishing and Gill Netting Downstream (TRM 482.0) of Sequoyah Nuclear Plant Discharge, Autumn 2000.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Gizzard shad	*Dorosoma cepedianum*	OM		X	TOL	9.00	54.22	135			135
Common carp	*Cyprinus carpio*	OM			TOL	0.07	0.40	1			1
Golden shiner	*Notemigonus crysoleucas*	OM		X	TOL	0.73	4.42	11			11
Spotfin shiner	*Cyprinella spiloptera*	IN		X	TOL	1.20	7.23	18			18
Bluntnose minnow	*Pimephales notatus*	OM		X	TOL	0.80	4.82	12			12
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	2.00	12.05	30			30
Green sunfish	*Lepomis cyanellus*	IN	X	X	TOL	0.13	0.80	2			2
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	20.73	124.90	311	0.30	3	314
Largemouth bass	*Micropterus salmoides*	TC		X	TOL	2.07	12.45	31			31
Skipjack herring	*Alosa chrysochloris*	TC		X	INT				0.30	3	3
Spotted sucker	*Minytrema melanops*	BI		X	INT	0.07	0.40	1	0.80	8	9
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	3.00	18.07	45			45
Smallmouth bass	*Micropterus dolomieu*	TC		X	INT	0.47	2.81	7	0.10	1	8
Brook silverside	*Labidesthes sicculus*	IN		X	INT	0.13	0.80	2			2
Threadfin shad	*Dorosoma petenense*	PK		X							0
Emerald shiner	*Notropis atherinoides*	IN		X		5.53	33.33	83			83
Bullhead minnow	*Pimephales vigilax*	IN		X		0.07	0.40	1			1
Blue catfish	*Ictalurus furcatus*	OM		X		0.67	4.02	10	0.80	8	18
Channel catfish	*Ictalurus punctatus*	OM		X		0.53	3.21	8	0.10	1	9
Flathead catfish	*Pylodictis olivaris*	TC		X					0.10	1	1
White bass	*Morone chrysops*	TC		X					0.10	1	1
Yellow bass	*Morone mississippiensis*	TC		X		0.40	2.41	6	0.90	9	15
Striped bass	*Morone saxatilis*	TC							0.10	1	1
Warmouth	*Lepomis gulosus*	IN	X	X		0.27	1.61	4	0.10	1	5
Redear sunfish	*Lepomis microlophus*	IN	X	X		4.00	24.10	60	0.30	3	63
Spotted bass	*Micropterus punctulatus*	TC		X		3.13	18.88	47	1.40	14	61
Black crappie	*Pomoxis nigromaculatus*	TC	X	X		0.13	0.80	2	0.20	2	4
Yellow perch	*Perca flavescens*	IN				0.07	0.40	1			1
Sauger	*Sander canadensis*	TC		X					0.30	3	3
Freshwater drum	*Aplodinotus grunniens*	BI		X					0.20	2	2
Chestnut lamprey	*Ichthyomyzon castaneus*	PS		X		0.07	0.40	1			1
Total						55.27	332.93	829	6.10	61	890
Number Samples						15			10		
Species Collected						24			16		

Appendix 2-P. Species Collected, Trophic Level, Native and Tolerance Classification, and Catch Per Unit Effort During Electrofishing and Gill Netting Upstream (TRM 490.5) of Sequoyah Nuclear Plant Discharge, Autumn 2000.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Gizzard shad	*Dorosoma cepedianum*	OM		X	TOL	2.27	13.39	34	0.60	6	40
Common carp	*Cyprinus carpio*	OM			TOL	0.87	5.12	13			13
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	0.80	4.72	12			12
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	5.53	32.68	83	0.40	4	87
Largemouth bass	*Micropterus salmoides*	TC		X	TOL	2.53	14.96	38			38
White crappie	*Pomoxis annularis*	TC	X	X	TOL				0.10	1	1
Skipjack herring	*Alosa chrysochloris*	TC		X	INT				0.80	8	8
Spotted sucker	*Minytrema melanops*	BI		X	INT	0.33	1.97	5	1.00	10	15
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	0.47	2.76	7			7
Smallmouth bass	*Micropterus dolomieu*	TC		X	INT	0.27	1.57	4	0.60	6	10
Brook silverside	*Labidesthes sicculus*	IN		X	INT	0.07	0.39	1			1
Threadfin shad	*Dorosoma petenense*	PK		X							0
Emerald shiner	*Notropis atherinoides*	IN		X		1.73	10.24	26			26
Channel catfish	*Ictalurus punctatus*	OM		X		1.40	8.27	21			21
Flathead catfish	*Pylodictis olivaris*	TC		X					0.10	1	1
White bass	*Morone chrysops*	TC		X					0.30	3	3
Yellow bass	*Morone mississippiensis*	TC		X		0.27	1.57	4	3.40	34	38
Striped bass	*Morone saxatilis*	TC							0.50	5	5
Warmouth	*Lepomis gulosus*	IN	X	X		0.53	3.15	8	0.10	1	9
Redear sunfish	*Lepomis microlophus*	IN	X	X		2.33	13.78	35	0.80	8	43
Spotted bass	*Micropterus punctulatus*	TC		X		0.87	5.12	13	3.50	35	48
Black crappie	*Pomoxis nigromaculatus*	TC	X	X		1.20	7.09	18	0.90	9	27
Yellow perch	*Perca flavescens*	IN				0.13	0.79	2			2
Sauger	*Sander canadensis*	TC		X					0.50	5	5
Freshwater drum	*Aplodinotus grunniens*	BI		X		0.20	1.18	3	0.10	1	4
Chestnut lamprey	*Ichthyomyzon castaneus*	PS		X		0.27	1.57	4			4
Total						22.07	130.32	331	13.70	137	468
Number Samples						15			10		
Species Collected						19			16		

Appendix 2-Q. Species Collected, Trophic Level, Native and Tolerance Classification, and Catch Per Unit Effort During Electrofishing and Gill Netting Downstream (TRM 482.0) of Sequoyah Nuclear Plant Discharge, Autumn 1999.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Gizzard shad	*Dorosoma cepedianum*	OM	.	X	TOL	0.93	5.38	14	7.60	76	90
Common carp	*Cyprinus carpio*	OM	.	.	TOL	0.73	4.23	11	.	.	11
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	0.67	3.85	10	.	.	10
Green sunfish	*Lepomis cyanellus*	IN	X	X	TOL	0.07	0.38	1	.	.	1
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	1.67	9.62	25	0.30	3	28
Largemouth bass	*Micropterus salmoides*	TC	.	X	TOL	0.20	1.15	3	0.30	3	6
Skipjack herring	*Alosa chrysochloris*	TC	.	X	INT	0.07	0.38	1	1.90	19	20
Mooneye	*Hiodon tergisus*	IN	.	X	INT	.	.	.	0.10	1	1
Spotted sucker	*Minytrema melanops*	BI	.	X	INT	0.53	3.08	8	0.40	4	12
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	0.07	0.38	1	.	.	1
Smallmouth bass	*Micropterus dolomieu*	TC	.	X	INT	0.07	0.38	1	.	.	1
Spotted gar	*Lepisosteus oculatus*	TC	.	X	.	0.40	2.31	6	.	.	6
Threadfin shad	*Dorosoma petenense*	PK	.	X	.	1.00	5.77	15	0.50	5	20
Emerald shiner	*Notropis atherinoides*	IN	.	X	.	3.20	18.46	48	.	.	48
Smallmouth buffalo	*Ictiobus bubalus*	OM	.	X	.	0.60	3.46	9	0.10	1	10
Blue catfish	*Ictalurus furcatus*	OM	.	X	.	.	.	.	1.50	15	15
Channel catfish	*Ictalurus punctatus*	OM	.	X	.	0.27	1.54	4	1.60	16	20
Flathead catfish	*Pylodictis olivaris*	TC	.	X	.	.	.	.	0.10	1	1
White bass	*Morone chrysops*	TC	.	X	.	0.07	0.38	1	0.10	1	2
Yellow bass	*Morone mississippiensis*	TC	.	X	.	.	.	.	1.60	16	16
Redear sunfish	*Lepomis microlophus*	IN	X	X	.	3.40	19.62	51	0.60	6	57
Hybrid sunfish	*Hybrid lepomis spp.*	IN	X	X	.	0.07	0.38	1	.	.	1
Spotted bass	*Micropterus punctulatus*	TC	.	X	.	0.80	4.62	12	0.50	5	17
Yellow perch	*Perca flavescens*	IN	.	.	.	0.47	2.69	7	.	.	7
Logperch	*Percina caprodes*	BI	.	X	.	0.60	3.46	9	.	.	9
Sauger	*Sander canadensis*	TC	.	X	.	.	.	.	0.40	4	4
Freshwater drum	*Aplodinotus grunniens*	BI	.	X	.	0.27	1.54	4	0.50	5	9
Chestnut lamprey	*Ichthyomyzon castaneus*	PS	.	X	.	0.07	0.38	1	.	.	1
Total						16.23	93.44	243	18.10	181	424
Number Samples						15			10		
Species Collected						23			17		

Appendix 2-R. Species Collected, Trophic Level, Native and Tolerance Classification, and Catch Per Unit Effort During Electrofishing and Gill Netting Upstream (TRM 490.5) of Sequoyah Nuclear Plant Discharge, Autumn 1999.

Common Name	Scientific name	Trophic level	Sunfish species	Native species	Tolerance	Electrofishing Catch Rate Per Run	Electrofishing Catch Rate Per Hour	Total fish EF	Gill Netting Catch Rate Per Net Night	Total Gill net fish	Total fish Combined
Gizzard shad	*Dorosoma cepedianum*	OM	.	X	TOL	1.87	10.81	28	11.80	118	146
Common carp	*Cyprinus carpio*	OM	.	.	TOL	0.20	1.16	3	.	.	3
Golden shiner	*Notemigonus crysoleucas*	OM	.	X	TOL	0.07	0.39	1	.	.	1
Bluntnose minnow	*Pimephales notatus*	OM	.	X	TOL	0.07	0.39	1	.	.	1
Redbreast sunfish	*Lepomis auritus*	IN	X	X	TOL	0.73	4.25	11	.	.	11
Green sunfish	*Lepomis cyanellus*	IN	X	X	TOL	0.07	0.39	1	.	.	1
Bluegill	*Lepomis macrochirus*	IN	X	X	TOL	1.93	11.20	29	0.10	1	30
Largemouth bass	*Micropterus salmoides*	TC	.	X	TOL	0.33	1.93	5	0.10	1	6
Skipjack herring	*Alosa chrysochloris*	TC	.	X	INT	.	.	.	3.50	35	35
Mooneye	*Hiodon tergisus*	IN	.	X	INT	.	.	.	0.20	2	2
Spotted sucker	*Minytrema melanops*	BI	.	X	INT	0.27	1.54	4	.	.	4
Longear sunfish	*Lepomis megalotis*	IN	X	X	INT	0.27	1.54	4	.	.	4
Smallmouth bass	*Micropterus dolomieu*	TC	.	X	INT	0.87	5.02	13	.	.	13
Spotted gar	*Lepisosteus oculatus*	TC	.	X	.	0.13	0.77	2	.	.	2
Threadfin shad	*Dorosoma petenense*	PK	.	X	.	0.67	3.86	10	0.20	2	12
Emerald shiner	*Notropis atherinoides*	IN	.	X	.	1.80	10.42	27	.	.	27
Smallmouth buffalo	*Ictiobus bubalus*	OM	.	X	.	0.13	0.77	2	.	.	2
Golden redhorse	*Moxostoma erythrurum*	BI	.	X	.	0.33	1.93	5	.	.	5
Blue catfish	*Ictalurus furcatus*	OM	.	X	.	.	.	.	0.40	4	4
Channel catfish	*Ictalurus punctatus*	OM	.	X	.	0.13	0.77	2	0.30	3	5
Flathead catfish	*Pylodictis olivaris*	TC	.	X	.	0.07	0.39	1	.	.	1
White bass	*Morone chrysops*	TC	.	X	.	.	.	.	0.30	3	3
Yellow bass	*Morone mississippiensis*	TC	.	X	.	.	.	.	5.00	50	50
Redear sunfish	*Lepomis microlophus*	IN	X	X	.	2.27	13.13	34	0.80	8	42
Spotted bass	*Micropterus punctulatus*	TC	.	X	.	0.87	5.02	13	0.10	1	14
Black crappie	*Pomoxis nigromaculatus*	TC	X	X	.	0.07	0.39	1	0.10	1	2
Yellow perch	*Perca flavescens*	IN	.	.	.	0.07	0.39	1	.	.	1
Logperch	*Percina caprodes*	BI	.	X	.	0.07	0.39	1	.	.	1
Sauger	*Sander canadensis*	TC	.	X	.	0.07	0.39	1	0.20	2	3
Hybrid walleye x sauger	Hybrid *Sander*	TC	.	.	.	0.07	0.39	1	.	.	1
Freshwater drum	*Aplodinotus grunniens*	BI	.	X	.	0.47	2.70	7	1.30	13	20
Total						13.90	80.33	208	24.40	244	452
Number Samples						15			10		
Species Collected						26			15		