Tennessee Valley Authority, Post Office Box 2000, Soddy-Daisy, Tennessee 37384-2000

November 14, 2006

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

Attention: Mr. Chip Hannah

Dear Mr. Hannah:

SEQUOYAH NUCLEAR PLANT - DISCHARGE MONITORING REPORT FOR OCTOBER 2006 AND ENTRAINMENT MONITORING, 2004 FINAL REPORT

Enclosed is the October 2006 Discharge Monitoring Report and the Entrainment Monitoring, 2004 Final Report for Sequoyah Nuclear Plant. Please contact me at (423) 843-6700 if you have any questions or comments.

Sincerely,

Stephanie A. Howard

Stephanie A. Howard
Principal Environmental Engineer
Signatory Authority for
J. Randy Douet
Site Vice President
Sequoyah Nuclear Plant

Enclosure
cc (Enclosure):
Chattanooga Environmental Assistance Center
Division of Water Pollution Control
State Office Building, Suite 550
540 McCallie Avenue
Chattanooga, Tennessee 37402-2013

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

IE25

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*
Name TVA - SEQUOYAH NUCLEAR PLANT
Address P.O. BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	101 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	06	10	01	To	06	10	31

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE ☐ ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	25.1	04	0	31 / 31	MODELD
00010 Z 0 0 INSTREAM MONITORING	PERMIT REQUIREMENT	********	********	****	********	********	30.5 DAILY MX	DEG. C.		SEE PERMIT	CK REQ
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	**	********	********	37.9	04	0	31 / 31	RCORDR
00010 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT DAILY MX	DEG. C.		SEE PERMIT	CK REQ
TEMP. DIFF. BETWEEN SAMP. & UPSTRM DEG.C	SAMPLE MEASUREMENT	********	********	**	********	********	2.7	04	0	31 / 31	CALCTD
00016 1 S 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	3.0 DAILY MX	DEG. C.		CONTIN UOUS	CALCTD
PH	SAMPLE MEASUREMENT	********	********	**	7.5	********	7.7	12	0	16 / 31	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	4	4	19	0	1 / 31	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	30 MO AVG	100 DAILY MX	MG/L		MONTHLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	<5	<5	19	0	1 / 31	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	15 MO AVG	20 DAILY MX	MG/L		MONTHLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	********	1607	03	********	********	********	**	0	31 / 31	RCORDR
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT DAILY MX	MGD	********	********	********	****		CONTIN UOUS	RCORDR

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
J. Randy Douet Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer	423	843-6700	06	11	14
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

No closed mode operation. The following information is included in an attachment: 1. thermal compliance information 2. CCW data 3. veliger monitoring data. PCL-222 Copolymer (max. calc. conc. was 0.008mg/L--limit 0.2mg/L). PCL-222 Phosphate (max. calc. conc. was 0.025mg/L--limit 0.2mg/L)

October 2006 DMR Attachment

October 2006 Thermal Compliance Information

October 1-31: The downstream temperature and temperature rate-of-change are based on measurements from Station 8, the "backup temperature monitor" located at the end of the mixing zone (TRM 483.4). The temperature rise is based on the increase in temperature from measurements at Station 14, located upstream of the plant (TRM 490.5), and measurements at Station 8 (TRM 483.4). Consistent with the permit, measurements reported for the downstream temperature and the temperature rise represent daily maximum 24-hour rolling averages; and, measurements reported of the temperature rate-of-change represent 1-hour averages. Measurements were used rather than the numerical modeling system because of relatively low river flows. TVA has learned as a result of the continuing studies performed under Part III.G. of the permit that under low flow conditions, adjustments may be needed in the formulation of numerical model to improve its accuracy. Until river flows increase or appropriate model adjustments can be made, the modeling system is considered "out of service".

October 2006 CCW Data

CCW TRENCH				
Date/Time Collected	**Extractable Petroleum Hydrocarbons**	**Analysis Date/Time**	**Analyst**	**Method**
10/03/2006 @ 0930	<0.5 mg/L	10/10/2006 @ 1117	JH	EPA 8015
CCW CHANNEL				
Date/Time Collected	**Extractable Petroleum Hydrocarbons**	**Analysis Date/Time**	**Analyst**	**Method**
10/03/2006 @ 0940	<0.5 mg/L	10/10/2006 @ 1106	JH	EPA 8015

October 2006 Veliger Monitoring Information

No samples collected the month of October 2006.

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

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Address: P.O. BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility: TVA - SEQUOYAH NUCLEAR PLANT
Location: HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	101 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	06	10	01	To	06	10	31

MAJOR
(SUBR 01)
F - FINAL
DIFFUSER DISCHARGE
EFFLUENT

*** NO DISCHARGE [ ] ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	********	********	**	********	0.012	0.022	19	0	28 / 31	GRAB
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	0.10 MO AVG	0.10 INST MAX	MG/L		WEEK-DAYS	CALCTD
TEMPERATURE - C, RATE OF CHANGE	SAMPLE MEASUREMENT	********	0.7	62	********	********		**	0	31 / 31	CALCTD
82234 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	2.0 DAILY MX	DEG C/HR	********	********	*******	****		CONTIN-UOUS	CALCTD
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	Certification	SIGNATURE	TELEPHONE		DATE		
J. Randy Douet Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer	423	843-6700	06	11	14
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

Biodetergent 73551 (max. calc. conc. was 0.016mg/L--limit 2.0mg/L). MSW-101 (max. calc. conc. was 0.018mg/L--limit 2.0mg/L). H-150M (max. calc. conc. was 0.035mg/L--limit 0.050mg/L). H-150M (low detection level analytical method was <0.020mg/L--limit 0.050mg/L).

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Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	101 T
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	06	10	01	To	06	10	31

MAJOR
(SUBR 01)
F - FINAL
BIOMONITORING FOR OUTFALL 101
EFFLUENT

*** NO DISCHARGE ☐ ***

Form Approved.
OMB No. 2040-0004

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PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	********	********	**	Monitoring Not Required	********	********	23			
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MINIMUM	********	********	PERCENT		SEE PERMIT	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	********	********	**	Monitoring Not Required	********	********	23			
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	45.2 MIMINUM	********	********	PERCENT		SEE PERMIT	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
J. Randy Douet Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer	423	843-6700	06	11	14
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

Toxicity was not sampled in October 2006.

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

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Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	103 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	06	10	01	To	06	10	31

MAJOR
(SUBR 01)
F - FINAL
LOW VOL. WASTE TREATMENT POND
EFFLUENT

*** NO DISCHARGE [ ] ***

NOTE: Read instructions before completing this form.

Form Approved.
OMB No. 2040-0004

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
PH	SAMPLE MEASUREMENT	********	********	**	7.2	********	8.6	12	0	13 / 31	GRAB
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	**	6.0 MINIMUM	********	9.0 MAXIMUM	SU		THREE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	106	130	26	********	10	12	19	0	4 / 31	GRAB
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	380 MO AVG	1250 DAILY MX	LBS/DY	********	30 MO AVG	100 DAILY MX	MG/L		WEEKLY	GRAB
OIL AND GREASE	SAMPLE MEASUREMENT	<53	<54	26	********	<5	<5	19	0	4 / 31	GRAB
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	190 MO AVG	250 DAILY MX	LBS/DY	********	15 MO AVG	20 DAILY MX	MG/L		WEEKLY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT	1.286	1.438	03	********	********	********	**	0	31 / 31	TOTALZ
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	**		SEE PERMIT	TOTALZ
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
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COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*
Name TVA - SEQUOYAH NUCLEAR PLANT
Address P.O. BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	107 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	06	10	01	To	06	10	31

MAJOR
(SUBR 01)
F - FINAL
METAL CLEANING WASTE POND
EFFLUENT

*** NO DISCHARGE [XX] ***

Form Approved.
OMB No. 2040-0004

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PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
PH	SAMPLE MEASUREMENT	********	********	**		********		12			
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		DAILY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	********		19			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	30 DAILY MX	MG/L		DAILY	COMPOS
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	********		19			
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	15 DAILY MX	MG/L		DAILY	GRAB
PHOSPHORUS, TOTAL (AS P)	SAMPLE MEASUREMENT	********	********	**	********	********		19			
00665 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
COPPER, TOTAL (AS CU)	SAMPLE MEASUREMENT	********	********	**	********	********		19			
01042 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
IRON, TOTAL (AS FE)	SAMPLE MEASUREMENT	********	********	**	********	********		19			
01045 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	MG/L		DAILY	COMPOS
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT			03	********	********	********	**			
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	****		DAILY	CALCTD

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
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TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*
No Discharge this Period

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*
Name TVA - SEQUOYAH NUCLEAR PLANT
Address P.O. BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	110 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	06	10	01	To	06	10	31

MAJOR
(SUBR 01)
F - FINAL
RECYCLED COOLING WATER
EFFLUENT

*** NO DISCHARGE XX ***

Form Approved.
OMB No. 2040-0004

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PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
TEMPERATURE, WATER DEG. CENTIGRADE	SAMPLE MEASUREMENT	********	********	04	********	********		04			
00010 Z 0 0 INSTREAM MONITORING	PERMIT REQUIREMENT	********	********	DEG C	********	********	38.3 DAILY MX	DEG C		DAILY	GRAB-4
PH	SAMPLE MEASUREMENT	********	********	**		********		12			
00400 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	6.0 MINIMUM	********	9.0 MAXIMUM	SU		WEEKLY	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	********		19			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	30 DAILY MX	MG/L		DAILY	COMPOS
OIL AND GREASE	SAMPLE MEASUREMENT	********	********	**	********	********		19			
00556 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	15 DAILY MX	MG/L		DAILY	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT			03	********	********	********	**			
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	****		DAILY	CALCTD
CHLORINE, TOTAL RESIDUAL	SAMPLE MEASUREMENT	********	********	**	********	********		19			
50060 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	0.10 DAILY MX	MG/L		WEEKLY	GRAB-4
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER			TELEPHONE		DATE		
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TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

No Discharge this Period

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

Name TVA - SEQUOYAH NUCLEAR PLANT
Address P.O. BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	110 T
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	06	10	01	To	06	10	31

MAJOR
(SUBR 01)
F - FINAL
RECYCLED COOLING WATER
EFFLUENT

*** NO DISCHARGE XX ***

NOTE: Read instructions before completing this form.

Form Approved.
OMB No. 2040-0004

PARAMETER		QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		AVERAGE	MAXIMUM	UNITS	MINIMUM	AVERAGE	MAXIMUM	UNITS			
IC25 STATRE 7DAY CHR CERIODAPHNIA	SAMPLE MEASUREMENT	********	********	**		********	********	23			
TRP3B 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	**45.2 MINIMUM**	********	********	PERCENT		SEMI ANNUAL	COMPOS
IC25 STATRE 7DAY CHR PIMEPHALES	SAMPLE MEASUREMENT	********	********	**		********	********	23			
TRP6C 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	**45.2 MINIMUM**	********	********	PERCENT		SEMI ANNUAL	COMPOS
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER		SIGNATURE	TELEPHONE		DATE		
J. Randy Douet Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer	423	843-6700	06	11	14
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

No Discharge this Period

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

Name TVA - SEQUOYAH NUCLEAR PLANT
Address P.O. BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

TN0026450	116 G
PERMIT NUMBER	DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	06	10	01	To	06	10	31

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE ☐ ***

Form Approved.
OMB No. 2040-0004

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
DEBRIS, FLOATING (SEVERITY)	SAMPLE MEASUREMENT	********	********	**	********	********	0	9A	0	1 / 31	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
OIL AND GREASE VISUAL	SAMPLE MEASUREMENT	********	0	94	********	********	********	**	0	1 / 31	VISUAL
84066 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT MO TOTAL	YES=1 NO=0	********	********	********	****		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
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	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER	Certification	Signature	TELEPHONE		DATE		
J. Randy Douet Site Vice President	I Certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is , to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.	Stephanie A. Howard Principal Environmental Engineer	423	843-6700	06	11	14
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

Operations performs visual inspections for floating debris and oil and grease during all backwashes.

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*
Name TVA - SEQUOYAH NUCLEAR PLANT
Address P.O. BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

PERMIT NUMBER	DISCHARGE NUMBER
TN0026450	117 G

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	06	10	01	To	06	10	31

MAJOR
(SUBR 01)
F - FINAL
BACKWASH
EFFLUENT

*** NO DISCHARGE ☐ ***

NOTE: Read instructions before completing this form.

Form Approved.
OMB No. 2040-0004

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
DEBRIS, FLOATING (SEVERITY)	SAMPLE MEASUREMENT	********	********	**	********	********	0	9A	0	1 / 31	VISUAL
01345 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	REPORT MO TOTAL	PASS=0 FAIL=1		SEE PERMIT	VISUAL
OIL AND GREASE VISUAL	SAMPLE MEASUREMENT	********	0	94	********	********	********	**	0	1 / 31	VISUAL
84066 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	REPORT MO TOTAL	YES=1 NO=0	********	********	********	****		SEE PERMIT	VISUAL
	SAMPLE MEASUREMENT										
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	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
J. Randy Douet
Site Vice President
TYPED OR PRINTED

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Stephanie A. Howard
Principal Environmental Engineer
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE		DATE		
423	843-6700	06	11	14
AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*
Operations performs visual inspections for floating debris and oil and grease during all backwashes.

PERMITTEE NAME/ADDRESS *(Include Facility Name/Location if Different)*

Name TVA - SEQUOYAH NUCLEAR PLANT
Address P.O. BOX 2000
(INTEROFFICE SB-2A)
SODDY - DAISY TN 37384
Facility TVA - SEQUOYAH NUCLEAR PLANT
Location HAMILTON COUNTY

ATTN: Stephanie A. Howard

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM *(NPDES)*
DISCHARGE MONITORING REPORT *(DMR)*

PERMIT NUMBER	DISCHARGE NUMBER
TN0026450	118 G

MAJOR
(SUBR 01)
F - FINAL
WASTEWATER & STORM WATER
EFFLUENT

Form Approved.
OMB No. 2040-0004

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
From	06	10	01	To	06	10	31

*** NO DISCHARGE XX ***

NOTE: Read instructions before completing this form.

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
OXYGEN, DISSOLVED (DO)	SAMPLE MEASUREMENT	********	********	**		********	********	19			
00300 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	2.0 DAILY MN	********	********	MG/L		TWICE/ WEEK	GRAB
SOLIDS, TOTAL SUSPENDED	SAMPLE MEASUREMENT	********	********	**	********	********		19			
00530 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	100 DAILY MX	MG/L		TWICE/ WEEK	GRAB
SOLIDS, SETTLEABLE	SAMPLE MEASUREMENT	********	********	**	********	********		25			
00545 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	********	********	****	********	********	1.0 DAILY MX	ML/L		ONCE/ MONTH	GRAB
FLOW, IN CONDUIT OR THRU TREATMENT PLANT	SAMPLE MEASUREMENT			03	********	********	********	**			
50050 1 0 0 EFFLUENT GROSS VALUE	PERMIT REQUIREMENT	REPORT MO AVG	REPORT DAILY MX	MGD	********	********	********	*		ONCE/ BATCH	ESTIMA
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

J. Randy Douet
Site Vice President

TYPED OR PRINTED

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Stephanie A. Howard
Principal Environmental Engineer

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE		DATE		
423	843-6700	06	11	14
AREA CODE	NUMBER	YEAR	MO	DAY

COMMENTS AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

During this reporting period, there has been no flow from the Dredge Pond other than that resulting from rainfall.

October 6, 2006

Stephanie Howard, SB 2A-SQN

ENTRAINMENT MONITORING AT SEQUOYAH NUCLEAR PLANT (SQN), 2004 – FINAL REPORT

Attached are four copies of the Entrainment Monitoring at Sequoyah Nuclear Plant (SQN), 2004. This report, as you know, is required under the SQN NPDES permit and will be submitted to the Tennessee Department of Environment and Conservation. I would appreciate receiving a copy of official transmittal letter via email if possible. If you have any questions or need additional copies of the report, call or email me.

Dennis S. Baxter
Aquatic Zoologist
WT 11C-K

DSB:GS
Attachments
cc (Attachment):
Files, RS, WT 11C-K (1 copy of report)

SQN Entrainment 2006.doc

Entrainment Monitoring At Sequoyah Nuclear Plant 2004

by
Dennis S. Baxter
and
Johnny P. Buchanan

October 2006
Final

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Acronyms

AMSL	Above Mean Sea Level
BIP	Balanced Indigenous Population
CCW	Condenser Cooling Water
CFS	Cubic Feet per Second
NPDES	National Pollutant Discharge Elimination System
RFAI	Reservoir Fish Assemblage Index
SFI	Sport Fishing Index
SQN	Sequoyah Nuclear Plant
TRM	Tennessee River Mile
TVA	Tennessee Valley Authority
VS	Vital Signs

EXECUTIVE SUMMARY

Sequoyah Nuclear Plant's (SQN) current National Pollutant Discharge Elimination System permit number TN0026450 states, "For Section 316(b), the permittee shall summarize previous data and indicate whether significant changes have occurred in plant operation, reservoir operations or instream biology that would necessitate significant changes to the variance." Condenser Cooling Water (CCW) withdrawn from Chickamauga Reservoir potentially affects the fish community by entrainment (small fish and eggs drawn through the intake screens) and impingement (fish trapped against screens by the intake water velocity). Densities of fish in the reservoir near the intake and daily volume of water transported past the SQN were compared to daily CCW demand and densities of fish at the intake skimmer wall to estimate percent entrainment.

During operational monitoring from 1980 through 1985, the entrainment of total fish larvae was estimated to be 8.6 percent of those passing the plant. In order to compare the current larval fish assemblage and level of hydraulic entrainment with data collected during operational monitoring, ichthyoplankton sampling was conducted during May through July 2004. Clupeids (primarily gizzard and threadfin shad) were the dominant taxon collected in entrainment sampling and estimated entrainment was 15.4 percent. Freshwater drum larval entrainment was estimated to be 45.4 percent, the highest for any of the significant taxa. Overall larval entrainment was estimated to be 15.6 percent during 2004.

Entrainment estimates for total larvae in 2004 were higher than those from historical samples colleted during 1981 through 1985. Historical fluctuations in rates of entrainment and recent Reservoir Fish Assemblage Index evaluations indicate the Chickamauga Reservoir near SQN supports a balanced and diverse indigenous fish community with no significant impacts observed from current plant operation.

Introduction

Section 316(a) of the Clean Water Act allows point-source dischargers of heated water to obtain a variance from state water quality standards if the point-source can demonstrate maintenance of balanced indigenous populations (BIP) of aquatic life. Compliance requires permittee to characterize the aquatic community in the vicinity of the intake structure prior to operation; monitoring during normal operation to assess impacts; and periodically review current operational demands, reservoir operation, and condition of the aquatic community to ensure no significant changes have occurred. Two potential impacts associated with cooling water intake structures are impingement and entrainment. Impingement occurs when aquatic organisms are trapped against the intake structure (traveling screens) by the withdrawal of cooling water and entrainment occurs when organisms are drawn through the intake structure into the plant cooling system.

Sequoyah Nuclear Plant's (SQN) current National Pollutant Discharge Elimination System (NPDES) permit number TN0026450 states, "For Section 316(b), the permittee shall summarize previous data and indicate whether significant changes have occurred in plant operation, reservoir operations or instream biology that would necessitate significant changes to the variance." In 1991, the Tennessee Valley Authority (TVA) implemented changes in TVA reservoir operations to maintain minimum flows below dams at critical times and locations. These changes were the result of the Tennessee River and Reservoir System Operation and Planning Review (TVA 1991). Other changes included increasing dissolved oxygen below 16 dams by aerating releases, and to delay unrestricted summer drawdown until August 1 on ten tributary reservoirs. Further changes in reservoir operation policy were implemented in 2005 as a result of TVA's Reservoir Operations Study and Environmental Impact Statement (TVA 2004).

During operational monitoring at SQN from 1980 through 1985, the average hydraulic entrainment of fish larvae was estimated to be 8.6 percent of those passing the plant. In order to compare current level of larval fish and hydraulic entrainment with data collected during operational monitoring, ichthyoplankton sampling was conducted during April through July 2004. The purpose of this document is to summarize and provide Tennessee Department of Environment and Conservation the results and comparisons between current and historical entrainment monitoring data.

RESERVOIR AND PLANT OPERATION DURING 2004

Chickamauga Reservoir Operation

Surface elevation of Chickamauga Reservoir and river flow past SQN is dependent on the rate water is released through Watts Bar and Chickamauga Dams. TVA's integrated approach to Chickamauga Reservoir operation includes winter drawdown for flood control, minimum summer pools, and hydroelectric power generation. In 2004, average daily surface elevation of Chickamauga forebay ranged from 206.0 m above mean sea level (AMSL) to 209.5 m AMSL (Figure 1). Daily river flow past SQN ranged from 159 m^3/s to 2634 m^3/s in 2004 (Figure 2).

On May 18, 2004, the daily average release from Chickamauga Hydro was zero cubic feet per second (cfs) while the release from Watts Bar Hydro was 7100 cfs. This unusual situation resulted in essentially zero or negative flow past SQN.

Sequoyah Operation

SQN Units 1 and 2 were both in operation during the 2004 entrainment sampling (Figure 3). The combined generation rate for Units 1 and 2 averaged 2081 megawatts in 2004. The average daily withdrawal rate (hydraulic entrainment) of CCW from Chickamauga Reservoir during 2003 and 2004 was 86 m^3/s (Figure 4). However, CCW demand during entrainment sampling (April 27 through July 12, 2004) reflected normal operation, averaging 91 m^3/s.

Methods

Sample Collection

Larval sampling began on April 20 and continued through July 12, 2004. Ichthyoplankton samples provided temporal abundance of larval fish and eggs at five stations along a transect perpendicular to river flow just upstream of the plant intake channel at Tennessee River Mile (TRM) 485 (Figure 5). Seven samples were collected weekly during both day and night. Samples consisted of one full-stratum sample from both left and right overbanks, three samples from the mid-channel area with one taken from surface to mid-depth, one from mid-depth to bottom and one towed near bottom for the duration of the sample. In addition, two replicate, 20-minute full-stratum samples were collected along the intake skimmer wall.

Samples were collected with a beam net (0.5 m square, 1.8 m long, with 505 micron "nitex" mesh netting) towed upstream at a speed of 1.0 m/s for ten minutes. The volume of water filtered through the net was measured with a large-vaned General Oceanics flowmeter®. Approximately 150 m^3 of water were filtered per ten minute sample. Intake samples were collected by lowering the net to the bottom and gradually raising the net during the 20 minutes to the depth of the skimmer wall (approximately 16-17 meters). Approximately 40-50 m^3 of water were filtered per intake sample. Water temperature was recorded using a mercury thermometer calibrated to the tenth degree Celsius.

Laboratory and Data Analysis

Laboratory Analysis

Larval fish and eggs were removed from the samples, identified to the lowest possible taxon, counted and measured to the nearest millimeter total length following procedures outlined in NROPS-FO-BR-24.1 (TVA 1983). Taxonomic decisions were based on TVA's "Preliminary Guide to the Identification of Larval Fishes in the Tennessee River," (Hogue et al., 1976) and other pertinent literature.

The term "unidentifiable larvae" applies to specimens too damaged or mutilated to identify, while "unspecifiable" before a taxon implies a level of taxonomic resolution (e.g., "unspecifiable catostomids" designates larvae within the family Catostomidae that currently cannot be identified to a lower taxon). The category "unidentifiable eggs" applies to specimens that cannot be identified due to damage or lack of taxonomic knowledge. Taxonomic refinement is a function of specimen size and developmental stage. Throughout this report, the designation "unspecifiable clupeids" refers to clupeids less than 20 mm in total length and could include Dorosoma cepedianum (gizzard shad), D. petenense (threadfin shad), and/or Alosa chrysochloris (skipjack herring). Any clupeid specimens identified to species level represent postlarvae 20 mm or longer in total length.

Developmental stage of moronids also determines level of taxonomic resolution. Morone saxatilis (striped bass) hatch at a larger size than either M. chrysops (white bass) or M. mississippiensis (yellow bass). Although it is currently impossible to distinguish between larvae of the latter two species, M. saxatilis can be eliminated as a possibility based on developmental characteristics of specimens 6 mm or less in total length (hence, the taxonomic designation Morone, not saxatilis). Specimens identified as Morone *spp*. are greater than 6 mm total length.

Data Analysis

Temporal occurrence and relative abundance of eggs and larvae by taxon are presented and discussed for the entire monitoring period. Densities of fish eggs and larvae are expressed as numbers per 1000 m^3 of water sampled.

Estimated entrainment of fish eggs and larvae at SQN was calculated by the following method: densities of eggs and larvae transported past the plant were estimated for each sample period by averaging densities (all stations) of eggs and larvae from TRM 485 and multiplying by the corresponding 24-hour flow past the plant. Percentage of transported ichthyofauna entrained by the plant was estimated from the formula:

$$E = 100 \frac{D_i Q_i}{D_r Q_r}$$

where D_i = mean density (N/1000 m^3) of eggs or larvae in intake samples;

Dr = mean density (N/1000 m3) of eggs or larvae in river

(TRM 485 transect);

Q_i = plant intake water demand (m^3/d);

Q_r = river flow (m^3/d).

Results and Discussion

During twelve sample periods in 2004, the average volume of water filtered each period was 232.7 m^3 for intake samples and 876.6 m^3 for reservoir samples (Table 1). A list of families of fish eggs and larvae collected during 2004 including the lowest level of taxonomic resolution is presented in Table 2.

Fish Eggs

Freshwater drum eggs comprised 98.8 percent of the total fish eggs and were collected during all twelve sample periods (Table 3), demonstrating the extended spawning season for this species. Densities peaked on May 25 at 24,367/1000 m^3 in reservoir samples and on June 2 at 1,594/1000 m^3 in samples collected near the intake (Table 4) (Figure 6). Average seasonal densities for drum eggs were 549 and 652/1000 m^3 in the intake and reservoir samples respectively (Table 5).

Larval Fish

Relative abundance for all taxa of larval fish collected during the twelve weekly sample periods of 2004 (Table 3) was dominated by clupeids (87.9%), *Morone* (5.5%), freshwater drum (3.2%) and centrarchids (3.1%). Total number of larvae collected for the four dominant taxa was 51,350 and total collected for all taxa was 52,881. A comparison of densities of total fish larvae by sample period between intake and reservoir samples is presented in Figure 7.

Peak densities of clupeid larvae (primarily gizzard and threadfin shad) occurred on April 27 in reservoir samples (20,570/1000 m^3) and on May 3 in intake samples (15,464/1000 m^3) (Table 4). Following the high densities in late April and early May, clupeid densities decreased dramatically through the remainder of the sampling period with a slight increase observed during early June (Figure 8). Average seasonal density for clupeids was 2,249/1000 m^3 for intake and 3,465/1000m^3 for reservoir samples (Table 5).

Larval *Morone* were collected from the first sample period (April 20) through June 9, 2004. Densities of *Morone* (white and yellow bass) larvae also peaked on April 27 (Figure 9) at 1,558 and 277/1000m^3 in the reservoir and intake samples respectively. Average seasonal densities of larval *Morone* were 52/1000 m^3 in intake samples and 247/1000 m^3 in reservoir samples (Table 5).

Centrarchid (*Lepomis and Pomoxis*) larvae were first collected on April 27 and were present in samples throughout the remainder of the sampling season (Figure 10). Peak densities of 897/1000 m^3 occurred in the reservoir samples on June 2 and 1,027/1000 m^3 occurred on June 15 in the intake samples (Table 4). Centrarchid larvae exhibited similar average seasonal densities in both intake (131/1000 m^3) and reservoir samples (128/1000 m^3).

Freshwater drum larvae were first collected on April 27 and were present in samples throughout the remainder of the sampling season. Densities peaked on May 18 at 717/1000 m^3 in the intake samples and on June 9 at 379/1000 m^3 in reservoir samples (Table 4). Average seasonal densities were 200/1000m^3 in intake and 104/1000 m^3 in reservoir samples (Table 5).

Average seasonal densities for all taxa collected are presented in Table 5.

Hydraulic Entrainment Estimates

Hydraulic entrainment by SQN during the twelve sampling periods in 2004 averaged 24.2 percent with a range of 7.4 to 111.1 percent (Table 6). The peak hydraulic entrainment occurred on May 18 and the lowest was recorded on June 30. The entrainment estimate of 111.1 percent on May 18 was a result of zero release at Chickamauga Dam and 7,100 cfs average release from Watts Bar Dam.

Fish Egg and Larvae Entrainment Estimates

Estimated total transport of fish eggs (98.8% drum eggs) past SQN during 12 sample periods in 2004 was 5.4 billion. The seasonal entrainment estimate for drum (Sciaenid) eggs was 11.2 percent (Table 7).

Estimated total transport of fish larvae past SQN during 12 sample periods in 2004 was 9.8 billion. Clupeid larvae comprised 87.9 percent of this total and were entrained at a rate of 15.4 percent of the total passing the plant. The overall estimated rate of entrainment for total fish larvae was 15.6 percent, obviously driven by clupeids as the most dominant taxon. Average seasonal densities of clupeids in intake vs. reservoir samples were 2,249 and 3,465/1000 m^3 respectively (Table 5).

Estimated entrainment of freshwater drum larvae was 45.4 percent. The two highest densities of drum larvae were both observed in intake samples on May 18 and on June 02. The peak density of 717/1000 m^3 at the intake on May 18 occurred coincidentally when the hydraulic entrainment estimate also peaked at 111.1 percent. Overall, densities of freshwater drum larvae were higher in intake samples than channel samples during 8 out of 12 sample periods (Figure 11).

The entrainment estimate for Centrarchids (primarily sunfish and crappie larvae) was 24.2 percent of those passing the plant. Average seasonal density was similar at both intake (131/1000 m^3) and reservoir (128/1000 m^3) samples (Table 5).

Morone larvae were the only other significant taxon with estimated entrainment over one percent (Table 5). An estimated five percent of *Morone* larvae passing SQN during 2004 were entrained.

Cyprinid (minnows) larvae were collected in very low numbers evidenced by seasonal densities of 7 and 2/1000 m^3 in intake and reservoir samples respectively. Higher densities in intake samples resulted in an estimate of 72.6 percent entrainment for this taxon (Table 6).

DISCUSSION WITH HISTORICAL COMPARISONS

Sample methods used to collect fish eggs and larvae during 2004 were only slightly different than those used in 1985 (TVA 1986 and TVA 1987). Seasonal mean hydraulic entrainment was 12.2 percent in 1985 compared to 24.2 percent in 2004. Higher hydraulic entrainment was likely the result of lower reservoir flow rate caused by lower than average runoff from rainfall. This also influenced the total entrainment rate of 15.6 percent for larval fish which was the highest ever recorded.

Estimated entrainment of freshwater drum eggs was 11.2 percent in 2004 compared to 16.6 percent in 1985. Drum larval entrainment was estimated at 30.2 percent in 1985 compared to 45.4 percent in 2004. Considering that hydraulic entrainment doubled from 1985 to 2004, this increased rate of entrainment estimated for drum larvae could be expected. Table 8 compares historical fish egg and larval entrainment estimates between 1981 through 1985 with the recent estimates during 2004. Historical data led to the conclusion that significant spawning by freshwater drum occurs in the vicinity of, or slightly downstream of SQN, producing eggs and larvae that are not subjected to plant entrainment. Even though seasonal larval drum entrainment was abnormally high (45.4%) during 2004, it was primarily attributed to the May 18 sample period when the peak density occurred simultaneously with peak hydraulic entrainment (111 %).

Chickamauga Reservoir Fish Community

Industries responsible for point-source discharges of heated water can obtain a variance from state water quality standards if the industry can demonstrate compliance with thermal criteria by documenting the maintenance of BIP of aquatic life in the vicinity of its discharge. SQN's current NPDES permit number TN0026450 states, "For Section 316(a), the permittee shall summarize previous data and indicate whether significant changes have occurred in plant operation, reservoir operations or in stream biology that would necessitate significant changes to the permitted variance." The permittee shall use the Reservoir Fish Assemblage Index (RFAI) to assess Chickamauga Reservoir fish community health. Any apparent declines in the fish community health will be further investigated to discover whether the decline is a valid conclusion and if the decline is real and to identify possible sources for the fish community decline. As part of the identification of potential sources for the decline, the instream effects of the discharges made under this permit will be investigated (TDEC 2000). In response to this requirement, TVA's Vital Signs (VS) monitoring program (Dycus and Meinert 1993) will be used to evaluate areas of Chickamauga Reservoir upstream and downstream of SQN discharge. Reservoirs are typically divided into three zones for VS Monitoring – inflow, transition and forebay. The inflow zone is generally in the upper reaches of the reservoir and is riverine in nature; the transition zone or mid-reservoir is the area where water velocity decreases due to increased cross-sectional area, and the forebay is the lacustrine area near the dam. The Chickamauga Reservoir inflow zone sample site is located at TRM 529.0; the transition zone sampling site is located at TRM 490.5 and the forebay zone sampling site is located at TRM 472.3. The VS transition zone, which is located approximately 7.2 river miles upstream of the SQN discharge (TRM 483.3), will be used to provide upstream data for the 316(a) thermal variance studies performed in sample years between 1993 and 2005. An additional transition station was later added downstream of the SQN discharge to more closely monitor Chickamauga Reservoir aquatic communities in close proximity to the SQN thermal effluent. This station is located at TRM 482.0 and will be used for downstream comparisons of aquatic communities for the 1999 through 2005 sample seasons. The forebay zone, will serve as the downstream station for 1993 through 1995 and 1997 sample seasons.

Sport Fishing Index

In the past, the Sport Fishing Index (SFI) was used in support of a thermal variance request at SQN (TVA 1996). The SFI was developed to quantify sport fishing quality for individual sport fish species. The SFI provides biologists with a reference point to measure the quality of a sport fishery. Comparison of the population sampling parameters and creel results for a particular sport fish species with expectations of these parameters from a high quality fishery (reference conditions) allows for the determination of fishing quality. Indices have been developed for black bass (largemouth, smallmouth and spotted bass), sauger, striped bass, bluegill, and channel catfish. Each SFI relies on measurements of quantity and quality aspects of angler success and fish population characteristics.

In recent years, SFI information has been used to describe the quality of the resident fishery in conjunction with compliance monitoring, thermal variance requests, and other regulatory issues at TVA nuclear plants in Tennessee. Similar NPDES compliance monitoring programs using the methodologies described above are also being performed at Browns Ferry Nuclear, Colbert and Widows Creek Fossil Plants in Alabama.

The TVA Spring Sport Fish Survey 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 fisherman.

In the autumn of 2004, Chickamauga Reservoir's sport fish population received similar RFAI scores (Table 9) compared to the eight year average (TVA 2006). Largemouth bass, smallmouth bass, spotted bass, crappie, bluegill, and channel catfish received higher scores than their seven year averages (Figure 12). Channel catfish, largemouth bass, and bluegill received their highest SFI scores to date. Crappie and black bass received lower scores in 2004 compared to scores in 2003. This quality assessment is not necessarily indicative of a trend and historical data indicate that SFI scores typically vary among years. However if future scores would continue to decline, further investigation would be warranted.

CONCLUSIONS

Both historical data and the 2004 sampling results demonstrate the significant variability in the occurrence and spatial-temporal distribution of larval fish in Chickamauga Reservoir near SQN. This variability translates into significant fluctuation in the entrainment rates associated with plant operation. Factors contributing to these fluctuations include:

- Proximity of intake to spawning and nursery areas
- Seasonality and period of occurrence
- Vertical distribution/movement
- Cross-sectional or horizontal distribution
- Diel distribution
- Life-stage/swimming ability
- Growth rate
- Physical parameters and operation of Chickamauga Reservoir in the vicinity of SQN

In calculating entrainment estimates, one or two species usually comprise a high percentage of the total composition, as is the case with clupeids and freshwater drum in the vicinity of SQN. Freshwater drum spawn in open water while shad spawn near shore and each female produces thousands of eggs, creating areas in the reservoir with high densities of fish eggs and early larvae. As these high density pulses of eggs and larvae drift downstream, their occurrence within a sampling area (either near the plant intake or in the open reservoir) may significantly affect individual entrainment estimates.

The 2004 316(b) data and recent fish community assessments in Chickamauga Reservoir near SQN show no significant impacts from current operation of SQN on the fish community near the plant. Furthermore, current 316(b) data support conclusions presented in the 1986 historical assessments. Results demonstrate annual variations in the relative abundance and spatial-temporal distribution of fish and fluctuations in reservoir flow are common in the vicinity of SQN. Life history aspects and dynamics of drifting larvae and fluctuation in reservoir flow past SQN are significant factors influencing variations observed in the annual entrainment estimates. These variations in fish density and reservoir flow in the Chickamauga transition zone have apparently had little affect on the fish community. Based on the 2004 316(b) evaluation and the annual RFAI and SFI scores for Chickamauga Reservoir, a viable balanced indigenous fish community is present in Chickamauga Reservoir in the vicinity of SQN.

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Table 1. Total Volume of Water Filtered by Sample Period at Sequoyah Nuclear Plant during 2004 to Estimate Entrainment of Fish Eggs and Larvae.

Sample Date	2004		
	Intake m^3	Reservoir m^3	Total m^3
Apr 27	216.7	965.5	1182.2
May 4	271.6	1067.7	1339.3
May 10	299.4	833.8	1133.2
May 18	346.1	799.8	1145.9
May 25	276.4	822.1	1098.5
Jun 2	209.6	901.9	1111.5
Jun 9	97.7	939.0	1036.7
Jun 15	189.9	738.5	928.4
Jun 23	254.5	884.1	1138.6
Jun 30	228.0	688.1	916.1
Jul 7	260.4	977.6	1238.0
Jul 12	142.0	901.3	1043.3
Total	**2792.3**	**10519.4**	**13311.7**
Average	**232.7**	**876.6**	**1109.3**

Table 2. List of Fish Eggs and Larvae by Family Collected at Sequoyah Nuclear Plant in 2004 Entrainment Samples and Lowest Level of Taxonomic Resolution for each Family.

Scientific Name	Common Name	Lowest Level of Taxonomic Identification
Clupeidae	**Shad**	**Family** - all larvae < 20 mm TL. **Genus or species** -larger individuals to *Alosa* spp.- alewife, skipjack, *Dorosoma* spp. - gizzard and threadfin shad.
Cyprinidae	**Minnows and Carps**	**Family** – most minnows, shiners, and chubs **Genus or species** -common carp, golden shiner, and larger individuals to emerald shiner, mimic shiner, *Pimephales* spp.
Catostomidae	**Suckers**	**Subfamily** - ictiobines (buffalo and carpsuckers) **Genus** - Larger individual to buffalo.
Ictaluridae	**Catfishes**	**Species** - Blue, Channel
Moronidae	**Temperate basses**	**Genus** -most larval life phases **Species** - yolk-sac larvae ≥ 5 mm TL (striped bass), larger individuals to white, yellow, and striped bass.
Centrarchidae	**Sunfishes**	**Genus** - crappie, lepomids (sunfishes), and black bass. **Species** - larger individuals to largemouth bass.
Sciaenidae	**Drums**	**Species**. freshwater drum
Unspecified Larvae and Eggs		Identification to family was not possible. Limiting factors were size, stage of development, and season when egg was collected.

Table 3. Percent Composition of Fish Eggs and Larvae by Family in Entrainment Samples at Sequoyah Nuclear Plant during 2004.

	Intake Samples %	Reservoir Samples %	All Samples %
Eggs			
Unspecified	0.0	1.9	1.2
Sciaenidae	100.0	98.1	98.8
Larvae			
Clupeidae	85.2	87.8	87.9
Cyprinidae	0.3	0.1	0.2
Catostomidae	T	T	T
Ictaluridae	T	T	T
Moronidae	2.0	6.3	5.5
Centrarchidae	5.0	3.3	3.1
Sciaenidae	7.6	2.6	3.2

T – Taxon was collected in samples but composition was less than 0.1%.

Table 4. Peak Densities and Sample Dates by Family for Fish Eggs and Larvae from Intake and Reservoir Entrainment Samples Collected at Sequoyah Nuclear Plant during 2004.

Peak Density Number/1000 m^3				
	Intake/ Skimmer Wall	**Sample Date D=Day N=Night**	**Reservoir**	**Sample Date D=Day N=Night**
EGGS				
Family				
Sciaenidae	1,594	June 2	4,433	May 25
LARVAE				
Family				
Clupeidae	15,464	May 3	20,570	April 27
Cyprinidae	28	April 27	6	April 27
Catostomidae	0	-	7	June 15
Ictaluridae	0	-	2	June 9
Moronidae	277	April 27	1,558	April 27
Centrarchidae	1,027	June 15	897	June 2
Sciaenidae	717	May 18	379	June 9

Table 5. Average Seasonal Density of Fish Eggs and Larvae in Entrainment Samples at Sequoyah Nuclear Plant during 2004.

	Intake Samples 1000 m^3	Reservoir Samples 1000 m^3	All Samples 1000 m^3
Eggs			
Unspecified	0	12	6
Sciaenidae	549	652	601
Totals:	549	664	607
Larvae			
Clupeidae	2249	3465	2857
Cyprinidae	7	2	5
Catostomidae	0	T	T
Ictaluridae	0	T	T
Moronidae	52	247	149
Centrarchidae	131	128	129
Sciaenidae	200	104	3.2
Totals:	**2639**	**3946**	**3292**

T – Taxon was collected in samples but density averaged less than 1 individual per 1000 m^3.

Table 6. Estimated Daily Hydraulic Entrainment by Sample Period at Sequoyah Nuclear Plant during 2004.

Sample Date	Volume		
	Intake m^3 day	Reservoir m^3 day	Entrained
	Q_i	Q_r	%
Apr 27	5.90E+06	2.50E+07	23.6%
May 4	6.00E+06	5.50E+07	10.9%
May 10	6.00E+06	5.40E+07	22.2%
May 18	6.00E+06	5.40E+06	111.1%
May 25	6.1.0E+06	2.10E+07	29.0%
Jun 02	6.00E+06	1.80E+07	33.3%
Jun 09	6.00E+06	6.70E+07	9.0%
Jun 15	6.00E+06	4.60E+07	13.0%
Jun 23	6.10E+06	5.90E+07	10.3%
Jun 30	6.10E+06	8.20E+07	7.4%
Jul 07	6.10E+06	5.70E+07	10.7%
Jul 12	6.10E+06	6.20E+07	9.8%
Average	**6.03E+06**	**4.37E+07**	**24.2%**

Table 7. Seasonal Entrainment Estimates for Numerically Significant Fish Taxa Collected at Sequoyah Nuclear Plant during 2004.

Taxa	Intake Number Entrained Per Day $Q_i X D_i$	Reservoir Total Number Per Day $Q_r X D_r$	Entrainment Estimate %
Eggs			
Sciaenidae	6.10E+09	5.40E+10	11.2
Totals:	**6.10E+09**	**5.40E+10**	**11.2**
Larvae			
Clupeidae	1.30E+10	8.60E+10	15.4
Cyprinidae	4.30E+07	5.90E+07	72.6
Catostomidae	0.00E+00	1.40E+07	0.0
Ictaluridae	0.00E+00	6.50E+06	0.0
Moronidae	3.10E+08	6.20E+09	5.0
Centrarchidae	7.70E+08	3.20E+09	24.2
Sciaenidae	1.20E+09	2.60E+09	45.4
Totals:	**1.53E+10**	**9.81E+10**	**15.6**

Table 8. Historical and Current Entrainment Percentages for Fish Eggs and Larvae at Sequoyah Nuclear Plant during 1981-1985 and 2004.

	1981	1982	1983	1984	1985	2004
Freshwater Drum Eggs	6.7	41.4	22.6	9.7	16.6	11.2
Larvae						
Clupeidae	2.1	1.5	2.7	1.8	1.1	15.4
Cyprinidae	4.3	4.2	5.9	2.3	3.1	72.6
Catostomidae	0.0	0.0	6.1	2.6	0.0	0.0
Ictaluridae	8.4	7.7	9.1	45.9	27.8	0.0
Moronidae	1.7	2.7	4.8	2.2	2.46	5.0
Centrarchidae	1.0	1.8	1.1	0.6	0.7	24.2
Percidae	3.6	1.6	10.7	1.6	3.5	0.0
Sciaenidae	5.5	25.6	57.8	22.7	30.2	45.4
Total Larvae	**2.3**	**2.2**	**4.7**	**2.3**	**2.6**	**15.6**

Table 9. **Recent (1993-2005) RFAI Scores Collected as Part of the Vital Signs Monitoring Program Upstream and Downstream of Sequoyah Nuclear Plant.**

Station	Reservoir	Location	1993	1994	1995	1997	1999	1993-1999 Average	2000*	2001	2002*	2003	2004	2005	1993-2005 Average
Upstream	Chickamauga	TRM 490.5	49	40	46	39	45	44 (Good)	46	45	51	42	49	48	45 (Good)
Sequoyah Transition	Chickamauga	TRM 482.0					41	41 (Good)	48	46	43	45	41	39	43 (Good)
Forebay	Chickamauga	TRM 472.3	44	44	47	39	45	44 (Good)	45	48	46	43	43	46	45 (Good)

*The 2000, and 2002, sample years were not part of the VS monitoring program, however the same methodology was applied.

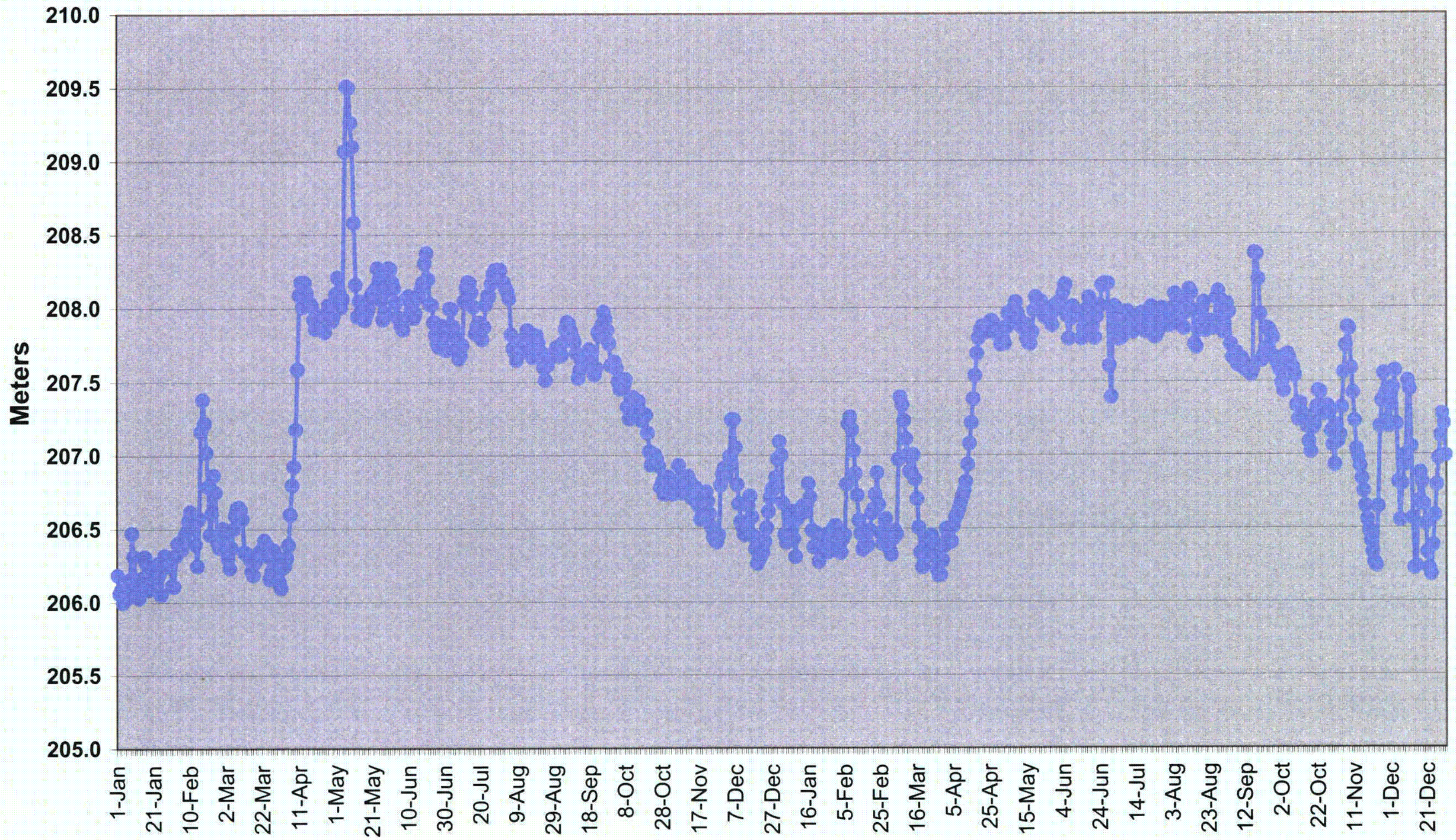

Figure 1. Average daily surface elevation (meters above mean sea level) of Chickamauga Reservoir during 2004.

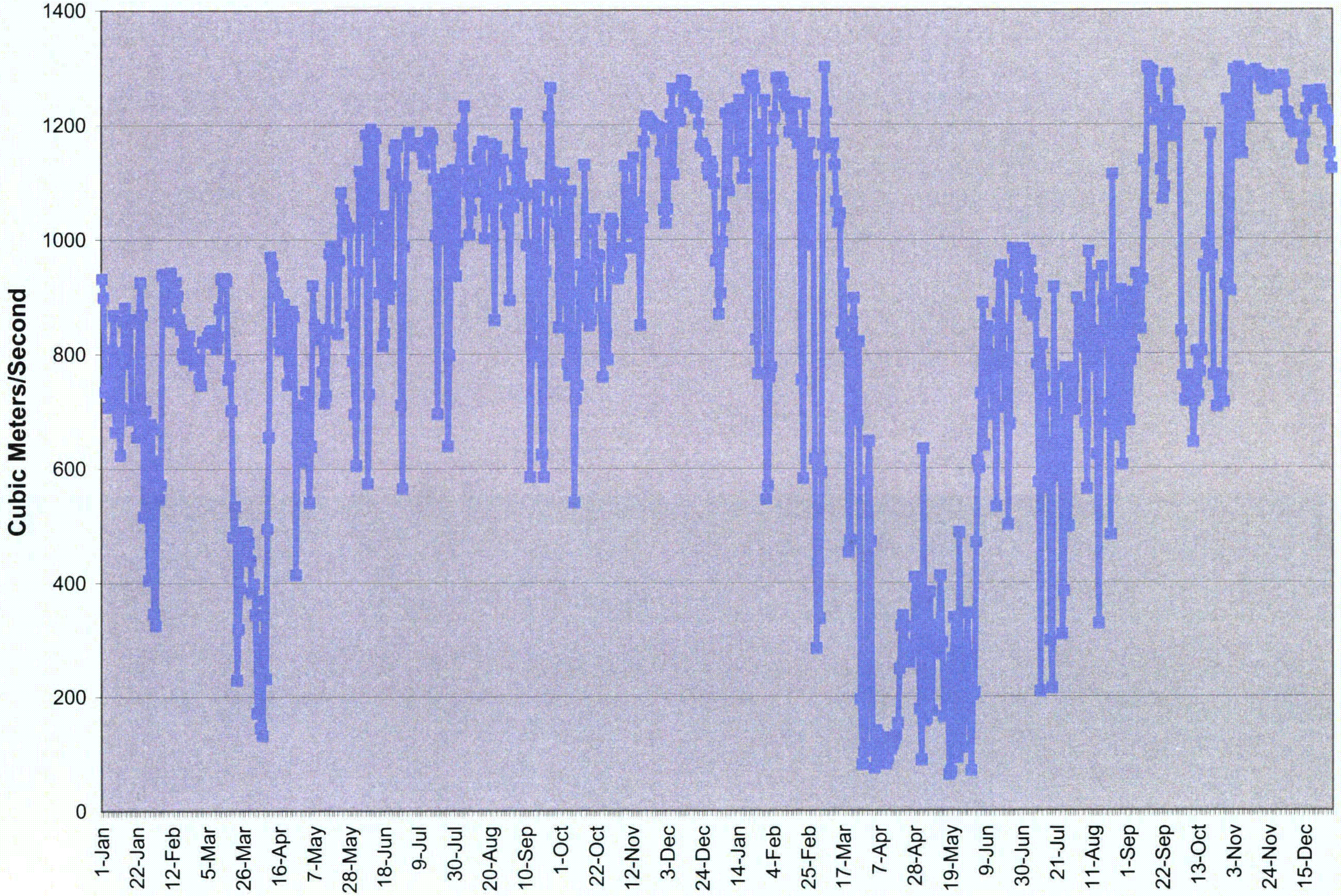

Figure 2. Average daily rate of flow in Chickamauga Reservoir during 2003 and 2004.

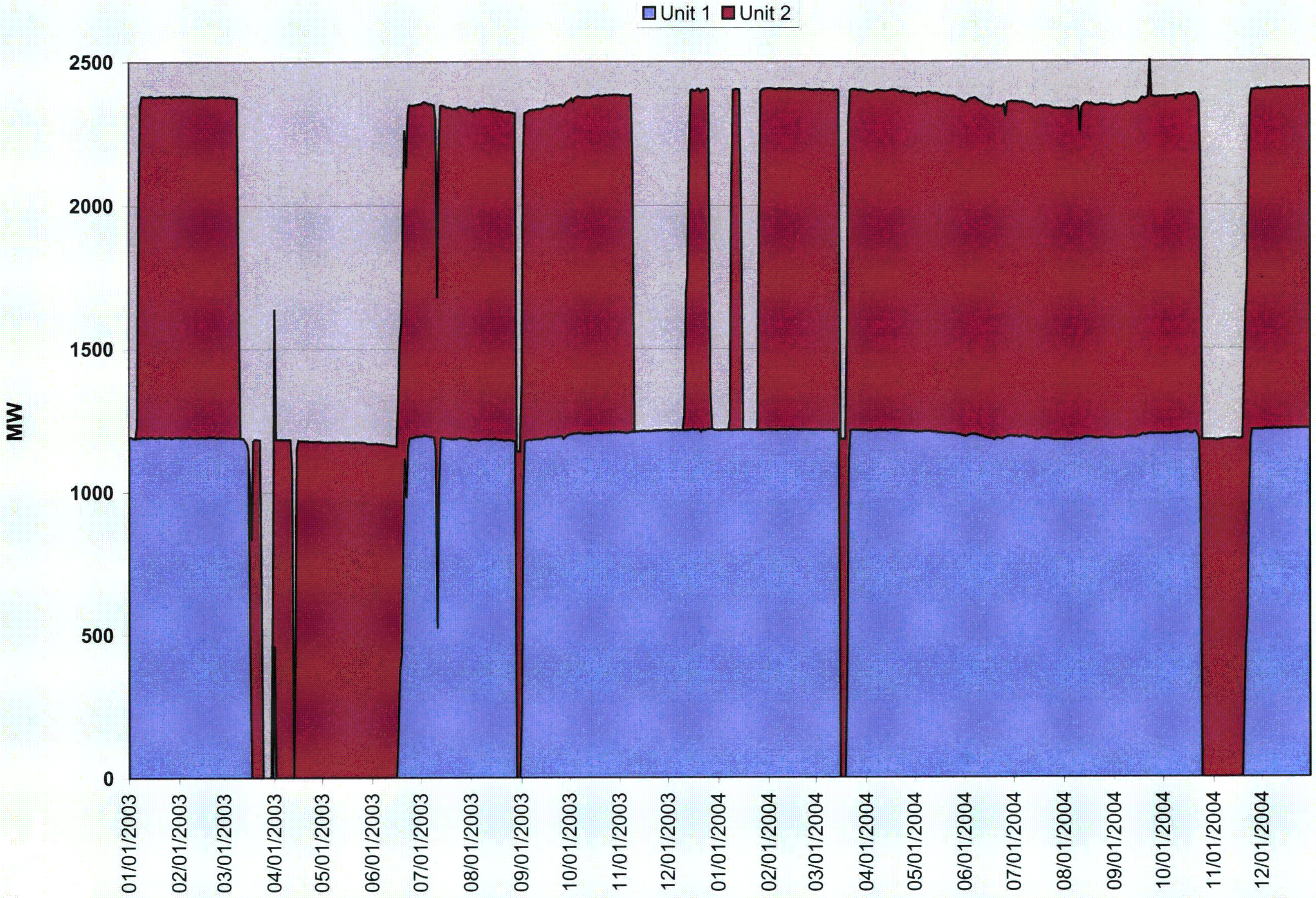

Figure 3. Average daily rate of generation at Sequoyah Nuclear Plant during 2003 and 2004.

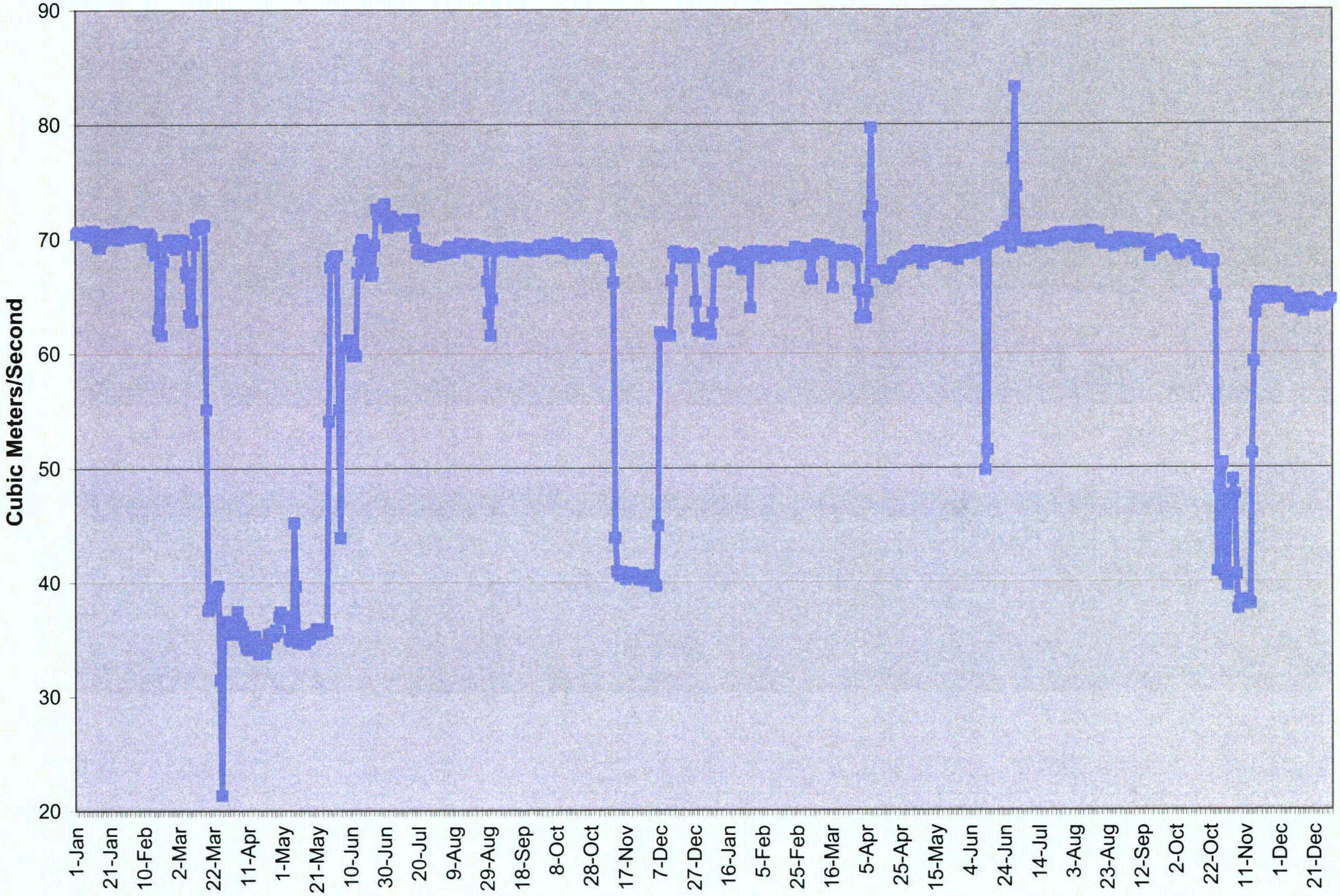

Figure 4. Average daily rate of hydraulic entrainment at Sequoyah Nuclear Plant during 2003 and 2004.

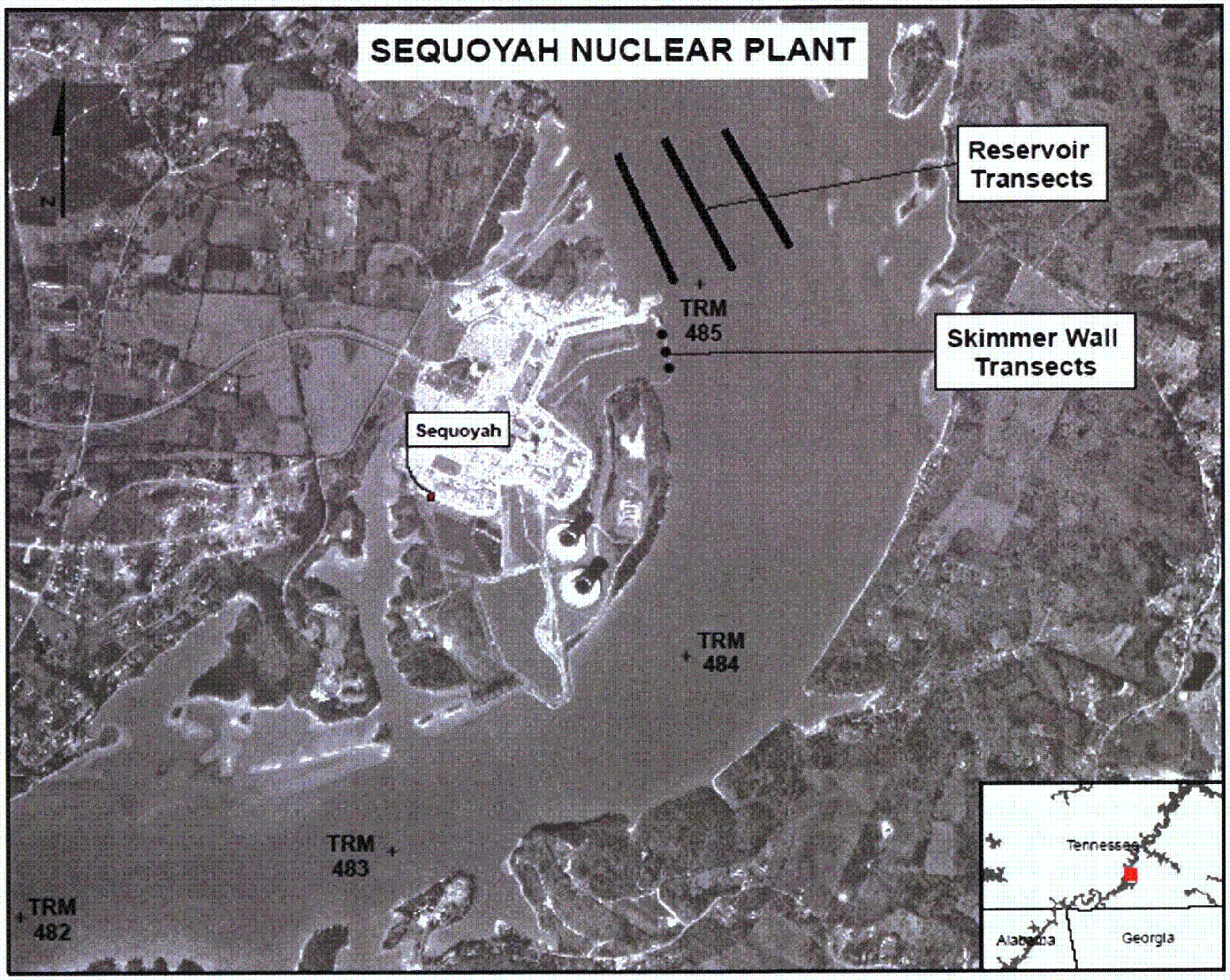

Figure 5. Map of entrainment sample transects in the vicinity of Sequoyah Nuclear Plant during 2004.

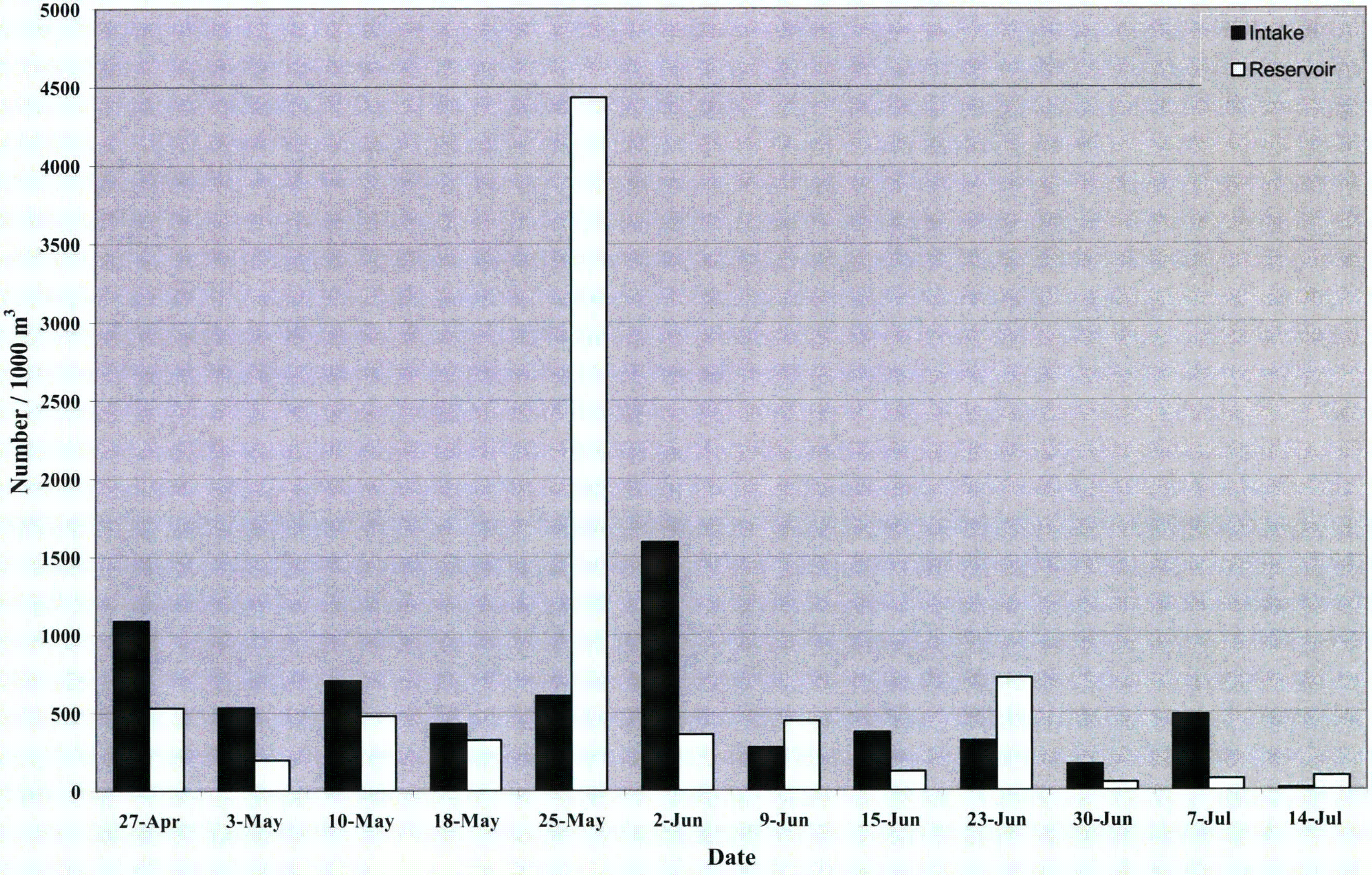

Figure 6. Densities of sciaenid eggs collected in intake and reservoir entrainment samples at Sequoyah Nuclear Plant during 2004.

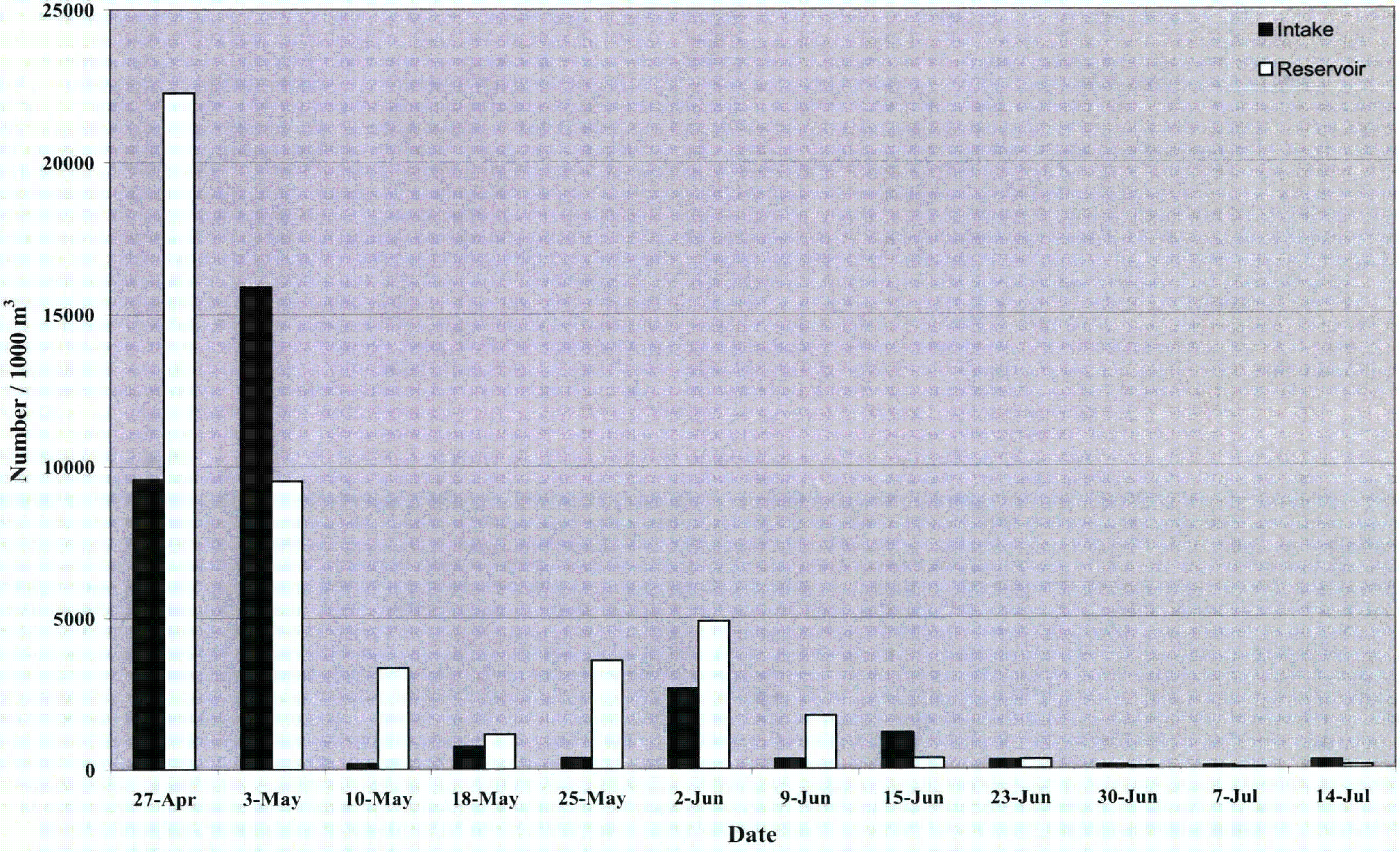

Figure 7. Densities of total larval fish collected in intake and reservoir entrainment samples at Sequoyah Nuclear Plant during 2004.

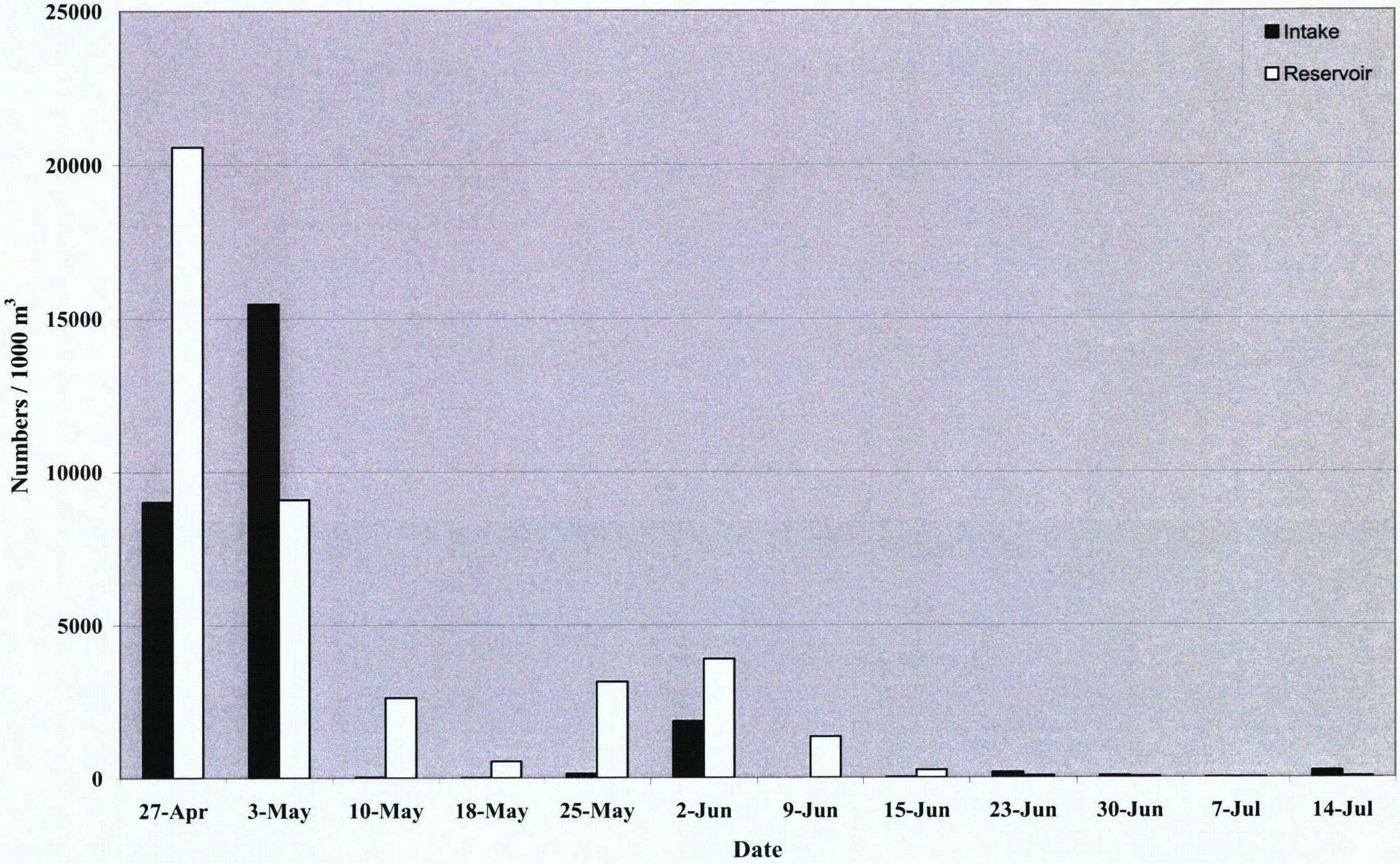

Figure 8. Densities of clupeid larvae collected in intake and reservoir entrainment samples at Sequoyah Nuclear Plant during 2004.

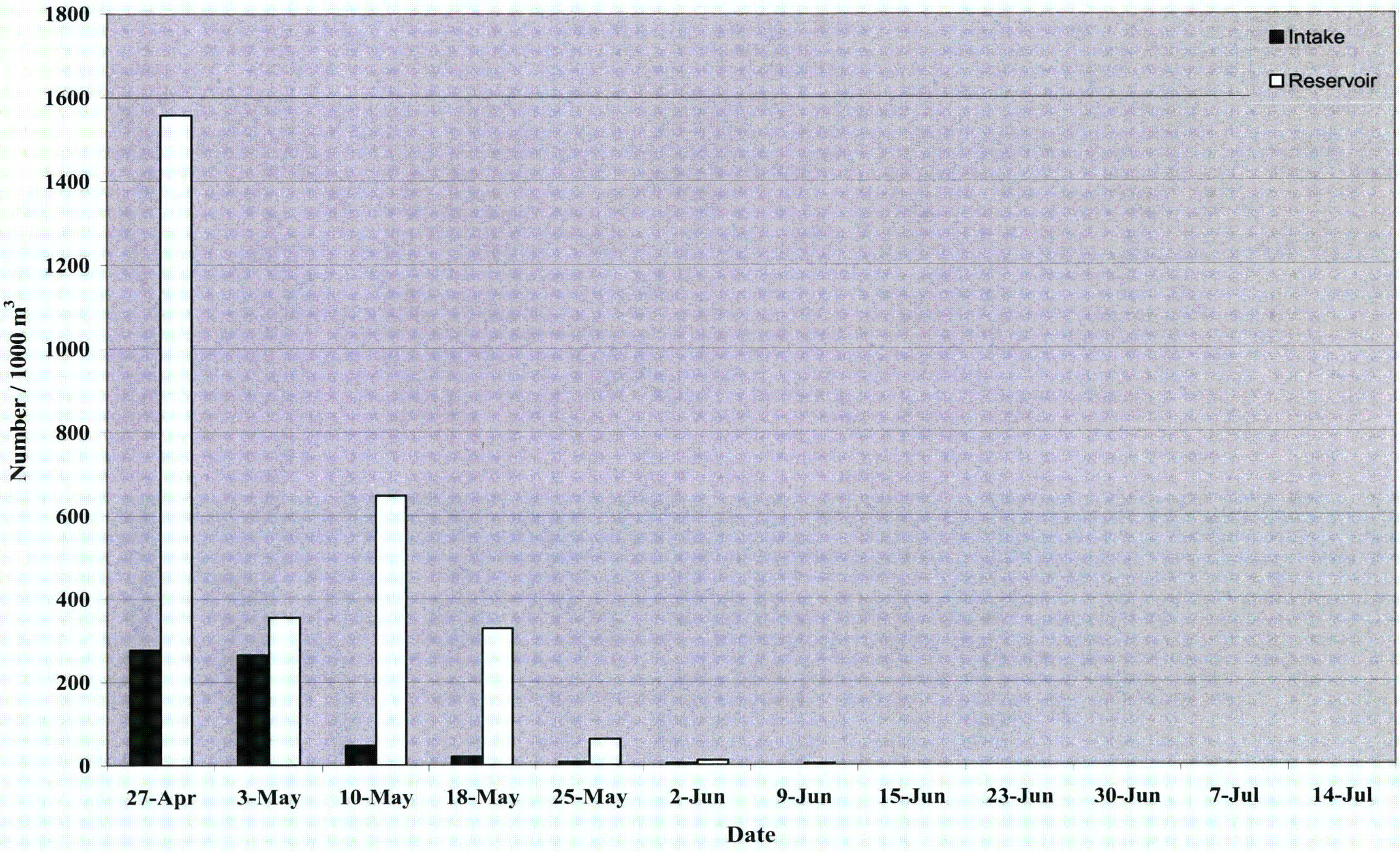

Figure 9. Densities of moronid larvae collected in intake and reservoir entrainment samples at Sequoyah Nuclear Plant during 2004.

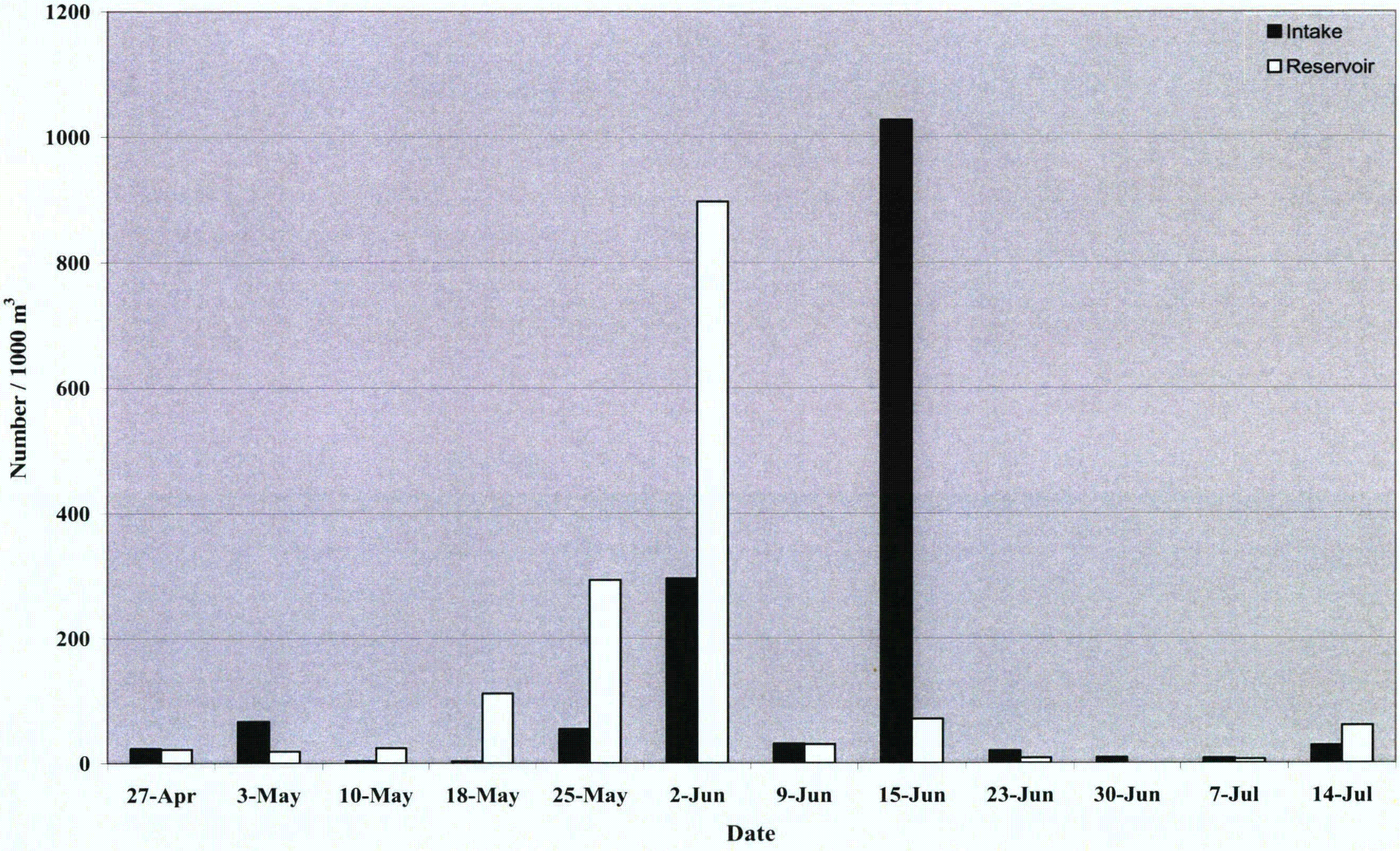

Figure 10. Densities of centrarchid larvae collected in intake and reservoir entrainment samples at Sequoyah Nuclear Plant during 2004.

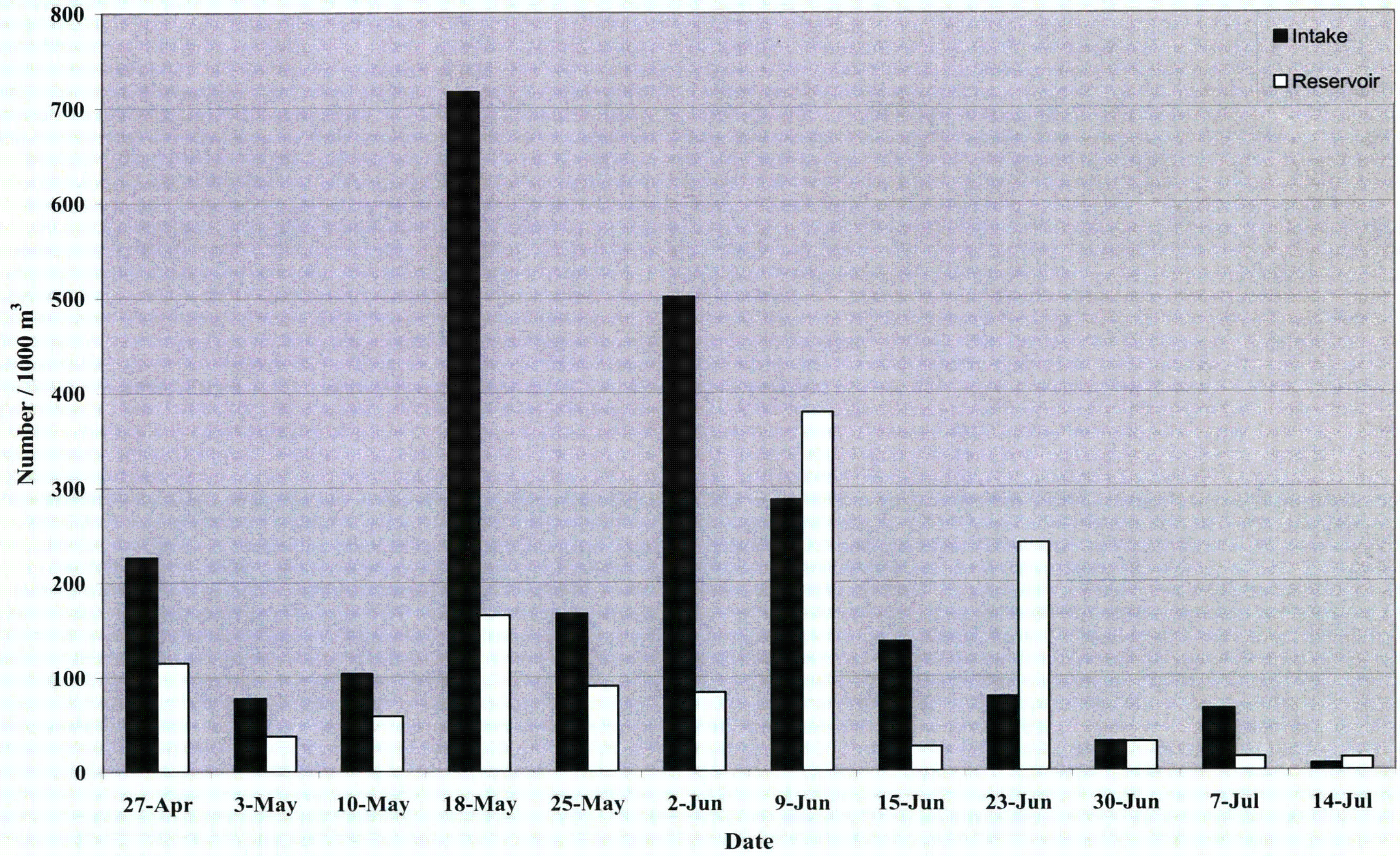

Figure 11. Densities of sciaenid larvae collected in intake and reservoir entrainment samples at Sequoyah Nuclear Plant during 2004.

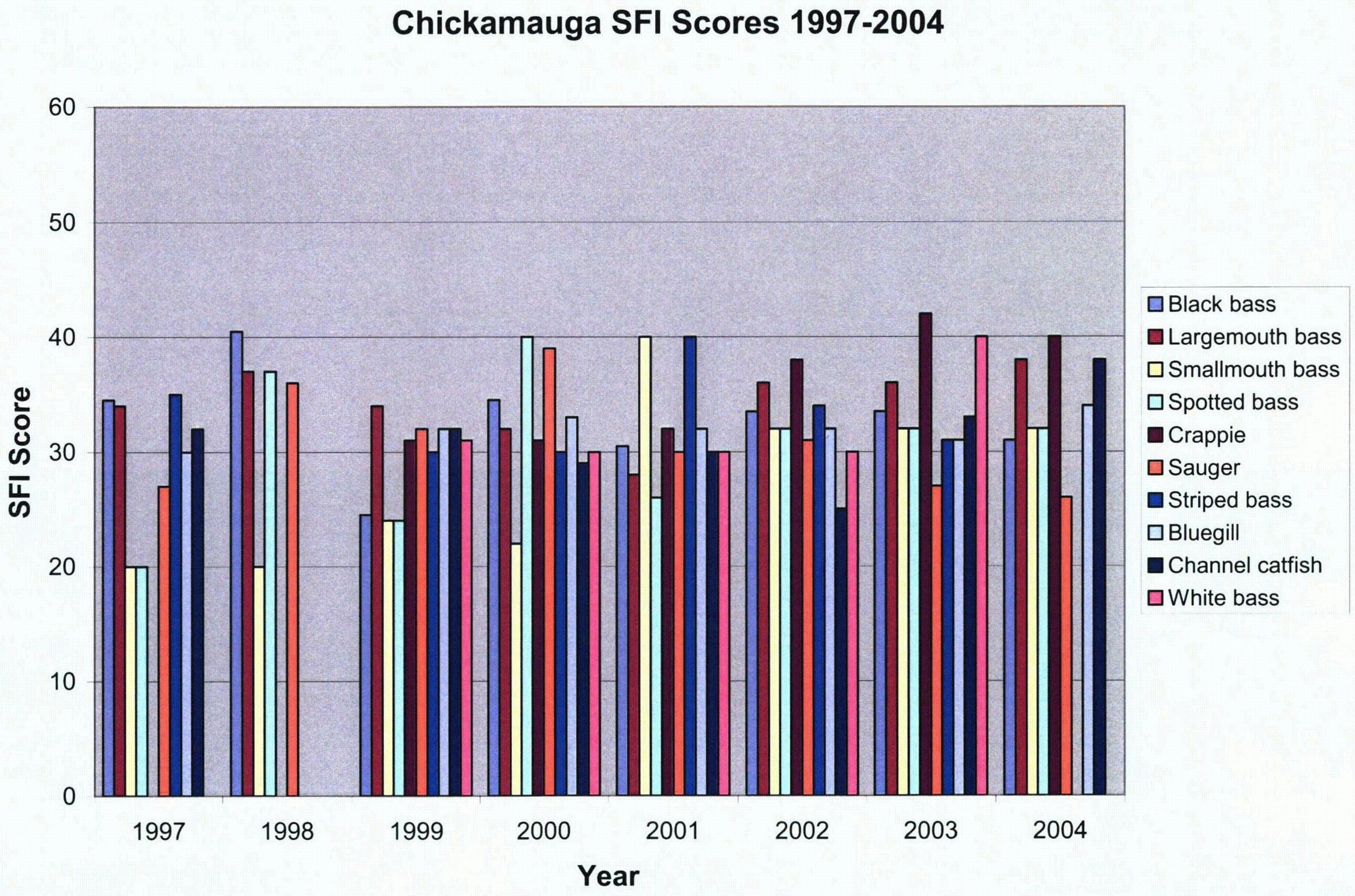

Figure 12. Sport Fishing Index results for Chickamauga Reservoir between 1997 and 2004.