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PREIMPOUNDMENT STUDY
CEDAR CREEK DRAINAGE BASIN
EVANS COUNTY WATERSHED
EVANS, TATTNALL, AND CANDLER COUNTIES
GEORGIA

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
SURVEILLANCE AND ANALYSIS DIVISION
ATHENS, GEORGIA

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INTRODUCTION

The U. S. Department of Agriculture, Soil Conservation Service (SCS), plans to construct a multipurpose impoundment in southeastern Georgia near the city of Claxton. At the request of and in support of SCS, water quality studies were performed in the drainage basin of the proposed impoundment by personnel of the U. S. Environmental Protection Agency, Region IV, Surveillance and Analysis Division (SAD). The studies were conducted under a cooperative, cost reimbursable agreement between SAD and SCS. A copy of this agreement [contracts No. Ag-13-SCS-00223 and No. Ag-13-SCS-00226 (EPA-IAG-R-5-0604)] is enclosed as Appendix A.

PURPOSE

These studies were conducted to:

(1) Determine and record preimpoundment water quality conditions within the drainage basin of the proposed impoundment;

(2) Provide a basis for predicting the water quality of the impounded waters following project completion;

(3) Provide data for the calibration and verification of the Hydrocomp Simulation Programming (HSP) model which, if possible, could then be used to predict future water quality in other proposed impoundments. These predictions, it was anticipated, could then be made with a minimal amount of additional data for model calibration and only for impoundments in the same general type of area (same climate, soil type and land usage). Unfortunately, local variations proved too great to make this a reliable procedure.

Authority

Authority for these studies may be found in the Federal Water Pollution Control Act Amendments of 1972 [PL92-500, Sec. 104(b)(6)].

SUMMARY

GENERAL

The proposed Cedar Creek impoundment will be located in a primarily rural agricultural section of southeast Georgia near the city of Claxton. The multipurpose impoundment will have a normal pool area of 387 acres and a 29,658 acre drainage basin. Natural conditions and both agricultural and animal husbandry practices provide the only sources of pollution in the drainage basin. When specific areas of the drainage basin are considered, two stand out as major contributors of pollution with heavier than normal loads from the above sources. These are the E-5 and E-6 arms (drainage areas upstream of Stations E-5 and E-6).

STUDY FINDINGS

Ranges and Station Means

Water temperatures ranged from 16° to 23°C in May and from 22° to 26°C in August. A reevaluation excluding data from the E-5 and E-6 arms showed little or no effect on these ranges.

Dissolved solids ranged from 8 to 3,120 mg/l in May and from 4 to 2,202 mg/l in August. Suspended solids ranged from 2 to 62 mg/l in May and from 1 to 22 mg/l in August. Exclusion of data from the E-5 and E-6 arms narrowed the range of the dissolved solids for August and the range of the suspended solids for May.

pH ranged from 5.3 to 6.9 units in May and from 5.0 to 6.4 units in August. Exclusion of pH data from the E-5 and E-6 arms had little or no effect on the ranges.

Dissolved oxygen (DO) ranged from 2.1 to 6.1 mg/l in May and from 3.1 to 5.3 mg/l in August. Exclusion of DO data from the E-5 and E-6 arms narrowed the ranges by elevating the lower concentrations.

BOD_5 ranged from 1.0 to 10.6 mg/l in May and from 0.3 to 5.1 mg/l in August. Exclusion of BOD_5 data from the E-5 and E-6 arms narrowed the ranges from both extremes.

Nutrient (nitrogen and phosphorus species) concentrations varied widely, even within a given month. Exclusion of data from the E-5 and E-6 arms caused only a slight reduction in the recalculated May (low flow) average concentrations, but a large reduction in the August (high flow) average concentrations. This indicates a large, runoff-oriented nutrient contribution from these two areas.

Total organic carbon (TOC) ranged from 12 to 20 mg/l in May and from 12 to 24 mg/l in August. Exclusion of data from the E-5 and E-6 arms caused a slight narrowing of the ranges.

Fecal coliform densities ranged from 130 to 5,600 counts/100 ml in May and from 100 to 2,200 counts/100 ml in August. Exclusion of data from the E-5 and E-6 arms had no effect on the May ranges; however, it narrowed the August ranges by approximately fifty percent.

Salmonella were isolated at four of the five stations sampled for this purpose in May.

Trends

High values (lows for DO) for nearly all parameters occurred during August. Major exceptions were higher values in May for BOD_5 and fecal coliforms. Trends in Cedar Creek (upstream to downstream) include slight reductions in both NO_2 and NO_3-N and Total-P concentrations and a slight increase in fecal coliform densities.

Data from Station E-4 on Cedar Creek (immediately downstream from its confluence with the E-6 arm) exhibited a slight elevation of values for almost all parameters.

Long Term BOD

During May, a long term BOD analysis was performed for Station E-1 to determine rate coefficients for mathematical modeling efforts. This analysis yielded typical rate coefficients.

Animal Population-Distribution Study

This study, performed during May, demonstrated that the E-6, E-7, and E-5, E-8 arms of the drainage basin contained the heaviest animal population.

Time of Travel Study

This study, using dye tracer techniques, was performed only during the low flow conditions which prevailed during May. Under these conditions, the average stream velocity for Cedar Creek was 0.25 mph.

Diurnal Studies

These studies (November 1974 and January 1975) revealed no significant diurnal variations.

Assessment of Potential Non-Point Source Loads

A gross non-point source assessment (see Appendix C) established potential loads for typical conditions and evaluated the attenuation effects of control practices. Numerical results of this assessment are too voluminous to present in summarized form.

Hydrocomp Predictions

Postimpoundment water quality was predicted by the Hydrocomp simulation Programming Model. The predicted water quality was compared to Georgia water quality standards. No major problems with violation of these standards were observed.

Potential Problem Areas

Comparisons were made between different areas of the drainage basin on a lbs/acre/day (combined chemical loadings) basis and on a fecal coliform/acre/day (fecal coliform loadings) basis. These procedures flagged potential pollution problems with discharges from the E-5 and E-6 arms. These same types of comparisons, plus comparison on a total lbs/day (combined chemical loadings) basis, showed that the E-6 arm held the greater potential for pollution discharge problems. Comparison of the carbon-nitrogen ratios for the two arms suggests that potential problems originating in the E-6 arm will be more responsive to correction by control practices.

CONCLUSIONS

(1) The high fecal coliform densities encountered plus the *Salmonella* isolations in the Cedar Creek watershed, represent stormwater runoff conditions under free flowing stream conditions. After project completion, retention time in the impoundment will cause a decrease in both fecal coliform densities as well as the presence of *Salmonella*. These decreases should be sufficient to make the waters acceptable for body contact recreation.

(2) Increased residence time in the impoundment will tend to dampen water quality variations now present in the free flowing stream. The occasional high nutrient concentrations observed during this study will be more diluted by the impoundment to levels acceptable for a variety of water uses. However, persistence of high concentrations for an extended period of time may cause a problem with algal production in the impoundment.

(3) Potential problems in the E-6 arm of the drainage basin can be partially, if not completely, alleviated by improved domestic animal and fowl waste handling practices.

(4) The eutrophication potential for this impoundment will depend on control of nutrient sources. This control includes the capacity of swampy areas to assimilate nutrients. The quantitative aspects of such a capacity are not clearly understood. Qualitative aspects, however, are evidenced by the data within this report.

RECOMMENDATIONS

(1) Attempts should be made to arrive at an agreement with local landowners (especially in the E-5 and E-6 arms of the drainage basin) for the following purposes:

(a) To contain runoff from swine and cattle feeding areas (especially during recreational periods of the year);

(b) To avoid more than the minimal application of chicken litter or animal manure to drainage area soils (either as an agricultural fertilizer or as a means of disposal) during recreational periods of the year; and

(c) To avoid the overapplication of chemical fertilizers.

(2) Initially, primary contact recreation in the upper reaches of the impoundment, especially during heavy runoff periods, should be restricted. Further fecal coliform monitoring should be conducted after the impoundment has stabilized. <u>The absence of high fecal coliform densities would warrant a removal of this restriction</u>.

STUDY METHODS

Twelve routine water quality sampling stations were established on Cedar Creek and its tributaries. The stations were located from just downstream of the proposed dam site near Bellville, Georgia to its headwaters near Cobbtown, Georgia. The sampling station locations are described in Appendix D and shown on the map in Appendix E.

A stage recorder and staff gauge were installed and cross referenced at Station E-1. Staff gauges were installed at all other stations except E-2 and E-3, where stream channel characteristics precluded stream gaugings. Initial stream gaugings were performed prior to initiation of the sampling program at each station except E-2 and E-3.

All stations were sampled from bridges at one foot below the surface or less, as dictated by stream depth. Stream surface elevations, as indicated by staff gauge readings, were recorded each time a sample was collected. Daily samples for physical, chemical, and bacteriological analyses were collected for five days each during May and August, 1974 at all flowing stations. All stations were not sampled during the November 1974 and January 1975 visits. (See Table 1 for a complete sampling schedule.)

Measurements and analyses of samples for the physical and chemical parameters were performed either immediately upon collection at the sampling site, within a few hours of collection at the SAD mobile laboratory in Claxton, Georgia, or at the SAD Regional Laboratory in Athens, Georgia. The parameter coverage, frequency of analysis, and location of analysis are presented in Table 2.

Bacteriological samples were also collected at a depth of approximately one foot or less, as dictated by stream depth using a grab technique. Samples

TABLE 1

SAMPLING SCHEDULE

Station Number	Month and Day																
	May, 1974					August, 1974					November, 1974				January, 1975		
E-1	13	14	15	16	17	7	8	15	29	30	17	18	20	21	13	14	25
E-2	13	14	15	16	17	7	8	15	29	30	N/V	N/V	N/V	N/V	N/V	N/V	N/V
E-3	13	14	15	16	17	7	8	15	29	30	N/V	N/V	N/V	N/V	N/V	N/V	N/V
E-4	13	14	15	16	17	7	8	15	29	30	N/V	N/V	N/V	21	N/V	N/V	N/V
E-5	13	14	15	16	17	N/V	N/V	15	29	30	N/V	N/V	N/V	N/V	N/V	N/V	25
E-6	13	14	15	N/F	N/F	7	8	15	29	30	N/V	N/V	N/V	21	N/V	N/V	25
E-7	13	14	15	N/F	N/F	N/F	N/F	N/V	29	30	N/V	N/V	N/V	N/V	N/V	N/V	N/V
E-8	13	14	15	16	17	N/F	N/F	15	29	30	N/V	N/V	N/V	21	N/V	14	N/V
E-9	13	14	15	16	17	N/F	N/F	15	N/F	N/F	N/V	N/V	N/V	N/V	N/V	14	25
E-10	13	14	15	16	17	N/F	N/F	15	N/F	N/F	N/V	N/V	N/V	N/V	N/V	N/V	25
E-11	13	14	15	16	17	N/F	N/F	15	N/F	N/F	N/V	N/V	N/V	N/V	N/V	N/V	25
E-12	13	14	15	16	17	N/F	N/F	15	N/F	N/F	N/V	N/V	N/V	N/V	N/V	14	N/V

Key: # - Day of month
N/F - No flow, not sampled
N/V - Not visited

TABLE 2

LIST OF ANALYSES BY LOCATION

A. On-Site

1. Dissolved oxygen
2. pH
3. Temperature (degrees centigrade)
4. Flow

B. Mobile Laboratory (SAD Laboratory, Athens, GA, after 8/30/74)

1. Biochemical oxygen demand (5 day)
2. Bacteriological-fecal coliform (MF Procedure)

C. SAD Laboratory, Athens, Georgia

1. Total phosphate
2. Kjeldahl nitrogen (TKN)
3. Ammonia nitrogen (NH_3-N)
4. Organic nitrogen (TKN minus NH_3-N)
5. Nitrate and nitrite nitrogen
6. Total dissolved solids
7. Suspended solids
8. Total organic carbon
9. Long term BOD

were placed on ice and analyses were initiated within six hours after collection.

Fecal coliform densities were determined using the membrane filter technique as outlined in Standard Methods for the Examination of Water and Wastewater, 13th Edition.[1*]

Qualitative determinations for the presence of *Salmonella* were made at selected stations by filtering 200 ml of sample through a 0.45u membrane filter. The filters were then placed in single strength Dulcitol Selenite Broth. The inoculated enrichment broth was incubated for 18 to 24 hours at 41.5°C according to Spino's procedure.[2]

After primary enrichment, an inoculum was streaked onto Taylor XLD, Agar (XLD), and Hektoen Enteric Agar (HE) plates and incubated for 18-24 hours. Suspected *Salmonella* colonies were picked from the respective plates and identified by the scheme outlined in Table 3.

With the exception of the cytochrome oxidase and lysine decarboxylase methods, the methods and media outlined in Table 3 are described by Ewing.[3] Oxidase and decarboxylase activity was determined using Patho-Tec-CO and Patho-Tec-LD** reagent impregnated paper strips, respectively.

Definitive serological identification of *Salmonella* isolates was made at the SAD-Athens laboratory using the standard serological procedures described by Edwards and Ewing.[4]

During the May and August study periods, attempts were made at gauging stream discharges at a variety of different stream levels at all stations with staff gauges. This was done in an attempt to prepare

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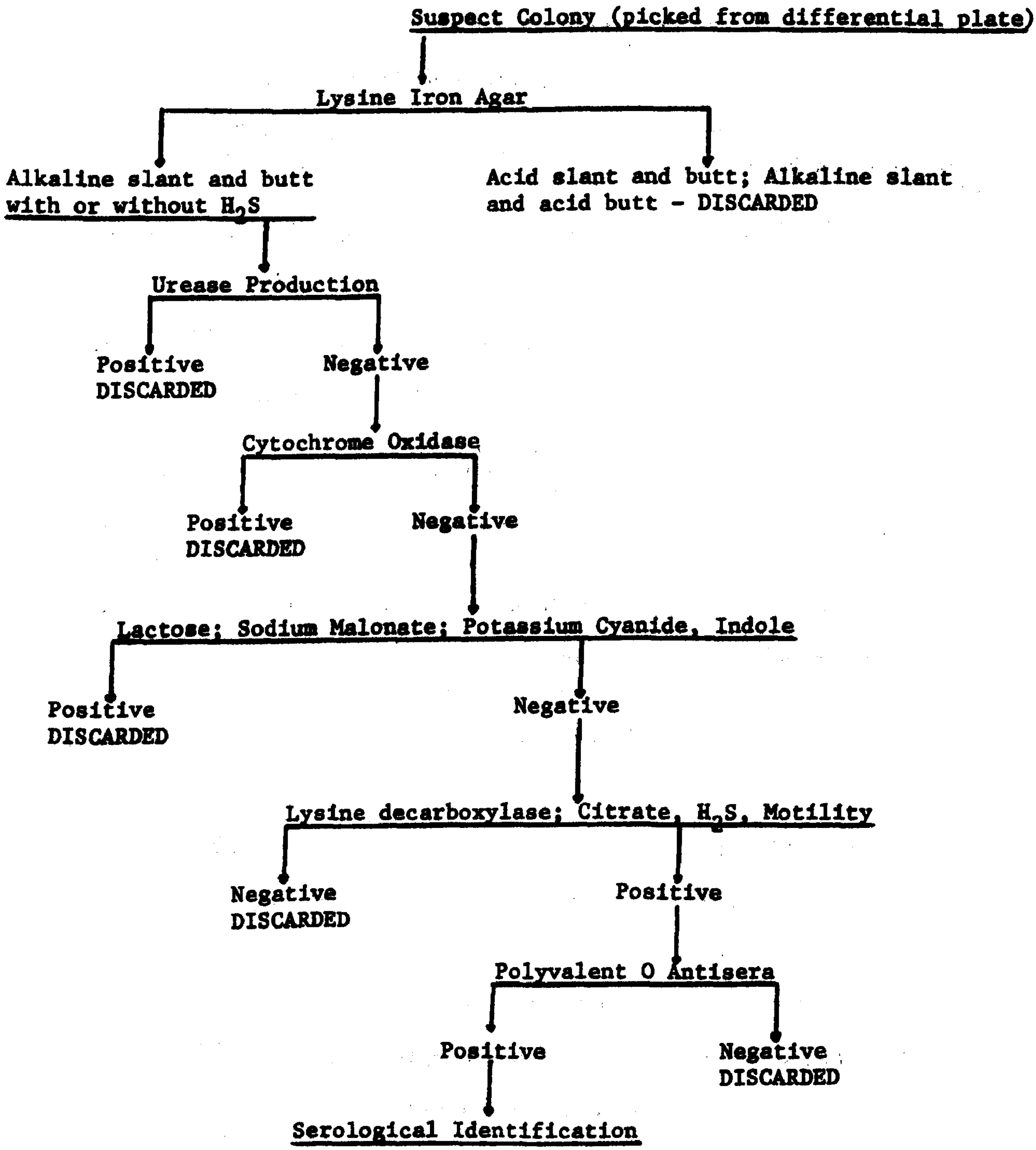
* References 1 through 16 appear on page 51.

** Does not imply endorsement of this product by EPA.

TABLE 3

IDENTIFICATION SCHEME FOR SALMONELLA SUSPECTS



stage-discharge curves for each station. From these curves and the individual staff gauge readings acquired during daily sampling visits, corresponding discharge data were obtained for most samples. Unfortunately, it was impossible to gauge discharges at Stations E-4, E-10, and E-11 at enough different stream stages to properly define a discharge curve for these stations.

Recording climatological equipment, listed below with the indicated data collection function(s), was installed at the indicated locations in support of both the sampling program outlined on Table 1 and for calibration of the Hydrocomp Simulation Programming (HSP) model.

Equipment	Data Collection Function	Location*
Rain Gauge	Precipitation	Sapp's Farm and Davis' house
Pyrheliograph	Incident solar radiation	Sapp's Farm
Hygrothermograph	Air temperature and relative humidity	Sapp's Farm
Evaporation Pan and Level Recorder	Rate of evaporation	Sapp's Farm

Figure 1 is a graphical presentation of the data obtained from the stage recorder at Station E-1 and the rain gauge at the upper end of the drainage basin.

As additional support for calibration of the HSP model, five years of historical climatological[5] and hydrological[6] data were tabulated and computer coded for the indicated locations:

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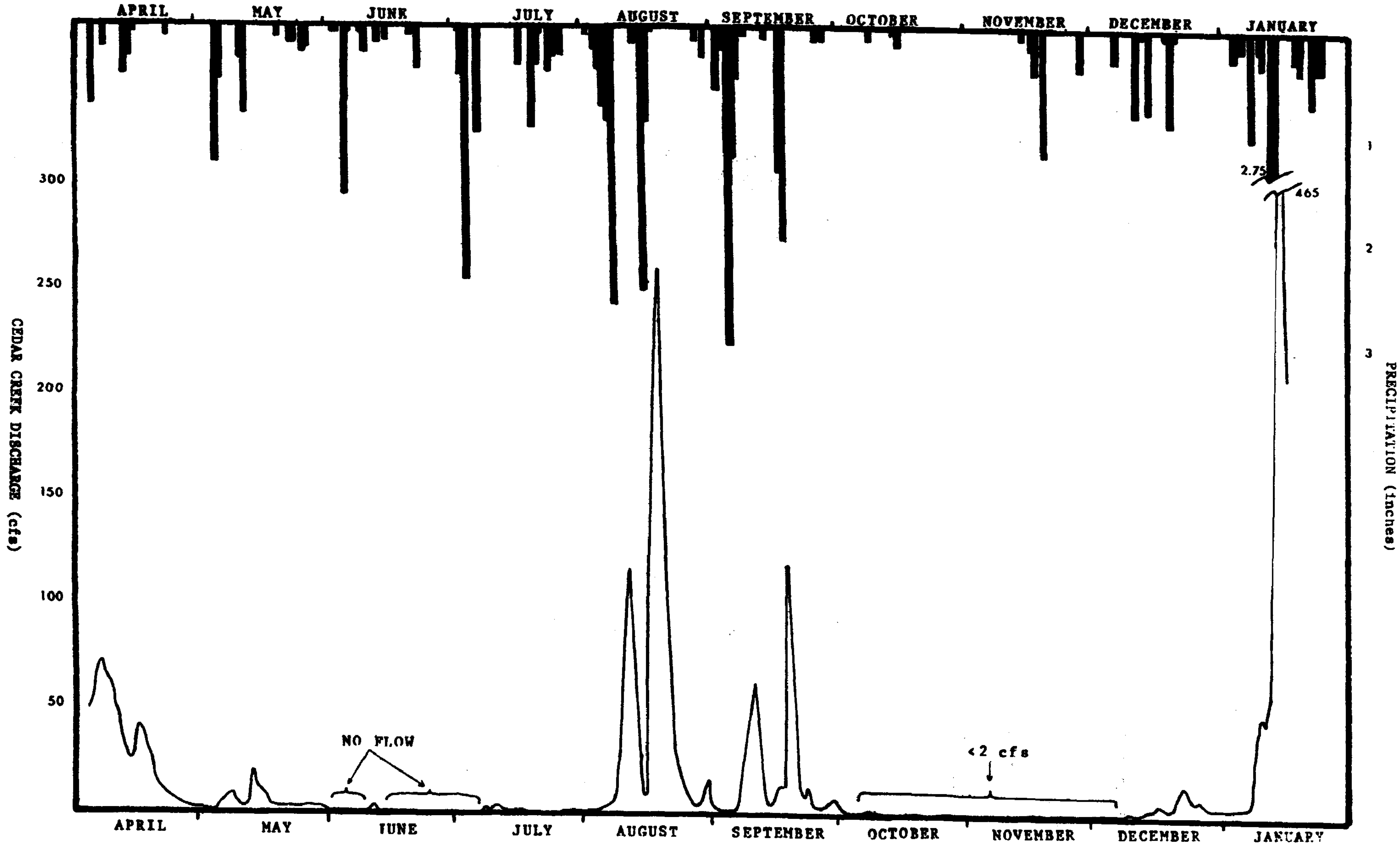
* Refer to Appendix E for exact locations.

FIGURE 1
ANNUAL PRECIPITATION
AND HYDROGRAPHS



Parameter	Location (Georgia)
Precipitation	Bellville Brooklet Metter Swainsboro
Maximum and Minimum Air Temperature	Metter Brooklet
Evaporation Rate	Ailey
Wind Speed	Savannah
Percent Cloud Cover	Augusta
Discharge (avg. daily cfs)	Canoochee River near Claxton

DESCRIPTION OF STUDY AREA

The heart of the Evans County Watershed project is a proposed multipurpose impoundment on Cedar Creek. This watershed[7] is located on the gently rolling Pleistocene shoreline of the Altanama Upland Division of the coastal plain near Claxton in southeast Georgia. The impoundment is to be located in Evans and Tatnall counties. The 46 square mile watershed extends from Evans County across Tatnall County and into a small portion of Candler County. The impoundment will cover 387 acres at normal (irrigation) pool level. Of these 387 acres, 272 acres will be available for recreation usage. Maximum flood storage pool will be 635 acres.

Land usage is 35.3% cropland, 6.3% pasture, 49.5% forest, and 8.9% idle or miscellaneous. Only a few concentrated sources of pollution exist; these consist primarily of runoff from cattle pastures, swine feedlots, and layer hen operations. Natural conditions and agricultural practices create three possible non-point sources of pollution:

(1) Stormwater and possibly irrigation runoff from a land surface characterized by dendritic drainage patterns,

(2) Subsurface discharge into stream channels from the shallow groundwater table, and

(3) Benthic decomposition of leaf and pasture litter deposited in the streams, and from both living and dead bottom-dwelling organisms.

Land elevation in the study area ranges from 110 to 250 feet above mean sea level (MSL). Base flows for the perennial streams in the area average 0.6 cubic feet per second per square mile of drainage area.

During wet portions of the year, the water table in this area is near the surface, causing soil moisture values to approach saturation. At these times, even small amounts of rainfall cause immediate runoff (either surface or subsurface) and corresponding but slower increases in stream flow.

After extended dry periods, the water table is lowered sufficiently to cause the smaller tributaries to become dry. The sandy soil becomes very dry and capable of absorbing large quantities of rainfall without corresponding increases in runoff and stream flow.

As examples, (Figure 2) a rainfall of less than 0.4 inches in August (wet period) caused a stream flow increase of approximately 2.2 cfs with less than one day's lag time (time between rainfall and peak stream flow). During June (a dry period) a two inch rain caused approximately the same river flow increase as was caused by the 0.4 inch rain in September. The two-inch June rain, however, had a six day lag time. The hydrograph peaks on May 8 and 13, and on August 11 and 18 (Figure 2) also demonstrate the short lag time typical of wet periods.

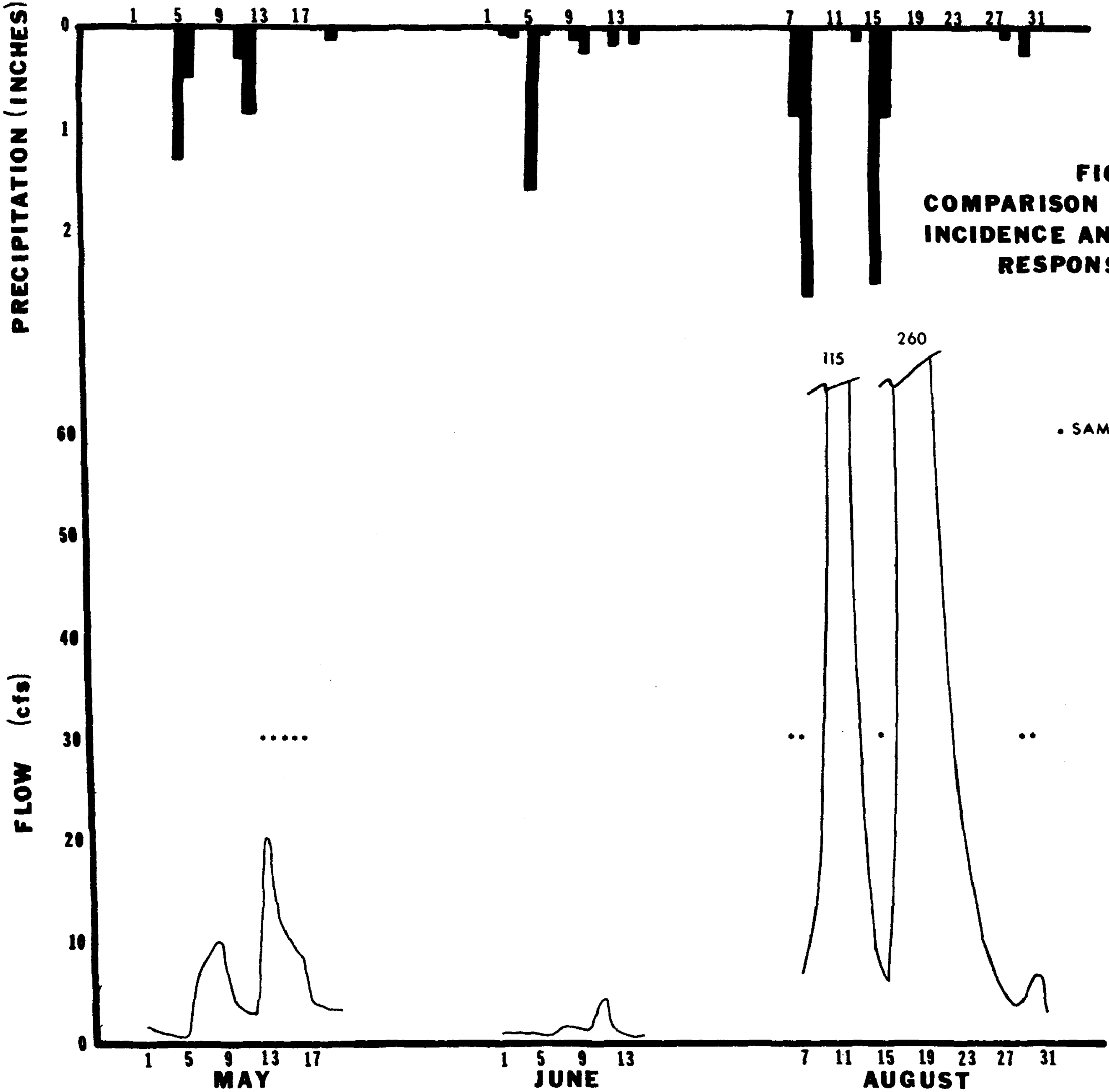


FIGURE 2
COMPARISON OF PRECIPITATION INCIDENCE AND HYDROGRAPH RESPONSE TIME

STUDY FINDINGS

RANGES AND STATION MEANS

General

Extreme values (lows for dissolved oxygen and highs for most of the other parameters) usually occurred at stations in the E-5 or E-6 arms of the drainage basin. These two potential problem areas include Stations E-5 and E-8 and Stations E-6 and E-7 respectively. Analysis of the data (Table 4) included two modes of comparison: (1) ranges of all values and (2) ranges of station means, both with and without exclusion of data from the E-5 and E-6 arms. These data were excluded to emphasize the effects, or lack of effects, of these two arms on the overall ranges. Where the overall ranges were significantly changed toward improved conditions, environmental pollution from these arms is indicated for the parameter under consideration. This analysis included only data for May and August, 1974. Data collected in November, 1974 and January, 1975 was only from a few selected stations. The following discussion is based on the analysis presented in Table 4.

Physical Parameters

Water temperature ranges* were not appreciably changed by exclusion of data from the E-5 and E-6 arms. The ranges reflect seasonal air temperatures and to some extent, the shading effects of heavy summer and fall vegetative cover (smaller ranges for August values).

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* These ranges exclude a single high water temperature reading of 29.8^{o}C, which occurred at Station E-7 on May 13, 1974. Basin highs of 8.1 mg/l dissolved oxygen (DO) and 10.6 mg/l five-day biochemical oxygen demand (BOD_5) also occurred at this station on the same day. The excluded high temperature value was considered atypical because of the circumstances surrounding collection of the sample. The sampling point was located on a small stream immediately downstream of a very wide, shallow and slow-moving overflow from a small shallow fish pond. The sample was collected late in the afternoon on a clear, unseasonably hot day.

TABLE 4

COMPARISON OF RANGES

Parameter	All Stations: All Data May	All Stations: All Data August	All Stations: Station Means* May	All Stations: Station Means* August	E-5 & E-6 Arms Excluded: All Data (-) May	E-5 & E-6 Arms Excluded: All Data (-) August	E-5 & E-6 Arms Excluded: Station Means (-)* May	E-5 & E-6 Arms Excluded: Station Means (-)* August
Physical								
Temp. °C	16-23	21.5-26	19.1-20.4	22.4-23.3	**	**	**	**
Dissolved Solids - mg/l	8-3120	4-2202	36-838	40-773	**	26-280	**	75-175
Suspended Solids - mg/l	2-62	1-22	3-49	2-13	2-23	**	3-16	**
Chemical								
pH - units	5.3-6.9	5.0-6.4	5.5-6.5	5.7-6.3	**	**	**	**
D.O. - mg/l	2.1-8.1	3.1-5.3	2.6-6.8	3.4-5.2	4.1-7.3	4.6-5.3	5.0-6.8	4.7-5.2
BOD_5 - mg/l	1.0-10.6	0.3-5.1	1.6-8.2	1.1-3.7	1.0-4.8	0.8-3.5	1.6-2.4	1.3-2.3
Org-N - mg/l	0.18-0.89	0.21-2.2	0.24-0.61	0.29-1.27	0.18-0.75	0.33-0.85	0.27-0.42	0.46-0.55
NH_3-N - mg/l	0.02-0.37	0.01-3.4	0.07-0.27	0.06-1.25	0.02-0.35	0.01-0.53	0.07-0.13	0.06-0.22
TKN - mg/l	0.24-1.17	0.33-5.05	0.34-0.88	0.36-2.12	0.24-1.0	0.33-1.20	0.34-0.55	0.49-0.75
NO_2+NO_3-N - mg/l	0.01-0.10	0.01-4.0	0.01-0.08	0.07-1.03	0.01-0.06	0.05-0.52	0.01-0.04	0.07-0.22
Total P - mg/l	0.01-0.17	0.01-1.5	0.01-0.12	0.03-0.73	0.01-0.09	0.01-0.18	0.01-0.06	0.05-0.13
TOC - mg/l	12-20	12-24	13-17	14-21	12-16	14-24	13-15	16-20
Bacteriological								
Fecal Coliform - counts/100 ml	130-5600	100-2200	238-2876	188-894	130-5600	110-1100	230-756	188-480

* - Geometric mean for Fecal Coliform.
** - No appreciable change.

Dissolved solids ranged from very low to very high during both the May and August periods of comparison. Suspended solids remained low throughout the year even after heavy areawide rains. This indicates that very little sediment is transported from the relatively flat sandy fields to the streams. In both modes of comparison, exclusion of solids data from the E-5 and E-6 arms lowered the August values for dissolved solids and the May values for suspended solids. These exclusions did not appreciably change the values for the May dissolved solids or the August suspended solids. This indicates an occasional, but not consistent, effect of the E-5 and E-6 arms on these parameters.

Chemical Parameters

All pH values were low. The magnitudes of these values for both modes of comparison were not affected by exclusion of values from the E-5 and E-6 arms of the drainage basin.

Dissolved oxygen (DO) concentrations were variable. The steadily decreasing May concentrations demonstrate the effects of the low to zero flow conditions which prevailed on some of the smaller tributaries during that time. The high of 8.1 mg/l in May (see footnote in temperature discussion) possibly resulted from algal oxygen production in the shallow pond. Exclusion of DO data from the E-5 and E-6 arms narrowed the ranges in both modes of comparison, primarily by elevating their lower extremes. This indicates that runoff from these two arms is relatively low in DO.

Some of the five day biochemical oxygen demand (BOD_5) concentrations were relatively high when compared with typical average BOD_5 for free flowing upland streams of 1-2 mg/l and with typical slow flowing swamp water streams of 2-3 mg/l. This holds true even when the single high BOD_5 of

10.6 mg/l for May is excluded (see footnote in temperature discussion). This is probably the result of domestic animal waste and decaying vegetation in the low-lying swampy areas of the drainage basin. Exclusion of BOD_5 data from the E-5 and E-6 arms significantly reduced the upper limits of the recomputed ranges in both modes of comparison. This indicates significant BOD_5 contribution from these two arms.

Concentrations of all of the nitrogen species studied and concentrations of total phosphorus varied widely, even within a given month. The overall effect of excluding values for the E-5 and E-6 arms was the lowering of the upper limits of the ranges for both modes of comparison. Specifically, exclusion had only a small effect on the May ranges for all values, and a moderate effect on the ranges of station means. It did, however, have a large effect in both modes of comparison for August. This suggests a large nutrient contribution from the E-5 and E-6 arms.

Examination of the individual nitrogen parameters for May shows a relatively large contribution from organic nitrogen (Org-N) to the total Kjeldahl nitrogen (TKN) values and a smaller yet significant contribution from ammonia nitrogen (NH_3-N). These nitrogen contributions, plus the fairly small concentrations of both nitrate-nitrite nitrogen (NO_2+NO_3-N) and total phosphorus (Total-P) during the low flow conditions in May, suggest that the largest part of the nutrient pollutional loadings during drier periods of the year originates from decaying vegetation in the low-lying swampy areas.

Examination of the same parameters for August shows a much higher TKN, with the majority as NH_3-N. Even though Org-N is the minority species in this case, it still has a much higher concentration than in May. The higher August NH_3-N concentrations coupled with the much higher NO_2+NO_3-N and total-P concentrations, plus much higher runoff-stream-flow conditions, suggests large nutrient contributions from animal sources during that month.

Total Organic Carbon (TOC) concentrations were typical for coastal plain swampy areas and the ranges of data were small. Exclusion of data for the E-5 and E-6 arms had no significant effect. There was very little difference between the comparison periods.

Bacteriological Parameters

Fecal coliform densities were high and very variable during both study periods with August having lower values for both modes of comparison. Exclusion of values from the E-5 and E-6 arms during May had no effect on the ranges of all data, but drastically reduced both the magnitude and range of the station means. This exclusion for August lowered the upper values for both modes of comparison. The E-5 and E-6 arms were significant contributors of fecal coliforms.

The high fecal coliform densities represent stormwater runoff under free flowing stream conditions. After project completion, retention time in the impoundment will result in greatly reduced fecal coliform densities. No water should be considered completely safe for body contact recreation, regardless of its fecal coliform density. Some health risks will be involved for the water user. However, these risks are greatly reduced in waters with low fecal coliform densities.

Qualitative determinations to detect *Salmonella* were made at five stations (E-1,E-3,E-4,E-9, and E-10) during May. *Salmonella* is a large serologically-related genus comprised of over 1,300 serotypes. *Salmonella* is probably the easiest enteric pathogen to isolate from water. All *Salmonella* are considered pathogenic to man and animals.

The presence of *Salmonella* is proof of fecal contamination from either man or animals, and establishes the potential of disease contraction resulting from water ingestion. It is important to note that the inverse of this statement is not true. Failure to isolate Salmonella does not establish that the water is free of pathogenic organisms.

The following serotypes were isolated during the May study:

Station No.	Serotype
E-1	*Salmonella gaminara*
E-4	*Salmonella gaminara* *Salmonella rubislaw*
E-9	*Salmonella rubislaw*
E-10	*Salmonella javiana*

No serotypes were isolated at Station E-3. No *Salmonella* determinations were made during the August study.

TRENDS

Table 5 shows that the high values (low values for DO) for most parameters during both May and August occurred on either the E-5 or E-6 arms of the drainage basin (Stations E-5 and E-8, and Stations E-6 and E-7, respectively). The predominance of mainstem (Cedar Creek) highs at Station E-4, immediately downstream of confluence of the E-6 arm, demonstrates the effect of the E-6 arm on the mainstem.

In the majority of cases, August exhibited the highest station means. The major exception to this was the occurrence of higher station means for dissolved solids, suspended solids, BOD_5, and fecal coliforms in May. Exclusion of data from the E-5 and E-6 arms changes the comparison to show August as the highest month for BOD_5, but not for fecal coliforms. The highest fecal coliform densities occurred during the drier period of the year, both with and without inclusion of data from the E-5 and E-6 arms. Highs for most of the chemical parameters occurred during the wet period. This

TABLE 5

COMPARISON OF HIGH VALUES AND TRENDS

Parameter	Basin Highs* [Sta.#(Value)] May	Basin Highs* [Sta.#(Value)] Aug	Mainstem Highs* [Sta.#(Value)] May	Mainstem Highs* [Sta.#(Value)] Aug	Month With Highest Means*	Monthly Comparative Means Aug/May	Upstream-Downstream Trends
Physical							
Temp. ^{o}C**	E-12(23)	E-2,3,4(26)	E-1(23)	E-2,3,4(26)	August	1.1	None
Dissolved Solids - mg/l	E-10(3170)	E-6(2202)	E-11(2074)	E-12(280)	May	0.9	None
Suspended Solids - mg/l	E-7(62)	E-2,5(22)	E-12(23)	E-2(22)	****		None
Chemical							
pH - units	E-1(6.9)	E-6(6.4)	E-1(6.9)	E-2,3(6.2)	Same	1.0	None
D.O. - mg/l	E-8(2.1)	E-6(3.1)	E-11(4.1)	E-4(4.6)	May	1.3	None
BOD_5 - mg/l	E-7(10.6)	E-6(5.1)	E-1(4.8)	E-4(3.5)	May	0.5	None
Org-N - mg/l	E-7(0.89)	E-6(2.2)	E-4(0.75)	E-4(0.85)	August	2.1	None
NH_3-N - mg/l	E-7(0.37)	E-6(3.4)	E-2(0.35)	E-3(0.53)	Same	4.6	None
TKN - mg/l	E-7(1.17)	E-6(5.05)	E-2,4(1.0)	E-3(1.2)	August	2.4	None
NO_2+NO_3-N - mg/l	E-6(0.10)	E-6(0.45) E-5(4.0)***	E-12(0.06)	E-4(0.52)	August	12.9	Slight reduction
Total-P - mg/l	E-7(0.17)	E-6(1.5)	E-12(0.09)	E-4(0.18)	August	6.1	Slight reduction
TOC - mg/l	E-7(20)	E-3(24)	E-4,9,11& 12(16)	E-3(24)	August	1.2	None
Bacteriological							
Fecal Coliform - counts/100 ml	E-7(5600) E-5(5600)	E-7(2200)	E-3(5600)	E-1(1100)	May	0.3	Slight increase

* - Lows for D.O.

** - These highs do not include a single high value of 29.8 at Station E-7 on May 13.

*** - This is the only high value at this station. All other values were near or below detectable limits.

**** - Suspended solids were approximately two times higher in August in the lower end of the drainage basin, and approximately two times higher in May in the upper end.

___ - Stations in the E-5 or E-6 arms of the drainage basin.

apparent discrepancy in the data is understandable when the hydrogeological characteristics of the area and the precipitation-hydrograph plots on Figure 2 are considered.

The flat fields and pastures in this area are composed of very permeable, sandy soil underlain by a shallow ground water table. Chicken litter spread on croplands and pastures, cow manure dropped on the pastures, and swine droppings in feedlots would all decompose with some of the decomposition products being leached into the soil following infrequent rains during drier periods. Very little surface runoff would occur during these periods.

According to Davis and DeWiest[8], surface water runoff does not begin until the amount of precipitation exceeds the infiltration capacity of the soil. Part of the infiltration water will experience slow lateral flow above the groundwater table toward nearby streams. The remainder will reach the groundwater table and also flow very slowly toward the streams (groundwater flow.) The rate of surface water flow, infiltration and both lateral and groundwater flow to the streams, will depend on the grade of the terrain. Additional factors affecting this rate include soil permeability as well as both the slope and gradient of the groundwater table.

Material which leaches into the upper part of the soil column during dry periods slowly migrates toward the streams. This material should reach the streams fairly rapidly when the water table gradient is raised after heavy rains. The concentration of material reaching the streams through groundwater flow should undergo slow "tailing-off" as the accumulated material is flushed from the groundwater.

On the other hand, some material will reach the streams by surface water runoff after heavy rains. The rate of surface water flow to the streams will be slowed drastically by both the flat terrain and the woods and swampy areas which border the streams in this area.

Fecal coliforms reach the streams mainly by surface water runoff. Both increases and maxima for this parameter usually lag behind hydrographic increases and maxima.[9] The high mean fecal coliform counts encountered in May and the steady five day decrease in individual counts (Appendix B) should, according to this argument, represent the declining slope of a hydrograph. Reference to the May sampling period on Figure 2 shows this to indeed be the case. Figure 2 also shows that all August sampling was performed during relatively low flows before and after hydrographic maxima. This should and does indicate lower fecal coliform counts than occurred immediately after the peak discharge.

Of the chemical parameters which show higher values in August, NO_2+ NO_3-N is the most prominent (Table 5 - Monthly Comparative Means column). These compounds leach through the soil much faster than any other chemical parameter studied.[10,11,12] The low May values for this parameter (Appendix B) represent the final stages of groundwater flushing as shown by the "tailing-off" of the long term hydrograph for April and May (Figure 2). The high values for August, however, represent the initial portion of long-term groundwater flushing after a long dry period of accumulation (Note on Figure 2 that rainfall in June and July had little or no effect on the low to zero flow conditions).

The only upstream to downstream trends which occurred on the mainstem (Cedar Creek) for any of the parameters were a slight reduction in NO_2+NO_3-N and Total-P, and a slight increase in fecal coliform counts.

<u>LONG TERM BOD</u>

Long term BOD (1,4,5,7,10,12,14,16,18, and 20 day) analyses were performed on a single sample collected from Station E-1 on May 17, 1974.

A least squares analysis[13] of this data produced the following results:

La = Ultimate Carbonaceous Demand	=	1.85 mg/l
k_1 = Carbonaceous Rate Coefficient*	=	0.18/day
Na = Nitrogenous Oxygen Demand	=	3.8 mg/l
k_3 = Nitrogenous Rate Coefficient*	=	0.022/day
tn = Lag time to initiation of nitrogenous (2nd stage) oxygen demand	=	10 days

Figure 4 is a plot of both the observed values and those predicted by the following equations:

$$Y=La(1.0-e^{-k_1 t}) \text{ when } t<tn \text{ and } Y=Na(1.0-e^{(-k_3)(t-tn)}) \text{ when } t>tn$$

Y = oxygen demand at time t

These values are typical and are included for use in any future modeling efforts with this data.

ANIMAL POPULATION - DISTRIBUTION

During the week of May 13 through 17, 1974, animal population - distribution data were gathered by a combined team of SAD and SCS personnel by interviewing the major farmers in the area. The results are presented in Table 6.

TIME OF TRAVEL STUDIES

Throughout the same week of May, time of travel studies were performed by use of dye tracer techniques. Dye injections were made at Stations E-9 and E-3. The results of this study are presented in Table 7 and on Figure 3. Figure 3 presents only the results of the dye injection at Station E-9. High stream discharges which partially flooded the swampy areas, precluded time of travel studies during August. This prevented comparisons between the two study periods on a time of travel basis.

* Both rate coefficients are to the base e at 20°C.

FIGURE 4
LONG TERM BOD
STATION E-1

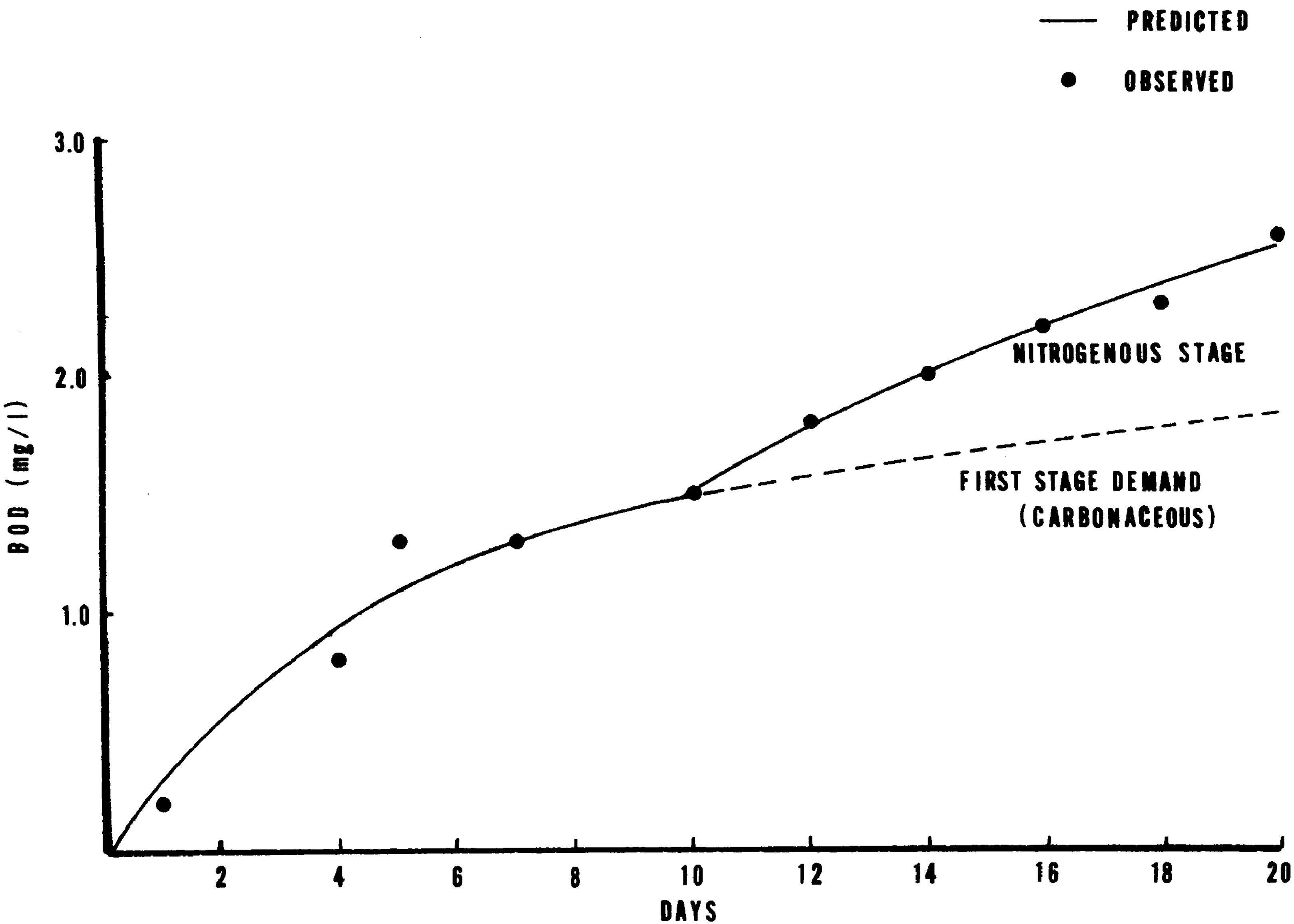


TABLE 6

LIVESTOCK POPULATION - DISTRIBUTION

Sub-basin	Cows	Swine	Poultry	Miles Upstream of Station Stream	Tributary
E-2	20*			0.5	1.6
E-3	20*			0	0.2
E-4	25			2.5	1.0
	100	200		1.9	0.9
E-5	40			2.1	1.1
E-6			45,000	0	0.6
		100		1.0	1.0
		118		1.4	0.4
E-7	50			0.6	0.6
	60			0.8	0.3
		100		0.8	0.3
E-8	40	250		0.3	0.6
			22,000	2.7	1.4
E-9	6	100		UNKNOWN	

*Estimated values

TABLE 7

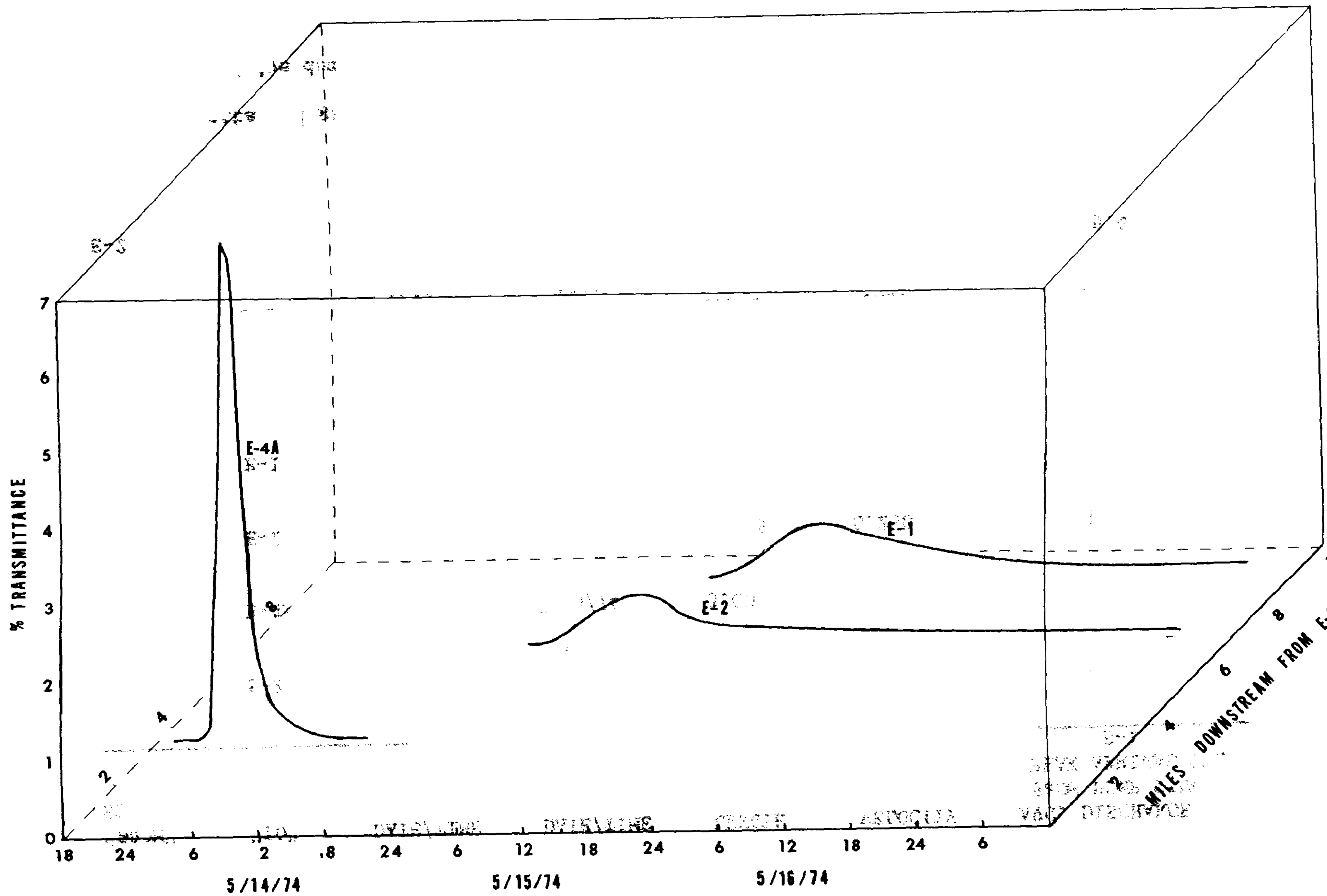
TIME OF TRAVEL DATA

"FROM" STA. #	"TO" STA. #	DATE/TIME OF DYE DUMP	DATE/TIME OF PEAK ARRIVAL	LENGTH OF REACH MILES	VELOCITY IN REACH MILES/HR	AVG. DISCHARGE (CFS) FROM DUMP TIME TO PEAK ARRIVAL TIME E-1
E-3	E-2	5/13/74 1524	5/13/74 2000	1.750	0.389	19.2
E-9[1/]	E-4A[1/]	5/13/74 1600	5/14/74 0130	3.000	0.316	16.9
E-9	E-2	5/13/74 1600	5/15/74 0630	9.875	0.256	13.8
E-9	E-1	5/13/74 1600	5/15/74 1700	12.292	0.251	13.0
E-4A	E-2[1/]	5/14/74 0130	5/15/74[2/] 0630	6.875	0.237	12.5
E-4A	E-1	5/14/74 0130	5/15/74[2/] 1700	9.292	0.235	12.1
E-2	E-1[1/]	5/15/74 0630	5/15/74[2/] 1700	2.417	0.230	9.4

1/ - See attached graph.

2/ - Peak of dye dumped at Station E-9.

FIGURE 3
TIME OF TRAVEL*
MAY 13-17, 1974



*Dye dumped into station E-9 at 1600 hours, 5/13/74.

DIURNAL STUDIES

Diurnal studies were performed at Station E-1 under ultra-low flow conditions during November, 1974 and under peaking flood conditions during January, 1975 (Figure 1). Results of these studies are presented in Appendix B. No significant diurnal variations were noted during either period.

ASSESSMENT OF POTENTIAL NON-POINT SOURCE RUNOFF LOADS

The gross assessment performed for this drainage basin was accomplished by applying loading factors to twelve sub-basins which are fully described by land use, soil type, topographic features, livestock and poultry-population-distributions and historic climatic conditions. A detailed report of this procedure is given in Appendix C with applicable loading factors stated. A brief summary of the results, both on an annual basis and on the seasonal wet period of June through August, follows:

- The Cedar Creek drainage basin contains 29,658 acres and is broken into 12 sub-basins ranging in size from 928 to 5,222 acres.
- It undergoes an annual erosion of 99,039 tons and a wet period erosion of 44,568 tons.
- It has an annual sediment delivery of 16,958 tons and a wet period sediment delivery of 7,631 tons.
- A one inch per hour storm produces seven percent of the average annual sediment load.*
- A two inch per hour storm produces thirty-two percent of the average annual sediment load.*
- Livestock and poultry produce about three percent of the N, two percent of the P, and 17 percent of the BOD.
- Sediment contains about 85 percent of the N, 96 percent of the P, and a negligible amount of BOD. This includes dissolved N and P.
- Forest and pasture litter provide about twelve percent of the N, two percent of the P, and 83 percent of the BOD.

* Under average soil moisture antecedent conditions

The analysis was performed to establish potential loads for typical conditions according to relationships stated on page "c" of the report. Attenuation effects of control practices can be determined using these calculations; however, it is unlikely that a valid comparison can be made between stream loads based on sampling and these gross assessment loads.

HYDROCOMP WATER QUALITY PREDICTIONS[14]

General

The postimpoundment water quality of Cedar Creek was simulated using the combined hydrologic and water quality models known as the Hydrocomp Simulation Programming (HSP) model. The models were calibrated (or adapted) to local conditions using observed hydrometeorologic and water quality data collected by the Environmental Protection Agency. Water quality in the basin was simulated for a five year period, both with and without the proposed impoundment. The resulting time series of water quality constituents was analyzed to determine the percentage of time that various concentration levels would be exceeded both with and without the impoundment. The result of these analyses were compared with Georgia Water Quality Standards.

Temperature

HSP predicts that the impoundment will dampen out extreme temperatures, both on an annual and on a seasonal basis. Without the impoundment, violations of the Georgia water temperature standard of 32.2°C would occur approximately 0.4% of the time on an annual basis and one percent of the time between June and September. With the impoundment, no violations are predicted during any portion of the year.

Dissolved Oxygen

HSP predicted that the instantaneous minimum standard of 4.0 mg/l D.O. would be violated less than two percent of the time on an annual basis, with or without the impoundment. September is predicted to be the most critical time of the year for the uncontrolled stream with violations 3.5% of the time. Under impounded conditions, however, August is the most critical month, with violations predicted six percent of the time. Predicted violations are spread more uniformly throughout the year without the impoundment (i.e., June-August with the impoundment, and June-March without the impoundment).

Hydrocomp used a very high, possibly unrealistic, NH_3 nitrification rate coefficient of 0.1 per hour, rather than a more typical value such as 0.0185 per hour. Consequently, the simulated D.O. concentrations represent the worst likely conditions; and actual D.O. concentrations may be considerably higher than simulated.

Fecal Coliform

HSP simulated both annual and summer fecal coliform concentrations, both with and without the influence of the lake. The model results clearly show that violation of Georgia's fecal coliform standard for body contact recreation* will not be a problem for the lake as a whole. In isolated shoreline areas, where influent and impoundment waters are not well mixed, problems could develop during some storm events. On an annual basis, predictions for the uncontrolled stream (for single observations, not for samples) during some storm events, indicate counts greater than 200/100 ml 69 percent of the time, and greater than 2,500/100 ml one percent of the time.

Five Day Biochemical Oxygen Demand (BOD_5)

Predictions for annual and seasonal BOD_5 concentrations with and without the impoundment were made. No appreciable variations were noted on the seasonal basis. BOD_5 concentrations of less than 5.0 mg/l are expected 95% of the time on the uncontrolled stream. With the impoundment, values of less than 3.0 mg/l BOD_5 were predicted 100% of the time.

* Measured values not to exceed 200 organisms/100 ml based on a geometric mean of four or more samples taken at least 24 hours apart.

Occational high BOD_5 values (greater than 9.5 mg/l one percent of the time) were predicted in the free-flowing stream, but such occurrences are to be expected with the animal population found in the watershed.

Nitrogen and Phosphorus Species

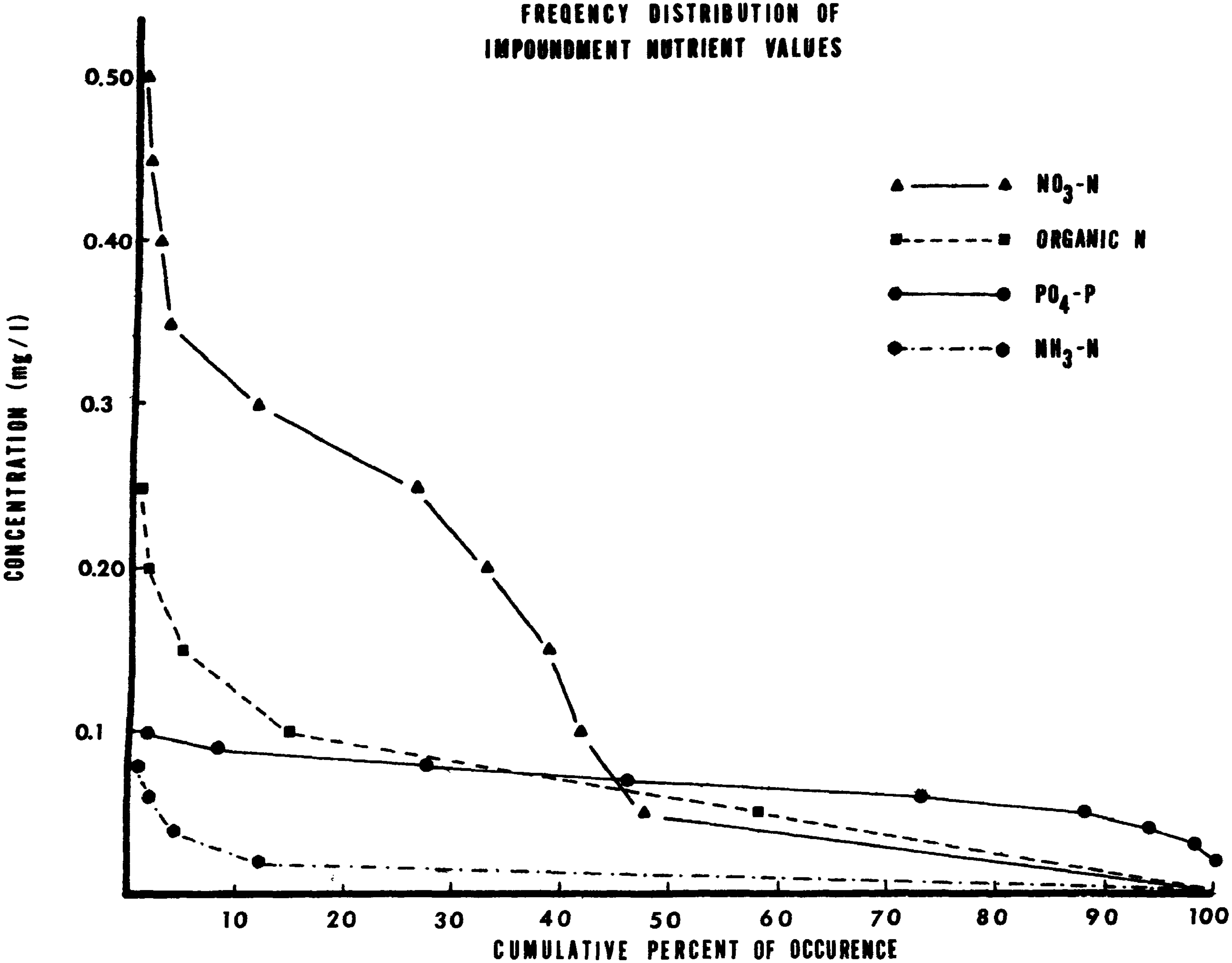
Predicted concentration frequencies for the various species are presented on Figure 5. HSP made no predictions as to the eutrophication potential which would exist at the various nutrient concentrations.

Total Dissolved Solids (TDS)

Hydrocomp predicted that the impoundment would increase the TDS concentrations slightly above those of the uncontrolled stream (greater than 90 mg/l 100% of the time with the impoundment and 90% of the time without the impoundment). However, peak concentrations would occur in the free flowing environment (greater than 105 mg/l two percent of the time without the impoundment and never exceeding 100 mg/l with the impoundment).

FIGURE 5

FREQENCY DISTRIBUTION OF
IMPOUNDMENT NUTRIENT VALUES



POTENTIAL PROBLEM AREAS

Although the Hydrocomp Simulation Programming (HSP) Model[14] predicts no significant violation of Georgia's Water Quality Standards for the Cedar Creek Impoundment as a whole, potential localized problems may be prevented by control of non-point pollution sources in some areas. Below is a more detailed examination of the two potential problem areas previously discussed in the study findings (E-5 and E-6 arms).

For comparison purposes, the overall drainage basin was divided into the following combined sub-basins with the indicated areas:

Combined Sub-basin	Upstream Area
E-6, E-7*	3.60 $mi.^2$ (2,304 acres)
E-5, E-8*	9.22 $mi.^2$ (5,901 acres)
E-9, E-10, E-11, E-12*	19.89 $mi.^2$ (12,729 acres)
Overall Basin	
E-1 through E-12	46.34 $mi.^2$ (29,658 acres)

In order to establish the relative magnitude of potential pollutional problems from a given sub-basin area, the sub-basins are compared to one another and to the overall basin. Detailed comparisons of the combined loadings (total lbs/acre/day for six parameters - TOC, BOD_5, Total-P, Org-N, NH_3-N and NO_2+NO_3-N) and fecal coliforms/acre/day are presented on Tables 8-12.

The intermittent occurrence of zero flow conditions in some sub-basins (described below) prevented comparison of all sub-basins with the overall basin for the same sampling periods.

* Hereafter called the E-6, E-5, and E-9 sub-basins, respectively.

TABLE 8

COMPARISON OF THE COMBINED E-5, E-6 SUB-BASINS WITH STATION E-1 (ENTIRE BASIN)

Parameter	Sub-basin or Downstream Station	Loadings -10^{-3} lbs/acre/day 8/20/74	8/30/74	Mean	Fractional Loadings $\frac{E\text{-}5,\ E\text{-}6}{E\text{-}1}$
TOC	E-5, E-6	88	43	66	4.1
	E-1	13	18	16	
BOD_5	E-5, E-6	13	5.5	9.2	11
	E-1	0.67	1.0	0.84	
Total-P	E-5, E-6	0.64	0.39	0.52	17
	E-1	0.034	0.027	0.030	
Org-N	E-5, E-6	2.1	1.9	2.0	4.5
	E-1	0.46	0.43	0.44	
NH_3-N	E-5, E-6	1.0	0.29	0.65	12
	E-1	0.067	0.044	0.056	
NO_2+NO_3-N	E-5, E-6	1.3	0.30	0.80	6.7
	E-1	0.10	0.13	0.12	
				Mean	9.2

TABLE 9

COMPARISON OF THE E-9
SUB-BASIN WITH STATION E-1 (ENTIRE BASIN)

Parameter	Sub-basin or Downstream Station	Loadings -10^{-3} lbs/acre/day 5/15/74	5/16/74	5/17/74	Mean	Fractional Loadings $\frac{E-9}{E-1}$
TOC	E-9	3.0	4.4	2.0	3.1	0.21
	E-1	26	10	8.7	15	
BOD_5	E-9	3.9	0.44	0.18	1.5	0.75
	E-1	3.9	0.87	1.1	2.0	
Total-P	E-9	0.04	0.003	0.002	0.015	1.4
	E-1	0.018	0.008	0.007	0.011	
Org-N	E-9	0.65	0.10	0.041	0.26	0.90
	E-1	0.50	0.16	0.22	0.29	
NH_3-N	E-9	0.16	0.034	0.01	0.068	0.70
	E-1	0.14	0.087	0.065	0.097	
NO_2+NO_3-N	E-9	0.02	0.031	0.002	0.018	1.6
	E-1	0.018	0.009	0.007	0.011	
					Mean	0.93

TABLE 10

COMPARISON OF THE COMBINED
E-5, E-6 SUB-BASINS WITH THE E-9 SUB-Basin

Parameter	Sub-Basin	Loadings-10^{-3} lbs/acre/day 5/15-17/74 Mean	Loadings-10^{-3} lbs/acre/day 8/29-30/76 Mean	Fractional Loadings $\frac{E\text{-}5,\ E\text{-}6}{E\text{-}9}$
TOC	E-5, E-6		66	21
	E-9	3.2		
BOD_5	E-5, E-6		9.4	6.3
	E-9	1.5		
Total-P	E-5, E-6		0.52	35
	E-9	0.015		
Org-N	E-5, E-6		2.0	7.7
	E-9	0.26		
NH_3-N	E-5, E-6		0.67	9.7
	E-9	0.069		
NO_2+NO_3-N	E-5, E-6		0.81	45
	E-9	0.018		
			Mean	21

TABLE 11

COMPARISON OF THE E-6 AND E-5 SUB-BASINS

Parameter	Sub-basin	Loadings-10^{-3}lbs/acre/day 8/29/74	8/30/74	Mean	Fractional Loadings $\frac{E-6}{E-5}$
TOC	E-6	150	45	98	1.8
	E-5	64	42	53	
BOD_5	E-6	27	6.7	17	2.7
	E-5	7.8	5.0	6.4	
Total-P	E-6	2.0	0.78	1.4	8.2
	E-5	0.10	0.24	0.17	
Org-N	E-6	4.0	1.8	2.9	1.7
	E-5	1.4	2.0	1.7	
NH_3-N	E-6	3.3	0.69	2.0	12
	E-5	0.17	0.14	0.16	
NO_2+NO_3-N	E-6	4.2	0.78	2.5	>16
	E-5	<0.17	<0.14	<0.16	
				Mean	>7.1

TABLE 12

COMPARISON OF FECAL COLIFORM (F.C.) LOADINGS

Sub-basin or Downstream Station	Loadings-Million F.C./acre/day				Fractional Loadings			
	8/29/74	8/30/74	Geometric Mean		E-5, E-6 / E-1	E-5, E-6 / E-9	E-6 / E-5	E-9 / E-1
E-5, E-6	15.2	4.41	8.19		3.79	7.65		
E-6	29.3	3.7	10.4				1.54	
E-5	9.71	4.69	6.75					
E-1	3.36	1.39	2.16					
	5/15/74	5/16/74	5/17/74	Geometric Mean				
E-9	2.12	0.384	0.421	1.07				1.24
E-1	3.57	0.944	0.188	0.859				

Period of Comparison	Comparison	Flow Conditions
5/15-17/74	E-9 with E-1	"0" flow at E-6
8/29-30/74	E-5, E-6 with E-1	"0" flow at E-9

Both periods of comparison, however, represent the same types of rainfall-streamflow conditions (short response time between rainfall incidence and streamflow increase). See "Description of Study Area" (discussion of Figure 2) for details on this phenomenon.

Comparison of loadings (Tables 8-12) indicate the following:

(1) The E-5, E-6 combined sub-basins are only 28% of the area of the overall basin (Station E-1). Compared to the overall basin, however, they contribute a 9.2 times higher combined chemical loading (Table 8) and a 3.8 times higher fecal coliform loading (Table 12).

(2) The E-9 sub-basin contains only 43% of the overall basin area but is 93% higher in combined loadings (Table 9) and 1.2 times higher in fecal coliform loadings (Table 12) than the overall basin.

(3) The combined E-5, E-6 sub-basins contain only 64% of the E-9 sub-basin area, yet they contribute combined chemical loadings averaging 21 times higher (Table 10), and coliform loadings averaging 7.6 times higher (Table 12) than E-9.

(4) The E-6 sub-basin is only 39% as large as the E-5 sub-basin, but averages both a 7.1 times higher combined chemical loading contribution (Table 11) and a 1.5 times higher fecal coliform loading contribution (Table 12) than E-5.

The combined E-5 and E-6 sub-basins clearly contribute a larger amount of the pollutional load to the proposed impoundment site than would be indicated by their size. Analysis of data from these two sub-basins on a total pounds/day basis (Table 13) indicates the following:

(1) The E-5 sub-basin contributes a higher TOC and Org-N load,

(2) Both sub-basins contribute approximately the same load of BOD_5, and

(3) The E-6 sub-basin contributes a higher load of Total-P, NH_3-N, and NO_2+NO_3-N.

The above comparisons suggest plants (leaf litter) in the E-5 sub-basin and animal waste in the E-6 sub basin as the major sources of pollution. The smaller E-6 sub-basin has 1.4 times as many cattle, 1.3 times as many swine, and 2.3 times as many poultry* as E-5. Compared to E-6, the E-5 sub-basin contains 2.6 times the total area, 2.6 times the stream miles, twice the swampy area and 4.2 times the forest area. The E-6 sub-basin has a much greater amount of animal and poultry waste subject both to leaching to the groundwater and surface runoff. The E-5 sub-basin, however, generates more leaf litter subject to aquatic decay and transport.

In support of these conclusions, and in an effort to determine the relative magnitude of the contribution from these two pollutional sources, the following carbon-nitrogen ratios (C:N) were used as guides.

---

* The poultry population[15] in the E-6 sub-basin consists of a single 40,000 to 50,000 layer hen operation located approximately 0.6 stream miles upstream of Station E-6. In this operation, the majority of the chicken litter is spread on surrounding cropland with the remainder placed in a small, shallow holding pond.

TABLE 13

LBS/DAY COMPARISONS OF THE
E-5 AND E-6 SUB-BASINS

Parameter	Sub-basin	8/29/76	8/30/76	Average
TOC	E-5	378	250	314
	E-6	345	103	224
BOD_5	E-5	46.2	29.7	38.0
	E-6	62.5	15.5	39.0
Total-P	E-5	0.6	1.4	1.0
	E-6	4.7	1.8	3.2
ORG-N	E-5	8.4	11.6	10.0
	E-6	9.1	4.1	6.6
NH_3-N	E-5	1.0	0.8	0.9
	E-6	7.6	1.6	4.6
NO_2+NO_3-N	E-5	<1.0	<0.8	<0.9
	E-6	9.7	1.8	5.8

C:N RATIOS

Non-Point Sources	Min.	Max.	Mean
Local trees[16]	40:1 (White Oak)	98:1 (Red Maple)	59:1
E-5			27:1
Animals and Poultry[15]	3.4:1 (Swine)	27:1 (Beef)	12:1*
E-6			13:1

Realizing that the C:N values for leaf litter and animal or poultry waste apply to fresh materials, and that those for the two sub-basins represent partially decomposed material from both sources, the correlations between basin and source type are good.

These comparisons and correlations suggest that the pollutional loadings contributed by the E-6 sub-basin will be responsive to improved animal and poultry waste handling practices. The pollutional loadings from the E-5 sub-basin, which appear to originate largely from natural processes, are less subject to control.

* Includes a C:N of 5.1:1 for poultry.

REFERENCES

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2. Spino, D. F., 1966. "Elevated Temperature Technique for the Isolation of Salmonella from Streams", Applied Microbiology, 14, pp. 591-596.

3. Ewing, W. H., 1962. Enterobacteriaceae Biochemical Methods for Group Differentiation, Public Health Service Publication No. 734.

4. Edwards, P. R., W. H. Ewing, 1962. Isolation and Grouping of Salmonella and Shigella Cultures, U. S. Department of Health, Education, and Welfare, Public Health Service.

5. Climatological Data, National Oceanic and Atmospheric Administration, Environmental Data Service, Asheville, NC.

6. United States Department of the Interior, Geological Survey, Water Resources Data for Georgia, 1969-1975.

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8. Davis, S. N. and R. J. DeWiest, 1966, Hydrogeology, New York, John Wiley and Sons, Inc.

9. U. S. Environmental Protection Agency, Technical Study, TS-04-73-01, Bacteriological Preimpoundment Study in the Upper Leaf River Watershed, Smith County, Mississippi, August, 1972.

10. Sawyer, C. N., 1960, Chemistry for Sanitary Engineers, New York McGraw-Hill Book Company, Inc.

11. Environmental Protection Technology Series, Quantification of Pollutants in Agricultural Runoff, EPA-600/2-74-005; February, 1974.

12. Environmental Protection Technology Series, Research Status on Effects of Land Application of Animal Waste, EPA-660/2-75-010, June, 1975.

13. Barnwell, Thomas O., Nonlinear Estimation of BOD Parameters Using Marquardt's Comprise Algorithm, PCS&A Branch, Surveillance and Analysis Division, Region IV, EPA, Athens, GA, January, 1972.

14. Hydrocomp, Inc., July 8, 1976. Study to Predict Post-Impoundment Water Quality in Two Proposed Reservoirs of Black Creek and Evans County Watersheds in Southeast Georgia, Report to fulfill U. S. Soil Conservation Service Contract No. H6-13-SCS-00238.

15. Personal communication - data transmitted by letter dated September 8, 1976, from A. B. Walden, Area Conservationist, U. S. Department of Agriculture, Soil Conservation Service, Statesboro, Georgia.

16. Personal communication - data transmitted through telephone conversation, October 14, 1976, with Dr. W. Metter, School of Forestry, Univ. of Georgia, Athens, Georgia.

Contract No. AG-13-scs-00223

COOPERATIVE AGREEMENT
between the
ENVIRONMENTAL PROTECTION AGENCY
and the
SOIL CONSERVATION SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE

RELATIVE TO: Preimpoundment Water Quality Studies

THIS AGREEMENT, made and entered into this 1st day of May , 1974, by and between the Environmental Protection Agency (EPA) Region IV (referred to as the EPA) and the Soil Conservation Service, United States Department of Agriculture (referred to as the Service).

AUTHORITY: (1) Federal Water Pollution Control Act Amendments of 1972 (86 Stat. 820) 33 U.S.C. 1254 (b)(6)

(2) Section 601 of the Economy Act of June 30, 1932, as amended (31 U.S.C. 686)

WITNESSETH

WHEREAS, the Soil Conservation Service in administering and carrying out an effective watershed protection program under provisions of Public Law 566 - 83rd Congress, as amended, 16 U.S.C. 1003, has a need for preimpoundment studies of water quality conditions within the drainage basins of proposed impoundments in Black Creek Watershed, Bulloch County, Georgia and Evans County Watershed, Evans, Tattnall and Candler Counties, Georgia. In order to determine existing stream water quality and to predict the quality of water in the reservoirs after impoundment, the Soil Conservation Service is desirous of entering into a financial arrangement with the Environmental Protection Agency for a preimpoundment study.

WHEREAS, the Environmental Protection Agency has the personnel, facilities and technical knowledge to make the desired studies and are willing to enter into a cooperative arrangement.

NOW, THEREFORE, for and in consideration of the promises and mutual covenants herein contained, the parties hereto do agree with each other as follows:

I. THE EPA AGREES:

A. To commence a comprehensive study in the current fiscal year to achieve the below listed objectives leading towards completion in the following fiscal year.

B. To conduct two studies of about one week duration each to determine the physical and chemical quality and the degree of bacteriological contamination of: (a) tributaries which will serve as influent water sources after the lakes are filled, (b) some main channel points on both Cedar and Little Black Creeks within the boundaries of the impoundments and (c) main channel points at or immediately downstream of both dam sites. Work will be performed in accordance with a prepared detailed study plan (Attachment A).

C. To predict the quality of the impounded waters following project completion; especially the expected fecal coliform concentrations in designated recreational areas of the impoundments.

D. To provide data for the confirmation of a mathematical model which can be used in the future, with a minimal amount of additional data, to predict water quality in other impoundments in the same general type of area (same soil type and land usage).

E. To furnish SCS with a complete report giving results of studies conducted under A, B, C and D above within nine (9) months after effective date of this agreement.

F. To periodically furnish the Service itemized billings for work accomplished in accordance with study plan (Attachment A).

II. THE SERVICE AGREES:

A. To assist EPA by changing charts on recording instruments at specific locations within the watersheds.

B. To furnish maps of the study areas and design data for the proposed impoundments.

C. To assist EPA in gathering land use data within the impoundment drainage areas.

D. To reimburse EPA for the preimpoundment studies in an amount not to exceed $15,000 during fiscal year 1974. Payments will be made upon receipt of itemized billings for work accomplished.

III. IT IS MUTUALLY AGREED:

A. This agreement shall be effective for the period May 1, 1974 through June 30, 1974 and may be supplemented, amended or renewed for continued work during subsequent fiscal year.

B. It is the intent of the EPA and Service to continue this agreement during fiscal year 1975 for completion of work in the study plan. Renewal will be contingent upon availability of appropriated funds.

C. This agreement shall be terminated upon completion of the work as mutually determined by the parties thereto.

IN WITNESS WHEREOF, the parties have executed this agreement on the day, month and year first above written.

ENVIRONMENTAL PROTECTION AGENCY	SOIL CONSERVATION SERVICE UNITED STATES DEPARTMENT OF AGRICULTURE
John C White for Jack E. Ravan	Charles W. Bartlett Charles W. Bartlett
Title: Regional Administrator Region IV	Title: State Conservationist

ATTACHMENT A

For copies of or details concerning the study plan, contact:

Dr. David W. Hill

or

Hugh C. Vick

Environmental Protection Agency
Region IV
Surveillance and Analysis Division
College Station Road
Athens, GA 30601

EPA-IAG-R5-0604

Contract No. AG-13-scs-00226

COOPERATIVE AGREEMENT
between the
ENVIRONMENTAL PROTECTION AGENCY
and the
SOIL CONSERVATION SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE

RELATIVE TO: Preimpoundment Water Quality Studies

THIS AGREEMENT, made and entered into this 1st day of July, 1974, by and between the Environmental Protection Agency (EPA) Region IV (referred to as the EPA) and the Soil Conservation Service, United States Department of Agriculture (referred to as the Service).

AUTHORITY: (1) Federal Water Pollution Control Act Amendments of 1972 (86 Stat. 820) 33 U.S.C. 1254 (b)(6)

(2) Section 601 of the Economy Act of June 30, 1932, as amended (31 U.S.C. 686)

WITNESSETH

WHEREAS, the Soil Conservation Service in administering and carrying out an effective watershed protection program under provisions of Public Law 566 - 83rd Congress, as amended, 16 U.S.C. 1003, has a need for preimpoundment studies of water quality conditions within the drainage basins of proposed impoundments in Black Creek Watershed, Bulloch County, Georgia and Evans County Watershed, Evans, Tattnall and Candler Counties, Georgia. In order to determine existing stream water quality and to predict the quality of water in the reservoirs after impoundment, the Soil Conservation Service is desirous of entering into a financial arrangement with the Environmental Protection Agency for a preimpoundment study.

WHEREAS, the Environmental Protection Agency has the personnel, facilities and technical knowledge to make the desired studies and is willing to enter into a cooperative arrangement.

NOW, THEREFORE, for and in consideration of the promises and mutual covenants herein contained, the parties hereto do agree with each other as follows:

I. THE EPA AGREES:

A. To carryout a comprehensive study in the current fiscal year to achieve the below listed objectives.

B. To conduct two studies of about one week duration each to determine the physical and chemical quality and the degree of bacteriological contamination of: (a) tributaries which will serve as influent water sources after the lakes are filled, (b) some main channel points on both Cedar and Little Black Creeks within the boundaries of the impoundments and (c) main channel points at or immediately downstream of both dam sites. Work will be performed in accordance with a prepared detailed study plan (Attachment A).

C. To predict the quality of the impounded waters following project completion; especially the expected fecal coliform concentrations in designated recreational areas of the impoundments.

D. To provide data for the confirmation of a mathematical model which can be used in the future, with a minimal amount of additional data, to predict water quality in other impoundments in the same general type of area (same soil type and land usage).

E. To furnish SCS with a complete report giving results of studies conducted under A, B, C and D above within seven (7) months after effective date of this agreement.

F. To periodically furnish the Service itemized billings for work accomplished in accordance with study plan (Attachment A).

II. THE SERVICE AGREES:

A. To assist EPA by changing charts on recording instruments at specific locations within the watersheds.

B. To furnish maps of the study areas and design data for the proposed impoundments.

C. To assist EPA in gathering land use data within the impoundment drainage areas.

D. To reimburse EPA for the preimpoundment studies in an amount not to exceed $23,469 during fiscal year 1975. Payments will be made upon receipt of itemized billings for work accomplished.

III. IT IS MUTUALLY AGREED:

A. This agreement shall be effective for the period July 1, 1974 through January 31, 1975 and may be supplemented, amended or renewed for continued work during subsequent fiscal year.

B. This agreement shall be terminated upon completion of the work as mutually determined by the parties thereto.

IN WITNESS WHEREOF, the parties have executed this agreement on the day, month and year first above written.

ENVIRONMENTAL PROTECTION AGENCY	SOIL CONSERVATION SERVICE UNITED STATES DEPARTMENT OF AGRICULTURE
Jack E. Ravan	Charles W. Bartlett
Jack E. Ravan	Charles W. Bartlett
Title: Regional Administrator Region IV	Title: State Conservationist

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region IV, Surveillance & Analysis Division
College Station Road, Athens, GA 30601

SUBJECT: Request for Extension of Cooperative Agreement with the Soil Conservation Service (SCS) DATE: May 20, 1975

FROM: 4ASI:David W. Hill
Chief, Special Studies

TO: 4A:Jack E. Ravan
Administrator, Region IV, EPA

THRU: 4AS:John A. Little
Director, S&A Division

JAL

SUMMARY

The attached amendment to our current Cooperative Agreement with SCS is intended to extend the agreement through the next fiscal year. This will be adequate time to complete and terminate the project and will allow us to take advantage of unused funds (more than $11,000) committed to the project.

Approximately May 1, 1975, the SCS finalized a contract with Hydrocomp, a private computer firm specializing in hydrology and water quality, which will analyze and make detailed (hour-by-hour) water quality projections from our field data. This is to be a six-month contract, and, consequently, Hydrocomp will not finish its work until around November 1, 1975, after which time we will need to use its findings and report as the major components of a report from EPA to SCS.

We are currently using the reimbursable funds available through this cooperative agreement primarily to hire students on the "Stay-in-School" program to process data. (All field work has been completed.) An extension of this agreement will allow us to continue to use the funds remaining in the contract for student salaries and other project-related costs. This use of these funds will not hinder other work in progress or assigned and will also provide Region IV with some very useful water quality data and projection techniques that will be valuable in connection with similar projects which we review for SCS through the EIS process.

ACTION

Please sign the attached amendment to allow us to continue to use SCS-designated funds during the next fiscal year. Please sign the original and all four copies of the amendment and return them to me.

EPA Form 1320-6 (Rev. 6-72)

BACKGROUND

Cooperative Agreement No. AG-13-scs-00226 (EPA-IAG-R5-0604) and cover letter dated May 15, 1975, from the State Conservationist, Athens, GA.

David W. Hill

David W. Hill
Chief, Special Studies

Enclosures

cc - Bill McBride

Contract No. AG-13-scs-00226
EPA-IAG-R5-0604

AMENDMENT
to
COOPERATIVE AGREEMENT
between the
ENVIRONMENTAL PROTECTION AGENCY
and the
SOIL CONSERVATION SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE

RELATIVE TO: Preimpoundment Water Quality Studies

Section III.A. and Amendment are hereby modified as follows:

This agreement shall be effective for the period July 1, 1975 through June 30, 1976 and may be supplemented, amended or renewed for continued work during subsequent fiscal year.

ENVIRONMENTAL PROTECTION AGENCY	SOIL CONSERVATION SERVICE UNITED STATES DEPARTMENT OF AGRICULTURE
Jack E. Ravan	Charles W. Bartlett
Title: Regional Administrator Region IV	Title: State Conservationist Acting

APPENDIX B
****
WATER QUALITY DATA - PREIMPOUNDMENT STUDY
CEDAR CREEK DRAINAGE BASIN
EVANS, TATNALL AND CANDLER COUNTIES, GEORGIA

STATION - E-01 CEDAR CR AT UNK CO RD. BELLVILLE OGEECHEE R. BASIN EVANS COUNTY WATERSHED

DATE	TIME	00003 DEPTH FEET	00010 WATER TEMP CENT	00060 STREAM FLOW CFS	00300 DO MG/L	00310 BOD 5 DAY MG/L	00400 PH SU	00515 RESIDUE DISS-105 C MG/L	00530 RESIDUE TOT NFLT MG/L	00303 BOD 1 DAY MG/L
740513	1530	2	22.0	38.0	7.0	4.8	5.8	98	8	
740514	0820	2	18.0	13.8	7.1	1.5	6.5	31	3	
740515	0930	1	20.0	9.8	7.1	2.2	6.9	64	6	
740515	1815	1	22.0		7.5	2.1	6.5	73	7	
740516	1315	1	20.5	4.8	6.5	1.0	6.3	27	3	
740517	0800	1	19.0	4.0	5.9	1.5	6.8	48	4	
740517	0805					1.3				0.200
740807	0820		22.0	6.8		1.3	5.4	102	4	
740808	0845		24.0	6.6		2.4	5.8			
740815	0810			6.6		0.8		110	6	
740829	1045		23.0	3.7	4.8	1.0	5.6	96	6	
740830	0855		22.5	4.8	4.8	1.2	5.8	108	6	
741117	2130		11.0			2.0		54	9	
741118	1200		14.0	1.1		2.4		32	18	
741118	1625		16.0	1.2		1.9		43	11	
741120	1515		17.0	1.5		1.9		48	6	
741120	1600		17.0	1.5		2.5		28	16	
741120	1630		17.0	1.5		2.6		30	8	
741120	1700		17.0	1.5		1.9		48	8	
741120	1745		15.0	1.5		1.7		34	6	
741120	1845		15.0	1.6		3.1		36	10	
741120	1945		15.0	1.6		2.0		35	23	
741121	0800		12.0	1.7		1.1		34	8	
741121	0920		12.5	1.7		2.4		33	25	
741121	1150		12.0	1.7		2.2		50	8	
750113	1455		13.0	313.0		2.6		112	6	
750113	1555		12.5	318.0		3.2		131	5	
750113	1700		12.5	323.0		2.6		97	5	
750113	1800		12.5	333.0		3.2		90	4	
750113	1900		12.0	343.0		3.1		85	9	
750113	2000		11.5	363.0		3.8		97	2	
750114	1100			470.0		1.2		74	7	
750114	1210			472.0		1.8		74	7	
750114	1250			467.0		1.1		75	1	
750125	1310			241.0		1.5		55	4	

APPENDIX B
****
WATER QUALITY DATA - PREIMPOUNDMENT STUDY
CEDAR CREEK DRAINAGE BASIN
EVANS, TATNALL AND CANDLER COUNTIES, GEORGIA

STATION - -E-01 CEDAR CR AT UNK CO RD. BELLVILLE OGEECHEE R. BASIN EVANS COUNTY WATERSHED

DATE	TIME	00306 BOD 4 DAY MG/L	00315 BOD 7 DAY MG/L	00322 BOD 10 DAY MG/L	00328 BOD 12 DAY MG/L	00350 BOD 14 DAY MG/L	00331 BOD 16 DAY MG/L	00333 BOD 18 DAY MG/L	00324 BOD 20 DAY MG/L
740517	0805	0.8	1.3	1.5	1.8	2.0	2.2	2.3	2.6

APPENDIX B
****
WATER QUALITY DATA - PREIMPOUNDMENT STUDY
CEDAR CREEK DRAINAGE BASIN
EVANS, TATNALL AND CANDLER COUNTIES, GEORGIA

STATION - E-01 CEDAR CR AT UNK CO RD. BELLVILLE OGEECHEE R. BASIN EVANS COUNTY WATERSHED

DATE	TIME	00003 DEPTH FEET	00605 ORG N N MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00650 T PO4 PO4 MG/L	00680 T ORG C C MG/L	31616 FEC COLI MFM-FCBR /100ML
740513	1530	2	0.640	0.20	0.84	0.01	0.02	14.0	4600
740514	0820	2	0.220	0.02	0.24	0.01K	0.01	13.0	1100
740515	0930	1	0.190	0.05	0.24	0.01K	0.01K	15.0	310
740515	1815	1	0.360	0.10	0.46	0.01K	0.01	14.0	570
740516	1315	1	0.180	0.10	0.28	0.01	0.01	12.0	240
740517	0800	1	0.300	0.06	0.36	0.01	0.01	12.0	570
740807	0820		0.420	0.06	0.48	0.05	0.07	14.0	150
740808	0845		0.470	0.08	0.55	0.05K	0.06	16.0	230
740815	0810		0.700	0.01K	0.70	0.05K	0.06	16.0	220
740829	1045		0.680	0.10	0.78	0.15	0.05	19.0	1100
740830	0855		0.500	0.05	0.55	0.15	0.03	21.0	350
741117	2130		0.360	0.03	0.39	0.01K	0.03	17.0	1830
741118	1200		0.350	0.01	0.36	0.01K	0.01K	13.0	1870
741118	1625		0.330	0.01	0.34	0.01K	0.01K	13.0	2470
741120	1515		0.230	0.03	0.26	0.01K	0.02	5.0	1650
741120	1600		0.190	0.07	0.26	0.01K	0.05	7.0	1730
741120	1630		0.230	0.01	0.24	0.01K	0.01K	5.0	1800
741120	1700		0.230	0.03	0.26	0.01K	0.02	7.0	3100
741120	1745		0.260	0.03	0.29	0.01K	0.04	5.0	2800
741120	1845		0.230	0.01	0.24	0.01K	0.05	6.0	3800
741120	1945		0.250	0.01	0.26	0.01K	0.02	5.0	2000
741121	0800		0.170	0.01	0.18	0.01K	0.01	8.0	1450
741121	0920		0.190	0.01	0.20	0.01K	0.02	6.0	1380
741121	1150		0.080	0.10	0.18	0.01K	0.02	5.0	1450
750113	1455		0.260	0.11	0.37	0.02	0.06	15.0	16600
750113	1555		0.430	0.06	0.49	0.01	0.05	19.0	14000
750113	1700		0.380	0.05	0.43	0.01	0.07	17.0	18000
750113	1800		0.370	0.06	0.43	0.01	0.06	16.0	18400
750113	1900		0.420	0.07	0.49	0.02	0.06	20.0	13600
750113	2000		0.400	0.07	0.47	0.02	0.11	20.0	11600
750114	1100		0.230	0.20	0.43	0.04	0.05	20.0	13800
750114	1210		0.350	0.05	0.40	0.02	0.05	19.0	16300
750114	1250		0.430	0.06	0.49	0.01	0.05	19.0	19400
750125	1310		0.300	0.01	0.31	0.02	0.02	13.0	200

APPENDIX B

****

WATER QUALITY DATA - PREIMPOUNDMENT STUDY
CEDAR CREEK DRAINAGE BASIN
EVANS, TATNALL AND CANDLER COUNTIES, GEORGIA

STATION - E-02 CEDAR CR AT EVANS-TATTNALL CO.LN OGEECHEE R. BASIN EVANS COUNTY WATERSHED

DATE	TIME	00003 DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00310 BOD 5 DAY MG/L	00400 PH SU	00515 RESIDUE DISS-105 C MG/L	00530 RESIDUE TOT NFLT MG/L	00605 ORG N N MG/L
740513	1600	2	22.0	6.7	3.5	5.7	87	9	0.650
740514	0845	2	18.0	7.0	2.1	6.3	29	5	0.300
740515	0945	1	20.0	6.7	2.1	6.3	65	4	0.260
740516	1305	1	20.0	6.7	1.3	6.2	26	4	0.260
740517	0830	1	19.5	6.3	1.8	6.2	21	7	0.320
740807	0900		21.5			6.2			
740808	0900		23.0		2.3	5.9			0.470
740814			26.0			5.9			
740815	0820				1.3		78	22	0.510
740829	1055		22.0	5.0	1.4	5.9	114	11	0.400
740830	0950		23.0	5.3	1.4	5.9	94	6	0.450

DATE	TIME	00003 DEPTH FEET	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00650 T PO4 PO4 MG/L	00680 T ORG C C MG/L	31616 FEC COLI MFM-FCBR /100ML
740513	1600	2	0.35	1.00	0.01	0.02	15.0	4600
740514	0845	2	0.04	0.34	0.01K	0.01	14.0	850
740515	0945	1	0.10	0.36	0.01K	0.01	14.0	280
740516	1305	1	0.10	0.36	0.01K	0.01	13.0	610
740517	0830	1	0.08	0.40	0.01	0.01	15.0	370
740807	0900							480
740808	0900		0.08	0.55	0.05K	0.06	16.0	470
740815	0820		0.04	0.55	0.05K	0.06	16.0	360
740829	1055		0.05K	0.40	0.15	0.03	21.0	560
740830	0950		0.05K	0.45	0.16	0.05	21.0	560

APPENDIX B
****

WATER QUALITY DATA - PREIMPOUNDMENT STUDY
CEDAR CREEK DRAINAGE BASIN
EVANS, TATNALL AND CANDLER COUNTIES, GEORGIA

STATION - E-03 CEDAR CR AT FAS ROUTE S1603 OGEECHEE R. BASIN EVANS COUNTY WATERSHED

DATE	TIME	00003 DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00310 BOD 5 DAY MG/L	00400 PH SU	00515 RESIDUE DISS-105 C MG/L	00530 RESIDUE TOT NFLT MG/L	00605 ORG N N MG/L
740513	1525	1			1.2		81	3	0.250
740514	0900	2	18.0	7.0	1.4	6.2	14	6	0.260
740515	1000	1	20.5	6.4	1.8	5.9	62	6	0.250
740516	1255	1	20.0	6.0	2.1	6.3	8	4	0.300
740517	0845	1	18.0	6.0	1.4	6.3	22	4	0.300
740807	0920		21.5		2.2	6.2	108	14	0.670
740808	0920		23.0		2.1	5.8			0.420
740814			26.0			5.0			
740815	0825				0.9		94	4	0.500
740829	1110		22.0	5.1	1.7	5.9	26	16	0.330
740830	1000		22.5	5.2	1.6	6.1	94	4	0.400

DATE	TIME	00003 DEPTH FEET	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00650 T PO4 PO4 MG/L	00680 T ORG C C MG/L	31616 FEC COLI MFM-FCBR /100ML
740513	1525	1	0.02	0.27	0.01K	0.02	14.0	5600
740514	0900	2	0.04	0.30	0.01K	0.05	15.0	380
740515	1000	1	0.08	0.33	0.01K	0.01	14.0	200
740516	1255	1	0.10	0.40	0.01K	0.01	13.0	170
740517	0845	1	0.10	0.40	0.01	0.05	14.0	1000
740807	0920		0.53	1.20	0.05	0.16	24.0	190
740808	0920		0.23	0.65	0.05	0.10	14.0	300
740815	0825		0.01K	0.50	0.05K	0.06	19.0	110
740829	1110		0.05K	0.33	0.05K	0.01K	21.0	170
740830	1000		0.05K	0.40	0.17	0.05	22.0	220

APPENDIX B
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WATER QUALITY DATA - PREIMPOUNDMENT STUDY
CEDAR CREEK DRAINAGE BASIN
EVANS, TATNALL AND CANDLER COUNTIES, GEORGIA

STATION - E-04 CEDAR CR AT FAS ROUTE S1127 OGEECHEE R. BASIN EVANS COUNTY WATERSHED

DATE	TIME	00003 DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00310 BOD 5 DAY MG/L	00400 PH SU	00515 RESIDUE DISS-105 C MG/L	00530 RESIDUE TOT NFLT MG/L	00605 ORG N N MG/L
740513	1650	2	21.0	6.5	4.2	6.2	81	5	0.750
740514	0945	1	17.8	7.3	2.0	6.2	27	5	0.340
740515	1045	1	20.0	6.8	1.8	6.3	36	6	0.300
740516	1230	1	20.0	6.1	1.7	6.3	24	2	0.300
740517	0850	1	19.0	6.5	1.4	6.2	14	4	0.400
740807	1010		23.0		2.0	6.0	114	4	0.600
740808	0945		23.0		3.5	5.9			0.440
740814			26.0			6.0			
740815	0830				1.2		98	6	0.400
740829	1145		22.5	4.6	2.8	6.1	26	8	0.390
740830	1030		22.0	4.8	1.8	6.1	98	8	0.850
741121	1120		12.0		3.2		74	12	0.760

DATE	TIME	00003 DEPTH FEET	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00650 T PO4 PO4 MG/L	00680 T ORG C C MG/L	31616 FEC COLI MFM-FCBR /100ML
740513	1650	2	0.15	1.00	0.01K	0.03	16.0	950
740514	0945	1	0.11	0.45	0.01K	0.02	14.0	800
740515	1045	1	0.06	0.36	0.01K	0.01	14.0	280
740516	1230	1	0.10	0.40	0.01K	0.01	13.0	260
740517	0850	1	0.10	0.56	0.01	0.01	14.0	130
740807	1010		0.45	1.05	0.10	0.17	16.0	500
740808	0945		0.35	0.79	0.05	0.18	14.0	380
740815	0830		0.15	0.55	0.25	0.07	17.0	145
740829	1145		0.09	0.48	0.52	0.11	17.0	860
740830	1030		0.05	0.90	0.19	0.10	20.0	330
741121	1120		0.07	0.83	0.02	0.05	12.0	2800

APPENDIX B

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WATER QUALITY DATA - PREIMPOUNDMENT STUDY
CEDAR CREEK DRAINAGE BASIN
EVANS, TATNALL AND CANDLER COUNTIES, GEORGIA

STATION - E-05 CYPRESS FLAT CR AT FAS ROUTE OGEECHEE R. BASIN EVANS COUNTY WATERSHED

DATE	TIME	00003 DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00310 BOD 5 DAY MG/L	00400 PH SU	00515 RESIDUE DISS-105 C MG/L	00530 RESIDUE TOT NFLT MG/L	00605 ORG N N MG/L
740513	1705	1	22.0	6.6	3.4	5.9	73	11	0.460
740514	1000	1	18.0	6.6	3.2	6.3	34	6	0.470
740515	1055	1	20.5	5.7	2.8	6.3	45	7	0.330
740516	1220	1	20.0	4.9	2.3	6.1	23	3	0.350
740517	0900	1	16.0	4.6	1.8	6.1	18	4	0.350
740814			25.0			5.6			
740815	0850				1.0		76	8	0.450
740829	1200		22.5	5.2	2.2	5.7	36	22	0.400
740830	1040		22.5	5.2	1.9	6.0	96	6	0.740
750125	1455				2.0		47	3	0.320

DATE	TIME	00003 DEPTH FEET	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00650 T PO4 PO4 MG/L	00680 T ORG C C MG/L	31616 FEC COLI MFM-FCBR /100ML	00060 STREAM FLOW CFS
740513	1705	1	0.06	0.52	0.01K	0.09	15.0	2100	1.5
740514	1000	1	0.05	0.52	0.01K	0.06	14.0	1100	0.6
740515	1055	1	0.10	0.47	0.01K	0.04	15.0	210	0.2
740516	1220	1	0.08	0.43	0.01K	0.05	13.0	210	0.1
740517	0900	1	0.10	0.45	0.01	0.03	14.0	290	0.0
740814									3.4
740815	0850		0.01K	0.45	4.00	0.10	14.0	370	
740829	1200		0.05K	0.40	0.05K	0.03	18.0	600	3.9
740830	1040		0.05K	0.74	0.05K	0.09	16.0	390	
750125	1455		0.01	0.33	0.01K	0.03	9.0	205	

APPENDIX B

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WATER QUALITY DATA - PREIMPOUNDMENT STUDY
CEDAR CREEK DRAINAGE BASIN
EVANS, TATNALL AND CANDLER COUNTIES, GEORGIA

STATION - E-06 CEDAR CR UNNMED TRIB.NR MANASSAS OGEECHEE R. BASIN EVANS COUNTY WATERSHED

DATE	TIME	00003 DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00310 BOD 5 DAY MG/L	00400 PH SU	00515 RESIDUE DISS-105 C MG/L	00530 RESIDUE TOT NFLT MG/L	00605 ORG N N MG/L
740513	1645	1	22.0	4.9	4.9	6.2	117	47	0.540
740514	0930	1	17.5	4.0	2.4	6.2	69	5	0.550
740515	1030	1	19.0	3.2	2.5	6.1	89	17	0.500
740807	0950		22.5		5.1	6.4	192	8	1.650
740808	0930		23.0		4.4	6.4			2.200
740815	0840				2.9		2202	10	1.410
740829	1135		22.0	3.8	3.7	6.1	16	14	0.350
740830	1020		22.0	3.1	2.4	6.2	115	6	0.730
741121	1105		12.0		4.8		14	20	2.250
750125	1340				1.7		52	3	0.300

DATE	TIME	00003 DEPTH FEET	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00650 T PO4 PO4 MG/L	00680 T ORG C C MG/L	31616 FEC COLI MFM-FCBR /100ML	00060 STREAM FLOW CFS
740513	1645	1	0.35	0.89	0.10	0.12	17.0	5400	0.0
740514	0930	1	0.11	0.66	0.09	0.12	12.0	1000	0.0
740515	1030	1	0.16	0.66	0.05	0.13	15.0	1000	0.0
740807	0950		3.40	5.05	0.10	1.50	16.0	100	0.6
740808	0930		2.20	2.40	0.10	0.77	12.0	300	2.6
740815	0840		0.05	1.46	0.10	0.90	22.0	220	
740829	1135		0.35	0.70	0.45	0.22	16.0	690	4.0
740830	1020		0.25	0.98	0.27	0.27	16.0	290	1.2
741121	1105		4.30	6.55	0.01K	1.35	16.0	350	0.2
750125	1340		0.03	0.33	0.17	0.07	11.0	260	0.2

APPENDIX B

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WATER QUALITY DATA - PREIMPOUNDMENT STUDY
CEDAR CREEK DRAINAGE BASIN
EVANS, TATNALL AND CANDLER COUNTIES, GEORGIA

STATION - E-07 CEDAR CR UNNMD TRIB NR MANASSAS OGEECHEE R. BASIN EVANS COUNTY WATERSHED

DATE	TIME	00003 DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00310 BOD 5 DAY MG/L	00400 PH SU	00515 RESIDUE DISS-105 C MG/L	00530 RESIDUE TOT NFLT MG/L	00605 ORG N N MG/L
740513	1630	1	29.8	8.1	10.6	6.5	108	48	0.890
740514	0915	1	20.0	6.3	5.6	6.3	51	37	0.350
740515	1020	1	21.0	4.6	8.4	6.2	100	62	0.580
740829	1125		22.5	3.8	3.4	5.9	24	20	0.350
740830	1010		22.5	3.4	2.9	5.9	92	6	0.450

DATE	TIME	00003 DEPTH FEET	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00650 T PO4 PO4 MG/L	00680 T ORG C C MG/L	31616 FEC COLI MFM-FCBR /100ML	00060 STREAM FLOW CFS
740513	1630	1	0.28	1.17	0.01	0.11	20.0	2500	0.0
740514	0915	1	0.17	0.52	0.05	0.17	16.0	5600	0.0
740515	1020	1	0.37	0.95	0.01K	0.07	16.0	1700	0.0
740829	1125		0.10	0.45	0.05K	0.04	19.0	2200	0.8
740830	1010		0.05K	0.45	0.05K	0.03	22.0	440	0.4

APPENDIX B
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WATER QUALITY DATA - PREIMPOUNDMENT STUDY
CEDAR CREEK DRAINAGE BASIN
EVANS, TATNALL AND CANDLER COUNTIES, GEORGIA

STATION - E-08 CYPRESS FLAT CR FAS 1683 COLLINS OGEECHEE R. BASIN EVANS COUNTY WATERSHED

DATE	TIME	00003 DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00310 BOD 5 DAY MG/L	00400 PH SU	00515 RESIDUE DISS-105 C MG/L	00530 RESIDUE TOT NFLT MG/L	00605 ORG N N MG/L
740513	1720	1	21.0	2.9	2.8	5.5	61	8	0.380
740514	1015	1	20.0	4.1	1.5	5.3	20	8	0.180
740515	1110	1	20.0	2.4	1.7	5.3	50	12	0.190
740516	1210	1	21.0	2.6	1.5	5.6	16	2	0.220
740517	0910	1	18.0	2.1	1.3	5.8	35	13	0.250
740815	0900				0.3		71	5	0.340
740829	1210		22.5		1.6	5.5	4	16	0.330
740830	1050		22.5	3.6	0.5	5.6	44	4	0.210
741121	1025		12.0		1.5		22	10	0.220
750114	1320				1.8		14	1	0.320

DATE	TIME	00003 DEPTH FEET	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00650 T PO4 PO4 MG/L	00680 T ORG C C MG/L	31616 FEC COLI MFM-FCBR /100ML	00060 STREAM FLOW CFS
740513	1720	1	0.11	0.49	0.01K	0.01	13.0	1900	1.5
740514	1015	1	0.06	0.24	0.01K	0.01	12.0	700	1.4
740515	1110	1	0.08	0.27	0.01K	0.01K	12.0	420	0.1
740516	1210	1	0.11	0.33	0.01K	0.01	14.0	150	0.1
740517	0910	1	0.11	0.36	0.01	0.01	12.0	150	0.1
740815	0900		0.01K	0.34	0.10	0.06	12.0	240	
740829	1210		0.05K	0.33	0.05K	0.01	19.0	150	0.7
740830	1050		0.19	0.40	0.05K	0.01	15.0	285	0.6
741121	1025		0.10	0.32	0.01K	0.06	5.0	550	
750114	1320		0.05	0.37	0.01	0.03	19.0	1700	

APPENDIX B
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WATER QUALITY DATA - PREIMPOUNDMENT STUDY
CEDAR CREEK DRAINAGE BASIN
EVANS, TATNALL AND CANDLER COUNTIES, GEORGIA

STATION - E-09 CEDAR CR AT FAS S1683 NR COLLINS OGEECHEE R. BASIN EVANS COUNTY WATERSHED

DATE	TIME	00003 DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00310 BOD 5 DAY MG/L	00400 PH SU	00515 RESIDUE DISS-105 C MG/L	00530 RESIDUE TOT NFLT MG/L	00605 ORG N N MG/L
740513	1600	1			1.4		81	5	0.350
740514	1030	1	18.5	7.2	1.9	6.3	42	4	0.300
740515	1120	1	21.0	6.5	1.9	6.3	50	2	0.320
740516	1200	1	20.0	6.7	1.3	6.3	91	3	0.300
740517	0920	1	17.0	6.1	1.4	6.2	44	2	0.320
740815	0905				0.9		107	3	0.480
750114	1335				1.9		71	1K	0.390
750125	1515				1.0		64	1	0.310

DATE	TIME	00003 DEPTH FEET	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00650 T PO4 PO4 MG/L	00680 T ORG C C MG/L	31616 FEC COLI MFM-FCBR /100ML	00060 STREAM FLOW CFS
740513	1600	1	0.05	0.40	0.01K	0.02	14.0	1700	
740514	1030	1	0.10	0.40	0.01K	0.02	13.0	700	
740515	1120	1	0.08	0.40	0.01K	0.02	15.0	230	4.8
740516	1200	1	0.10	0.40	0.01K	0.01	13.0	250	0.8
740517	0920	1	0.08	0.40	0.01	0.01	16.0	730	0.3
740815	0905		0.01K	0.48	0.10	0.06	16.0	170	
750114	1335		0.06	0.45	0.01	0.03	21.0	9000	
750125	1515		0.06	0.37	0.03	0.83	14.0	170	

APPENDIX B
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WATER QUALITY DATA - PREIMPOUNDMENT STUDY
CEDAR CREEK DRAINAGE BASIN
EVANS, TATNALL AND CANDLER COUNTIES, GEORGIA

STATION - E-10 CEDAR CR AT CO RD SE OF COBBTOWN OGEECHEE R. BASIN EVANS COUNTY WATERSHED

DATE	TIME	00003 DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00310 BOD 5 DAY MG/L	00400 PH SU	00515 RESIDUE DISS-105 C MG/L	00530 RESIDUE TOT NFLT MG/L	00605 ORG N N MG/L
740513	1735	1	21.0	6.2					
740514	1045	1	18.0	6.7	1.2	6.2	64	2	0.410
740515	1130	1	20.5	5.8	2.0	6.4	38	16	0.370
740516	1145	1	21.5	6.0	2.2	6.2	3120	3	0.320
740517	0930	1	18.0	4.4	2.4	6.2	128	8	0.410
740815	0915				0.9		85	3	0.440
750125	1540				0.9		68	1	0.240

DATE	TIME	00003 DEPTH FEET	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00650 T PO4 PO4 MG/L	00680 T ORG C C MG/L	31616 FEC COLI MFM-FCBR /100ML
740513	1735	1						850
740514	1045	1	0.08	0.49	0.01K	0.02	13.0	140
740515	1130	1	0.06	0.43	0.05	0.01K	15.0	250
740516	1145	1	0.14	0.46	0.04	0.01	15.0	150
740517	0930	1	0.05	0.46	0.06	0.03	14.0	170
740815	0915		0.01	0.45	0.10	0.06	16.0	200
750125	1540		0.06	0.30	0.01	0.01	12.0	280

APPENDIX B
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WATER QUALITY DATA - PREIMPOUNDMENT STUDY
CEDAR CREEK DRAINAGE BASIN
EVANS, TATNALL AND CANDLER COUNTIES, GEORGIA

STATION - E-11 CEDAR CR UNNAMED CR SE COBBTOWN OGEECHEE R. BASIN EVANS COUNTY WATERSHED

DATE	TIME	00003 DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00310 BOD 5 DAY MG/L	00400 PH SU	00515 RESIDUE DISS-105 C MG/L	00530 RESIDUE TOT NFLT MG/L	00605 ORG N N MG/L
740513	1745	1	22.0	5.2					
740514	1100	1	18.0	5.8	2.1	6.3	62	6	0.280
740515	1140	1	20.0	5.2	1.5	6.1	52	2	0.340
740516	1130	1	20.0	4.7	1.3	6.2	2074	18	0.270
740517	0935	1	19.0	4.1	1.7	6.3	43	3	0.360
740815	0920				0.5		87	3	0.470
750125	1550				0.5		58	1	0.230

DATE	TIME	00003 DEPTH FEET	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00650 T PO4 PO4 MG/L	00680 T ORG C C MG/L	31616 FEC COLI MFM-FCBR /100ML
740513	1745	1						250
740514	1100	1	0.05	0.33	0.02	0.02	12.0	170
740515	1140	1	0.06	0.40	0.02	0.01	16.0	150
740516	1130	1	0.09	0.36	0.02	0.01	14.0	860
740517	0935	1	0.10	0.46	0.02	0.01	15.0	220
740815	0920		0.01	0.48	0.05K	0.06	19.0	540
750125	1550		0.04	0.27	0.01	0.01	13.0	250

APPENDIX B

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WATER QUALITY DATA - PREIMPOUNDMENT STUDY
CEDAR CREEK DRAINAGE BASIN
EVANS, TATNALL AND CANDLER COUNTIES, GEORGIA

STATION - E-12 CEDAR CR UNNAMED CR NR COBBTOWN OGEECHEE R. BASIN EVANS COUNTY WATERSHED

DATE	TIME	00003 DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00310 BOD 5 DAY MG/L	00400 PH SU	00515 RESIDUE DISS-105 C MG/L	00530 RESIDUE TOT NFLT MG/L	00605 ORG N N MG/L
740513	1800	1	23.0	6.3					
740514	1115	1	20.0	7.2	3.2	6.4	89	19	0.220
740515	1150	1	20.0	6.4	3.1	6.5	67	23	0.390
740516	1105	1	21.0	6.6	2.1	6.5	69	19	0.430
740517	0945	1	18.0	6.3	1.4	6.5	59	5	0.520
740815	0935				0.9		280	14	0.380
750114	1400				0.9		69	1	0.220

DATE	TIME	00003 DEPTH FEET	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00650 T PO4 PO4 MG/L	00680 T ORG C C MG/L	31616 FEC COLI MFM-FCBR /100ML	00060 STREAM FLOW CFS
740513	1800	1						650	1.4
740514	1115	1	0.08	0.40	0.01	0.04	16.0	830	1.1
740515	1150	1	0.11	0.50	0.05	0.05	16.0	440	0.7
740516	1105	1	0.08	0.51	0.06	0.09	15.0	390	0.5
740517	0945	1	0.16	0.68	0.05	0.04	15.0	410	0.5
740815	0935		0.01K	0.38	0.05K	0.12	18.0	950	
750114	1400		0.13	0.35	0.02	0.02	19.0	220	7.4

A GROSS ASSESSMENT OF CEDAR CREEK, GA, WATERSHED RURAL RUNOFF ANNUALLY, WET SEASON AND UNDER SELECTED STORM CONDITIONS

This watershed has been subdivided into twelve areas (See Map - Page B) to allow reasonably detailed information to be used on a geographic basis. This representation seemed best for this particular watershed; however, some watersheds can be divided into combined areas based on land use or equal slope percentages. The locally developed process EPARRB, "Erosion, Sedimentation and Rural Runoff," is flexible enough to handle any of these area representations. The descriptive information for each area is stated on Page C. The summarization of total area results for five periods or conditions can be found on Page D with detailed reports numbered 1 through 5 cross-referenced in the summary.

The principal soils in the area are: Tifton (K = .24), Fuquay (K = .20) Cowarts (K = .32), Lakeland (K = .17), Waher (K = .28), Leefield (K = .20), Kershaw (K = .15), and Troup (K = .17). Slope percentages ranged from 0-3% in the swamp areas to 0-12% in the highlands, and slope lengths ranging from 100 to 400 feet were used.

Sediment Delivery Ratios of .05, .10, and .20 were used in various parts of the watershed, and the local area estimate of 2,900 pounds per year per acre of Forest/Pasture Litter-fall* was considered appropriate. The ultimate delivery to waterbodies of nutrients from this litter was estimated at 1%. Standard Cropping Factors (C) were used, and no Control Practices (P) were assumed.

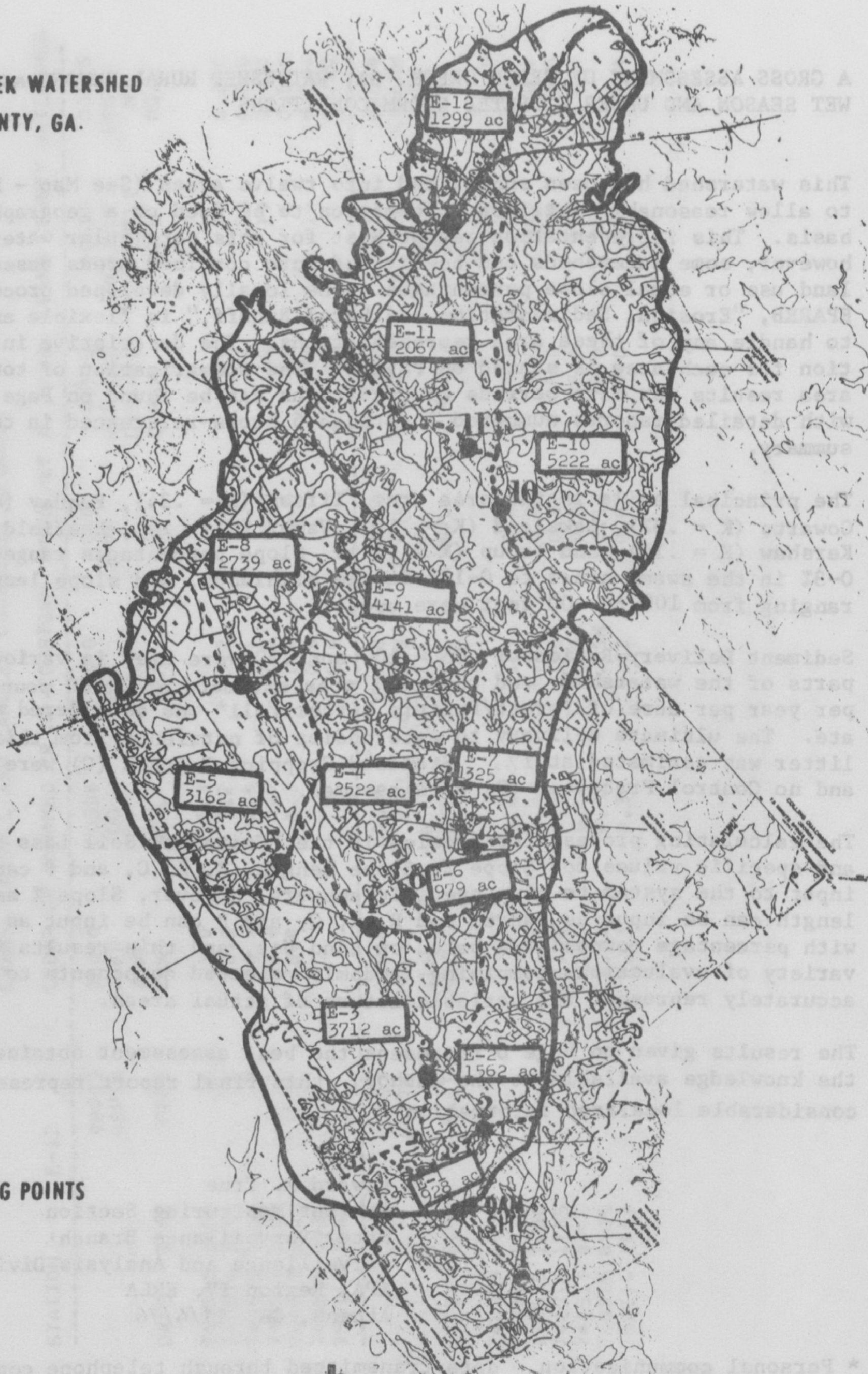
The calculating process for erosion is the "Universal Soil Loss Equation" and specific values for Slope %, Slope Length, R, K, C, and P can be input to the system to give specific answers; however, Slope % and Slope length can be input as ranges and R, K, C, and P can be input as values with percentage composition based on Land Use, and this results in a variety of evaluations combining randomly selected components to more accurately represent the variable nature of actual areas.

The results given on Page D represent the best assessment obtainable with the knowledge available to the author; this final report represents use of considerable localized information.

Howard A. True
Ambient Monitoring Section
Water Surveillance Branch
Surveillance and Analysis Division
EPA, Region IV, ERLA
Athens, GA 11/4/76

* Personal communication - data transmitted through telephone conversation, October 14, 1976, with Dr. W. Nutter, School of Forestry, University of Georgia, Athens, Georgia.

CEDAR CREEK WATERSHED
EVANS COUNTY, GA.



● **SAMPLING POINTS**

CEDAR CREEK (GA) IMPOUNDMENT WATERSHED ANALYSIS
DATA USED FOR FINAL GROSS ASSESSMENT USING "EPARRB" PLANNING MODEL

Items	E-1	E-2	E-3	E-4	E-5	E-6	E-7	E-8	E-9	E-10	E-11	E-12	Totals
	Areas												
Area acres	928	1562	3712	2522	3162	979	1325	2739	4141	5222	2067	1299	29,658
Area sq. miles	1.45	2.44	5.80	3.94	4.94	1.53	2.07	4.28	6.47	8.16	3.23	2.03	46.34
Blowup acres 1/	4	10	10	10	10	6	5	7	10	10	7	3	
Land use %:													
(1) Cropland	7	40	20	20	25	35	60	25	30	60	40	55	
(2) Pasture	7	12	5	6	10	4	4	10	5	2	7	10	
(3) Forest	85	40	60	65	55	50	25	60	60	30	40	25	
(5) Other	1	8	15	9	10	11	11	5	5	8	13	10	
Slope % range	0-10	0-10	0-10	0-6	0-12	0-3	0-3	0-10	0-12	0-4	0-12	0-3	
Slope lgth. range	150-300	150-300	150-300	250-400	100-300	350-400	350-400	150-300	100-300	300-400	100-300	350-400	
K, C, P values & %													
K	.28-10	.28-10	.28-10	.28-40	.28-20	.28-20	.28-10	.28-20	.28-20	.28-20	.28-20	.28-20	
	.24-45	.24-35	.24-30	.24-30	.24-65	.20-80	.20-90	.24-30	.24-80	.24-15	.24-65	.20-80	
	.20-45	.20-35	.20-30	.20-30	.20-15			.20-50		.20-65	.20-15		
		.15-20	.15-30										
C	.26- 7	.26-40	.26-20	.26-20	.26-25	.26-35	.26-60	.26-25	.26-30	.26-60	.26-40	.26-55	
	.012-93	.012-60	.012-80	.012-80	.012-75	.012-65	.012-40	.012-75	.012-70	.012-40	.012-60	.012-45	
P	1.0-100	1.0-100	1.0-100	1.0-100	1.0-100	1.0-100	1.0-100	1.0-100	1.0-100	1.0-100	1.0-100	1.0-100	
Sed. Del. % range	10-30	10-30	10-30	5-15	10-30	0-10	0-10	10-30	10-30	0-10	10-30	0-10	
Nutrient % of Sed:													
N	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	
P	.08	.08	.08	.08	.08	.08	.08	.08	.08	.08	.08	.08	
K	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	
Animal/Fowl Cnts.:2/													
Total Cows		20	20	125	40		110	40	6				361
Dairy Cows		20	20	100	40		60		6				246
Swine				200		216	100	250	215				981
Poultry						45000		22000					67000
Forest/Pasture Litter:2/													
Lbs/ac/yr.	2900	2900	2900	2900	2900	2900	2900	2900	2900	2900	2900	2900	
Delivery %	1	1	1	1	1	1	1	1	1	1	1	1	
Composition %:													
N	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	.9	
P	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	.12	
K	.18	.18	.18	.18	.18	.18	.18	.18	.18	.18	.18	.18	
BOD	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	
TOC	50.2	50.2	50.2	50.2	50.2	50.2	50.2	50.2	50.2	50.2	50.2	50.2	

1/ Each evaluation of the "Universal Soil Loss Equation", using randomly selected values from 100 value tables for land use, slope %, slope length, K, C and P, is multiplied by the blowup acres for accumulation of report quantities. (Note E-12 1299 acres with blowup factor of 3 acres = 433 evaluations).

2/ Animal/Fowl counts and Forest/Pasture litter was not used in single storm event calculations since primary objective was to obtain erosion and sediment.

C

CEDAR CREEK (GA) WATERSHED RURAL RUNOFF GROSS QUANTITIES

Period/Type	EI	Erosion Tons	Sediment Tons	Forest/Pasture Litter Tons	N Lbs.	P Lbs.	K Lbs.	BOD Lbs.	TOC Lbs.	Report Number
Annual Totals	275	99,039	16,958	267	40,085	28,410	424,897	64,426	280,546	1(a)
Daily Average (365 Days)		271.4	46.5	.7	110	78	1,164	177	769	1(b)
Wet Period Totals (June - August)	124	44,568	7,631	120	17,766	12,657	191,208	26,790	123,763	2(a)
Period Daily Avg		484.5	83.0	1.3	193	138	2,078	291	1,345	2(b)
May Daily Avg	30/Mo.	363.1	62.2	1.0	146	104	1,558	226	1,018	2(c)
August Daily Avg	36/Mo.	415.4	71.1	1.1	166	118	1,782	254	1,158	2(d)
Single Storm (1" per hour) Sed. Del. = 0-10% 5-10% 0-30%	19	6,843	1,172	—	—	—	—	—	—	3
Single Storm (2" per hour) Sed. Del. = 0-10% 5-15% 0-30%	88	31,693	5,427	—	—	—	—	—	—	3
Single Storm (2" per hour) Sed. Del. = 20-28% (based on drainage area)	88	31,693	7,057	—	—	—	—	—	—	5

Note: Only erosion and sediment delivery is meaningful for single storm events.
Data information for all reports has been stated on the data sheet; however, report #5 is a special report with sediment delivery percentages calculated from drainage area sizes (See Pg. 22 "Controls of Water Pollution from Cropland"), see S.D. percentages on top of report 5.
A 1" per hour storm event would be expected to occur 2 times in July each year and 1 time in June and August every 5 years.
A 2" per hour storm event would be expected to occur 1 time in each month of June, July and August every 5 years.
(period of analysis 1970-1974 at Bellville, GA)

LAND UNITS 1-12 ARE DRAINAGE AREAS FOR SAMPLING POINTS E1-E12.
**** PERIOD MONTHS 1 - 12

UNIT/TYPE (PLOT AC.)	ACRES	S.L. TONS	TO WATER BODIES							
			SED. TONS	LITTER TONS	NIT.LBS	PHOS.LBS	<K> LBS	BOD LBS	TOC LBS	ACID LBS
1 LAND (4.0)	928.00	1424.43	308.58	11.94	832.	522.	7757.	2388.	11590.	0.
PER ACRE LOADS FOR PERIOD		1.53	0.33	0.01	0.90	0.56	8.36	2.57	12.92	0.0
2 LAND (10.0)	1562.00	7676.85	1460.13	12.44	3144.	2366.	36548.	2488.	12490.	0.
LIVESTOCK/FOWL					47.	37.	0.	264.	319.	
UNIT TOTALS	1562.00	7676.85	1460.13	12.44	3191.	2404.	36548.	2752.	12810.	0.
PER ACRE LOADS FOR PERIOD		4.91	0.93	0.01	2.04	1.54	23.40	1.76	8.20	0.0
3 LAND (10.0)	3712.00	10137.71	2097.53	37.65	4873.	3446.	52573.	7531.	37806.	0.
LIVESTOCK/FOWL					51.	41.	0.	287.	347.	
UNIT TOTALS	3712.00	10137.71	2097.53	37.65	4924.	3487.	52573.	7818.	38153.	0.
PER ACRE LOADS FOR PERIOD		2.73	0.57	0.01	1.33	0.94	14.16	2.11	10.28	0.0
4 LAND (10.0)	2522.00	2664.00	282.14	26.95	1049.	516.	7150.	5390.	27056.	0.
LIVESTOCK/FOWL					209.	146.	0.	1953.	2191.	
UNIT TOTALS	2522.00	2664.00	282.14	26.95	1258.	662.	7150.	7343.	29247.	0.
PER ACRE LOADS FOR PERIOD		1.06	0.11	0.01	0.50	0.26	2.84	2.91	11.60	0.0
5 LAND (10.0)	3162.00	16675.26	3404.25	30.35	7354.	5520.	85212.	6071.	30477.	0.
LIVESTOCK/FOWL					101.	80.	0.	566.	685.	
UNIT TOTALS	3162.00	16675.26	3404.25	30.35	7456.	5600.	85212.	6637.	31162.	0.
PER ACRE LOADS FOR PERIOD		5.27	1.08	0.01	2.36	1.77	26.95	2.10	9.86	0.0
6 LAND (6.0)	979.00	910.57	47.24	8.86	254.	97.	1213.	1773.	8898.	0.
LIVESTOCK/FOWL					207.	46.	0.	1056.	1234.	
UNIT TOTALS	979.00	910.57	47.24	8.86	461.	143.	1213.	2828.	10132.	0.
PER ACRE LOADS FOR PERIOD		0.93	0.05	0.01	0.47	0.15	1.24	2.89	10.35	0.0
7 LAND (5.0)	1325.00	2344.38	113.33	8.41	378.	202.	2864.	1681.	8439.	0.
LIVESTOCK/FOWL					59.	40.	0.	499.	607.	
UNIT TOTALS	1325.00	2344.38	113.33	8.41	437.	242.	2864.	2180.	9046.	0.
PER ACRE LOADS FOR PERIOD		1.77	0.09	0.01	0.33	0.18	2.16	1.65	6.83	0.0
8 LAND (7.0)	2739.00	9000.69	1882.16	27.78	4264.	3078.	47154.	5556.	27891.	0.
LIVESTOCK/FOWL					532.	155.	0.	3868.	4456.	
UNIT TOTALS	2739.00	9000.69	1882.16	27.78	4796.	3233.	47154.	9424.	32347.	0.
PER ACRE LOADS FOR PERIOD		3.29	0.69	0.01	1.75	1.18	17.22	3.44	11.81	0.0
9 LAND (10.0)	4141.00	20760.34	4187.53	42.02	9131.	6800.	104828.	8404.	42188.	0.
LIVESTOCK/FOWL					157.	91.	0.	2521.	2570.	
UNIT TOTALS	4141.00	20760.34	4187.53	42.02	9288.	6892.	104828.	10924.	44758.	0.
PER ACRE LOADS FOR PERIOD		5.01	1.01	0.01	2.24	1.66	25.31	2.64	10.81	0.0
10 LAND (10.0)	5222.00	12948.42	655.57	35.95	1958.	1135.	16518.	7190.	36096.	0.
PER ACRE LOADS FOR PERIOD		2.48	0.13	0.01	0.38	0.22	3.16	1.38	6.91	0.0
11 LAND (7.0)	2067.00	11957.40	2398.63	16.47	5094.	3878.	60030.	3294.	16534.	0.
PER ACRE LOADS FOR PERIOD		5.78	1.16	0.01	2.46	1.88	29.04	1.59	8.00	0.0
12 LAND (3.0)	1299.00	2539.49	120.63	8.24	390.	213.	3050.	1648.	8273.	0.
PER ACRE LOADS FOR PERIOD		1.95	0.09	0.01	0.30	0.16	2.35	1.27	6.37	0.0
STATE GROUP LAND	29658.00	99039.37	16958.11	267.06	38722.	27773.	424897.	53413.	268137.	0.
LIVESTOCK/FOWL					1364.	637.	0.	11013.	12409.	
GEORGIA	29658.00	99039.37	16958.11	267.06	40085.	28410.	424897.	64426.	280546.	0.
AREA LAND	29658.00	99039.37	16958.11	267.06	38722.	27773.	424897.	53413.	268137.	0.
LIVESTOCK/FOWL					1364.	637.	0.	11013.	12409.	
GRAND TOTALS	29658.00	99039.37	16958.11	267.06	40085.	28410.	424897.	64426.	280546.	0.

LAND UNITS 1-12 ARE DRAINAGE AREAS FOR SAMPLING POINTS E1-E12.
**** PERIOD MONTHS 1 - 12

UNIT/TYPE	(PLOT AC.)	ACRES	S.L. TONS	SED. TONS	LITTER TONS	NIT.LBS	PHOS.LBS	<K> LBS	BOD LBS	TOC LBS	ACID LBS
				DAILY LOADINGS TO WATER BODIES							
1 LAND	(4.0)	928.00	3.90	0.85	0.03	2.	1.	21.	7.	33.	0.
2 LAND	(10.0)	1562.00	21.03	4.00	0.03	9.	6.	100.	7.	34.	0.
LIVESTOCK/FOWL						0.	0.	0.	1.	1.	
UNIT TOTALS		1562.00	21.03	4.00	0.03	9.	7.	100.	8.	35.	0.
3 LAND	(10.0)	3712.00	27.78	5.75	0.10	13.	9.	144.	21.	104.	0.
LIVESTOCK/FOWL						0.	0.	0.	1.	1.	
UNIT TOTALS		3712.00	27.78	5.75	0.10	13.	10.	144.	21.	105.	0.
4 LAND	(10.0)	2522.00	7.30	0.77	0.07	3.	1.	20.	15.	74.	0.
LIVESTOCK/FOWL						1.	0.	0.	5.	6.	
UNIT TOTALS		2522.00	7.30	0.77	0.07	3.	2.	20.	20.	80.	0.
5 LAND	(10.0)	3162.00	45.69	9.33	0.08	20.	15.	233.	17.	84.	0.
LIVESTOCK/FOWL						0.	0.	0.	2.	2.	
UNIT TOTALS		3162.00	45.69	9.33	0.08	20.	15.	233.	18.	85.	0.
6 LAND	(6.0)	979.00	2.49	0.13	0.02	1.	0.	3.	5.	24.	0.
LIVESTOCK/FOWL						1.	0.	0.	3.	3.	
UNIT TOTALS		979.00	2.49	0.13	0.02	1.	0.	3.	8.	28.	0.
7 LAND	(5.0)	1325.00	6.42	0.31	0.02	1.	1.	8.	5.	23.	0.
LIVESTOCK/FOWL						0.	0.	0.	1.	2.	
UNIT TOTALS		1325.00	6.42	0.31	0.02	1.	1.	8.	6.	25.	0.
8 LAND	(7.0)	2739.00	24.66	5.16	0.08	12.	8.	129.	15.	76.	0.
LIVESTOCK/FOWL						1.	0.	0.	11.	12.	
UNIT TOTALS		2739.00	24.66	5.16	0.08	13.	9.	129.	26.	89.	0.
9 LAND	(10.0)	4141.00	56.88	11.47	0.12	25.	19.	287.	23.	116.	0.
LIVESTOCK/FOWL						0.	0.	0.	7.	7.	
UNIT TOTALS		4141.00	56.88	11.47	0.12	25.	19.	287.	30.	123.	0.
10 LAND	(10.0)	5222.00	35.48	1.80	0.10	5.	3.	45.	20.	99.	0.
11 LAND	(7.0)	2067.00	32.76	6.57	0.05	14.	11.	164.	9.	45.	0.
12 LAND	(3.0)	1299.00	6.96	0.33	0.02	1.	1.	8.	5.	23.	0.
STATE GROUP LAND		29658.00	271.37	46.47	0.73	106.	76.	1164.	146.	735.	0.
LIVESTOCK/FOWL						4.	2.	0.	30.	34.	
GEORGIA		29658.00	271.37	46.47	0.73	110.	78.	1164.	177.	769.	0.
AREA LAND		29658.00	271.37	46.47	0.73	106.	76.	1164.	146.	735.	0.
LIVESTOCK/FOWL						4.	2.	0.	30.	34.	
GRAND TOTALS		29658.00	271.37	46.47	0.73	110.	78.	1164.	177.	769.	0.

EROSION & SD FOR SUMMER (WET) MONTHS JUN JUL & AUG.
LAND UNITS 1-12 ARE DRAINAGE AREAS FOR SAMPLING POINTS E1-E12.
**** PERIOD MONTHS 6 - 8

UNIT/TYPE (PLOT AC.)	ACRES	S.L. TONS	SED. TONS	LITTER TONS	NIT.LBS	PHOS.LBS	<K> LBS	BOD LBS	TOC LBS	ACID LBS
			TO WATER BODIES							
1 LAND (4.0)	928.00	640.98	138.66	5.37	374.	235.	3491.	1075.	5395.	0.
PER ACRE LOADS FOR PERIOD		0.69	0.15	0.01	0.40	0.25	3.76	1.16	5.81	0.0
2 LAND (10.0)	1562.00	3454.61	657.05	5.60	1415.	1065.	16446.	1120.	5621.	0.
LIVESTOCK/FOWL					12.	9.	0.	66.	80.	
UNIT TOTALS	1562.00	3454.61	657.05	5.60	1427.	1074.	16446.	1186.	5700.	0.
PER ACRE LOADS FOR PERIOD		2.21	0.42	0.00	0.91	0.69	10.53	0.76	3.65	0.0
3 LAND (10.0)	3712.00	4562.04	943.87	16.95	2193.	1551.	23658.	3389.	17013.	0.
LIVESTOCK/FOWL					13.	10.	0.	72.	87.	
UNIT TOTALS	3712.00	4562.04	943.87	16.95	2206.	1561.	23658.	3461.	17099.	0.
PER ACRE LOADS FOR PERIOD		1.23	0.25	0.00	0.59	0.42	6.37	0.93	4.61	0.0
4 LAND (10.0)	2522.00	1198.79	126.96	12.13	472.	232.	3218.	2425.	12175.	0.
LIVESTOCK/FOWL					52.	36.	0.	488.	548.	
UNIT TOTALS	2522.00	1198.79	126.96	12.13	524.	269.	3218.	2914.	12723.	0.
PER ACRE LOADS FOR PERIOD		0.48	0.05	0.00	0.21	0.11	1.28	1.16	5.04	0.0
5 LAND (10.0)	3162.00	7503.78	1531.90	13.66	3310.	2484.	38346.	2732.	13714.	0.
LIVESTOCK/FOWL					25.	20.	0.	142.	171.	
UNIT TOTALS	3162.00	7503.78	1531.90	13.66	3335.	2504.	38346.	2874.	13885.	0.
PER ACRE LOADS FOR PERIOD		2.37	0.48	0.00	1.05	0.79	12.13	0.91	4.39	0.0
6 LAND (6.0)	979.00	409.76	21.26	3.99	114.	44.	546.	798.	4004.	0.
LIVESTOCK/FOWL					52.	11.	0.	264.	309.	
UNIT TOTALS	979.00	409.76	21.26	3.99	166.	55.	546.	1062.	4313.	0.
PER ACRE LOADS FOR PERIOD		0.42	0.02	0.00	0.17	0.06	0.56	1.08	4.41	0.0
7 LAND (5.0)	1325.00	1054.96	51.00	3.78	170.	91.	1289.	756.	3798.	0.
LIVESTOCK/FOWL					15.	10.	0.	125.	152.	
UNIT TOTALS	1325.00	1054.96	51.00	3.78	185.	101.	1289.	881.	3949.	0.
PER ACRE LOADS FOR PERIOD		0.80	0.04	0.00	0.14	0.08	0.97	0.67	2.98	0.0
8 LAND (7.0)	2739.00	4050.45	846.96	12.50	1919.	1385.	21219.	2500.	12551.	0.
LIVESTOCK/FOWL					133.	39.	0.	967.	1114.	
UNIT TOTALS	2739.00	4050.45	846.96	12.50	2052.	1424.	21219.	3467.	13664.	0.
PER ACRE LOADS FOR PERIOD		1.48	0.31	0.00	0.75	0.52	7.75	1.27	4.99	0.0
9 LAND (10.0)	4141.00	9342.02	1884.39	18.91	4109.	3060.	47178.	3782.	18984.	0.
LIVESTOCK/FOWL					39.	23.	0.	630.	642.	
UNIT TOTALS	4141.00	9342.02	1884.39	18.91	4148.	3083.	47178.	4412.	19627.	0.
PER ACRE LOADS FOR PERIOD		2.26	0.46	0.00	1.00	0.74	11.39	1.07	4.74	0.0
10 LAND (10.0)	5222.00	5826.76	295.01	16.18	881.	511.	7433.	3236.	16243.	0.
PER ACRE LOADS FOR PERIOD		1.12	0.06	0.00	0.17	0.10	1.42	0.62	3.11	0.0
11 LAND (7.0)	2067.00	5380.87	1079.46	7.41	2292.	1745.	27013.	1482.	7440.	0.
PER ACRE LOADS FOR PERIOD		2.60	0.52	0.00	1.11	0.84	13.07	0.72	3.60	0.0
12 LAND (3.0)	1299.00	1142.75	54.37	3.71	175.	96.	1373.	742.	3723.	0.
PER ACRE LOADS FOR PERIOD		0.88	0.04	0.00	0.14	0.07	1.06	0.57	2.87	0.0
STATE GROUP LAND	29658.00	44567.76	7631.10	120.18	17425.	12498.	191208.	24036.	120660.	0.
LIVESTOCK/FOWL					341.	159.	0.	2753.	3102.	
GEORGIA	29658.00	44567.76	7631.10	120.18	17766.	12657.	191208.	26790.	123763.	0.
AREA LAND	29658.00	44567.76	7631.10	120.18	17425.	12498.	191208.	24036.	120660.	0.
LIVESTOCK/FOWL					341.	159.	0.	2753.	3102.	
GRAND TOTALS.	29658.00	44567.76	7631.10	120.18	17766.	12657.	191208.	26790.	123763.	0.

CEDAR CREEK IMPOUNDMENT
CANDLER, TATTNAL & EVANS COUNTIES, GA.

EROSION & SD FOR SUMMER (WET) MONTHS JUN JUL & AUG.
LAND UNITS 1-12 ARE DRAINAGE AREAS FOR SAMPLING POINTS E1-E12.
**** PERIOD MONTHS 6 - 8

UNIT/TYPE (PLOT AC.)	ACRES	S.L. TONS	SED. TONS	LITTER TONS	NIT.LBS	PHOS.LBS	<K> LBS	BOD LBS	TOC LBS	ACID LBS
			DAILY LOADINGS TO WATER BODIES							
1 LAND (4.0)	928.00	6.97	1.51	0.06	4.	3.	38.	12.	59.	0.
2 LAND (10.0)	1562.00	37.55	7.14	0.06	15.	12.	179.	12.	61.	0.
LIVESTOCK/FOWL					0.	0.	0.	1.	1.	
UNIT TOTALS	1562.00	37.55	7.14	0.06	16.	12.	179.	13.	62.	0.
3 LAND (10.0)	3712.00	49.59	10.26	0.18	24.	17.	257.	37.	185.	0.
LIVESTOCK/FOWL					0.	0.	0.	1.	1.	
UNIT TOTALS	3712.00	49.59	10.26	0.18	24.	17.	257.	38.	186.	0.
4 LAND (10.0)	2522.00	13.03	1.38	0.13	5.	3.	35.	26.	132.	0.
LIVESTOCK/FOWL					1.	0.	0.	5.	6.	
UNIT TOTALS	2522.00	13.03	1.38	0.13	6.	3.	35.	32.	138.	0.
5 LAND (10.0)	3162.00	81.57	16.65	0.15	36.	27.	417.	30.	149.	0.
LIVESTOCK/FOWL					0.	0.	0.	2.	2.	
UNIT TOTALS	3162.00	81.57	16.65	0.15	36.	27.	417.	31.	151.	0.
6 LAND (6.0)	979.00	4.45	0.23	0.04	1.	0.	6.	9.	44.	0.
LIVESTOCK/FOWL					1.	0.	0.	3.	3.	
UNIT TOTALS	979.00	4.45	0.23	0.04	2.	1.	6.	12.	47.	0.
7 LAND (5.0)	1325.00	11.47	0.55	0.04	2.	1.	14.	8.	41.	0.
LIVESTOCK/FOWL					0.	0.	0.	1.	2.	
UNIT TOTALS	1325.00	11.47	0.55	0.04	2.	1.	14.	10.	43.	0.
8 LAND (7.0)	2739.00	44.03	9.21	0.14	21.	15.	231.	27.	136.	0.
LIVESTOCK/FOWL					1.	0.	0.	11.	12.	
UNIT TOTALS	2739.00	44.03	9.21	0.14	22.	15.	231.	38.	149.	0.
9 LAND (10.0)	4141.00	101.55	20.48	0.21	45.	33.	513.	41.	206.	0.
LIVESTOCK/FOWL					0.	0.	0.	7.	7.	
UNIT TOTALS	4141.00	101.55	20.48	0.21	45.	34.	513.	48.	213.	0.
10 LAND (10.0)	5222.00	63.34	3.21	0.18	10.	6.	81.	35.	177.	0.
11 LAND (7.0)	2067.00	58.49	11.73	0.08	25.	19.	294.	16.	81.	0.
12 LAND (3.0)	1299.00	12.42	0.59	0.04	2.	1.	15.	8.	40.	0.
STATE GROUP LAND	29658.00	484.45	82.95	1.31	169.	136.	2078.	261.	1312.	0.
LIVESTOCK/FOWL					4.	2.	0.	30.	34.	
GEORGIA	29658.00	484.45	82.95	1.31	193.	138.	2078.	291.	1345.	0.
AREA LAND	29658.00	484.45	82.95	1.31	189.	136.	2078.	261.	1312.	0.
LIVESTOCK/FOWL					4.	2.	0.	30.	34.	
GRAND TOTALS	29658.00	484.45	82.95	1.31	193.	138.	2078.	291.	1345.	0.

CEDAR CREEK IMPOUNDMENT
CANDLER, TATTNAL & EVANS COUNTIES, GA.

LAND UNITS 1-12 ARE DRAINAGE AREAS FOR SAMPLING POINTS E1-E12.
**** PERIOD MONTHS 5 - 5

UNIT/TYPE	(PLOT AC.)	ACRES	S.L. TONS	DAILY LOADINGS TO WATER BODIES: SED. TONS	LITTER TONS	NIT.LBS	PHOS.LBS	<K> LBS	BOD LBS	TOC LBS	ACID LBS
1 LAND	(4.0)	928.00	5.22	1.13	0.04	3.	2.	28.	9.	44.	0.
2 LAND	(10.0)	1562.00	28.15	5.35	0.05	12.	9.	134.	9.	46.	0.
LIVESTOCK/FOWL						0.	0.	0.	1.	1.	
UNIT TOTALS		1562.00	28.15	5.35	0.05	12.	9.	134.	10.	47.	0.
3 LAND	(10.0)	3712.00	37.17	7.69	0.14	18.	13.	193.	28.	139.	0.
LIVESTOCK/FOWL						0.	0.	0.	1.	1.	
UNIT TOTALS		3712.00	37.17	7.69	0.14	18.	13.	193.	28.	140.	0.
4 LAND	(10.0)	2522.00	9.77	1.03	0.10	4.	2.	26.	20.	99.	0.
LIVESTOCK/FOWL						1.	0.	0.	5.	6.	
UNIT TOTALS		2522.00	9.77	1.03	0.10	4.	2.	26.	25.	105.	0.
5 LAND	(10.0)	3162.00	61.14	12.48	0.11	27.	20.	312.	22.	112.	0.
LIVESTOCK/FOWL						0.	0.	0.	2.	2.	
UNIT TOTALS		3162.00	61.14	12.48	0.11	27.	20.	312.	24.	114.	0.
6 LAND	(6.0)	979.00	3.34	0.17	0.03	1.	0.	4.	6.	33.	0.
LIVESTOCK/FOWL						1.	0.	0.	3.	3.	
UNIT TOTALS		979.00	3.34	0.17	0.03	2.	0.	4.	9.	36.	0.
7 LAND	(5.0)	1325.00	8.60	0.42	0.03	1.	1.	10.	6.	31.	0.
LIVESTOCK/FOWL						0.	0.	0.	1.	2.	
UNIT TOTALS		1325.00	8.60	0.42	0.03	2.	1.	10.	8.	33.	0.
8 LAND	(7.0)	2739.00	33.00	6.90	0.10	16.	11.	173.	20.	102.	0.
LIVESTOCK/FOWL						1.	0.	0.	11.	12.	
UNIT TOTALS		2739.00	33.00	6.90	0.10	17.	12.	173.	31.	115.	0.
9 LAND	(10.0)	4141.00	76.11	15.35	0.15	33.	25.	384.	31.	155.	0.
LIVESTOCK/FOWL						0.	0.	0.	7.	7.	
UNIT TOTALS		4141.00	76.11	15.35	0.15	34.	25.	384.	38.	162.	0.
10 LAND	(10.0)	5222.00	47.47	2.40	0.13	7.	4.	61.	26.	132.	0.
11 LAND	(7.0)	2067.00	43.84	8.79	0.06	19.	14.	220.	12.	61.	0.
12 LAND	(3.0)	1299.00	9.31	0.44	0.03	1.	1.	11.	6.	30.	0.
STATE GROUP LAND		29658.00	363.11	62.17	0.98	142.	102.	1558.	196.	983.	0.
LIVESTOCK/FOWL						4.	2.	0.	31.	34.	
GEORGIA		29658.00	363.11	62.17	0.98	146.	104.	1558.	226.	1018.	0.
AREA LAND		29658.00	363.11	62.17	0.98	142.	102.	1558.	196.	983.	0.
LIVESTOCK/FOWL						4.	2.	0.	31.	34.	
GRAND TOTALS		29658.00	363.11	62.17	0.98	146.	104.	1558.	226.	1018.	0.

CEDAR CREEK IMPOUNDMENT
CANDLER, TATTNAL & EVANS COUNTIES, GA.

LAND UNITS 1-12 ARE DRAINAGE AREAS FOR SAMPLING POINTS E1-E12.
**** PERIOD MONTHS 8 - 8

UNIT/TYPE (PLOT AC.)	ACRES	S.L. TONS	DAILY LOADINGS TO WATER BODIES: SED. TONS	LITTER TONS	NIT.LBS	PHOS.LBS	<K> LBS	BOD LBS	TOC LBS	ACID LBS
1 LAND (4.0)	928.00	5.97	1.29	0.05	3.	2.	33.	10.	50.	0.
2 LAND (10.0)	1562.00	32.20	6.12	0.05	13.	10.	153.	10.	52.	0.
LIVESTOCK/FOWL					0.	0.	0.	1.	1.	
UNIT TOTALS	1562.00	32.20	6.12	0.05	13.	10.	153.	11.	53.	0.
3 LAND (10.0)	3712.00	42.52	8.80	0.16	20.	14.	220.	32.	159.	0.
LIVESTOCK/FOWL					0.	0.	0.	1.	1.	
UNIT TOTALS	3712.00	42.52	8.80	0.16	21.	15.	220.	32.	159.	0.
4 LAND (10.0)	2522.00	11.17	1.18	0.11	4.	2.	30.	23.	113.	0.
LIVESTOCK/FOWL					1.	0.	0.	5.	6.	
UNIT TOTALS	2522.00	11.17	1.18	0.11	5.	3.	30.	28.	119.	0.
5 LAND (10.0)	3162.00	69.93	14.28	0.13	31.	23.	357.	25.	128.	0.
LIVESTOCK/FOWL					0.	0.	0.	2.	2.	
UNIT TOTALS	3162.00	69.93	14.28	0.13	31.	23.	357.	27.	130.	0.
6 LAND (6.0)	979.00	3.82	0.20	0.04	1.	0.	5.	7.	37.	0.
LIVESTOCK/FOWL					1.	0.	0.	3.	3.	
UNIT TOTALS	979.00	3.82	0.20	0.04	2.	1.	5.	10.	41.	0.
7 LAND (5.0)	1325.00	9.83	0.48	0.04	2.	1.	12.	7.	35.	0.
LIVESTOCK/FOWL					0.	0.	0.	1.	2.	
UNIT TOTALS	1325.00	9.83	0.48	0.04	2.	1.	12.	8.	37.	0.
8 LAND (7.0)	2739.00	37.75	7.89	0.12	18.	13.	198.	23.	117.	0.
LIVESTOCK/FOWL					1.	0.	0.	10.	12.	
UNIT TOTALS	2739.00	37.75	7.89	0.12	19.	13.	198.	34.	129.	0.
9 LAND (10.0)	4141.00	87.07	17.56	0.18	38.	29.	440.	35.	177.	0.
LIVESTOCK/FOWL					0.	0.	0.	7.	7.	
UNIT TOTALS	4141.00	87.07	17.56	0.18	39.	29.	440.	42.	184.	0.
10 LAND (10.0)	5222.00	54.30	2.75	0.15	8.	5.	69.	30.	151.	0.
11 LAND (7.0)	2067.00	50.15	10.06	0.07	21.	16.	252.	14.	69.	0.
12 LAND (3.0)	1299.00	10.65	0.51	0.03	2.	1.	13.	7.	35.	0.
STATE GROUP LAND	29658.00	415.36	71.12	1.12	162.	116.	1782.	224.	1125.	0.
LIVESTOCK/FOWL					4.	2.	0.	30.	33.	
GEORGIA	29658.00	415.36	71.12	1.12	166.	118.	1782.	254.	1158.	0.
AREA LAND	29658.00	415.36	71.12	1.12	162.	116.	1782.	224.	1125.	0.
LIVESTOCK/FOWL					4.	2.	0.	30.	33.	
GRAND TOTALS	29658.00	415.36	71.12	1.12	166.	118.	1782.	254.	1158.	0.

NO LIVESTOCK - NO LITTER

CEDAR CREEK IMPOUNDMENT
CANDLER, TATTNAL & EVANS COUNTIES, GA.

EROSION & SD FOR 1" PER HR STORM - 2 JULY EVENTS/YR - 1 JUN & AUG EVENT/5 YRS.
LAND UNITS 1-12 ARE DRAINAGE AREAS FOR SAMPLING POINTS E1-E12.
**** SINGLE STORM WITH EI= 19.

UNIT/TYPE (PLOT AC.)	ACRES	S.L. TONS	TO WATER BODIES SED. TONS	LITTER TONS	NIT.LBS	PHOS.LBS	<K> LBS	BOD LBS	TOC LBS	ACID LBS
1 LAND (4.0)	928.00	98.42	21.32	0.0	43.	34.	533.	0.	0.	0.
PER ACRE LOADS FOR PERIOD		0.11	0.02	0.0	0.05	0.04	0.57	0.0	0.0	0.0
2 LAND (10.0)	1562.00	530.40	100.88	0.0	202.	161.	2522.	0.	0.	0.
PER ACRE LOADS FOR PERIOD		0.34	0.06	0.0	0.13	0.10	1.61	0.0	0.0	0.0
3 LAND (10.0)	3712.00	700.42	144.92	0.0	290.	232.	3623.	0.	0.	0.
PER ACRE LOADS FOR PERIOD		0.19	0.04	0.0	0.08	0.06	0.98	0.0	0.0	0.0
4 LAND (10.0)	2522.00	184.06	19.49	0.0	39.	31.	487.	0.	0.	0.
PER ACRE LOADS FOR PERIOD		0.07	0.01	0.0	0.02	0.01	0.19	0.0	0.0	0.0
5 LAND (10.0)	3162.00	1152.11	235.20	0.0	470.	376.	5880.	0.	0.	0.
PER ACRE LOADS FOR PERIOD		0.36	0.07	0.0	0.15	0.12	1.86	0.0	0.0	0.0
6 LAND (6.0)	979.00	62.91	3.26	0.0	7.	5.	82.	0.	0.	0.
PER ACRE LOADS FOR PERIOD		0.06	0.00	0.0	0.01	0.01	0.08	0.0	0.0	0.0
7 LAND (5.0)	1325.00	161.98	7.83	0.0	16.	13.	196.	0.	0.	0.
PER ACRE LOADS FOR PERIOD		0.12	0.01	0.0	0.01	0.01	0.15	0.0	0.0	0.0
8 LAND (7.0)	2739.00	621.87	130.04	0.0	260.	208.	3251.	0.	0.	0.
PER ACRE LOADS FOR PERIOD		0.23	0.05	0.0	0.09	0.08	1.19	0.0	0.0	0.0
9 LAND (10.0)	4141.00	1434.35	289.32	0.0	579.	463.	7233.	0.	0.	0.
PER ACRE LOADS FOR PERIOD		0.35	0.07	0.0	0.14	0.11	1.75	0.0	0.0	0.0
10 LAND (10.0)	5222.00	894.62	45.29	0.0	91.	72.	1132.	0.	0.	0.
PER ACRE LOADS FOR PERIOD		0.17	0.01	0.0	0.02	0.01	0.22	0.0	0.0	0.0
11 LAND (7.0)	2067.00	826.15	165.74	0.0	331.	265.	4143.	0.	0.	0.
PER ACRE LOADS FOR PERIOD		0.40	0.08	0.0	0.16	0.13	2.00	0.0	0.0	0.0
12 LAND (3.0)	1299.00	175.46	8.35	0.0	17.	13.	209.	0.	0.	0.
PER ACRE LOADS FOR PERIOD		0.14	0.01	0.0	0.01	0.01	0.16	0.0	0.0	0.0
GEORGIA	29658.00	6842.73	1171.65	0.0	2343.	1875.	29291.	0.	0.	0.
GRAND TOTALS	29658.00	6842.73	1171.65	0.0	2343.	1875.	29291.	0.	0.	0.

NO LIVESTOCK - NO LITTER

CEDAR CREEK IMPOUNDMENT
CANDLER, TATTNAL & EVANS COUNTIES, GA.

EROSION & SD FOR 2" PER HR STORM - 1 EVENT/5 YRS. FOR EACH MON JUN JUL & AUG.
LAND UNITS 1-12 ARE DRAINAGE AREAS FOR SAMPLING POINTS E1-E12.
**** SINGLE STORM WITH EI= 88.

UNIT/TYPE	(PLOT AC.)	ACRES	S.L. TONS	* * * * * * * * * * * * * * * * * TO WATER BODIES	* * * * * * * * * * * * * * * *					
				SED. TONS	LITTER TONS	NIT.LBS	PHOS.LBS	<K> LBS	BOD LBS	TOC LBS	ACID LBS
1 LAND	(4.0)	928.00	455.61	98.75	0.0	197.	158.	2469.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			0.49	0.11	0.0	0.21	0.17	2.66	0.0	0.0	0.0
2 LAND	(10.0)	1562.00	2456.61	467.24	0.0	934.	748.	11681.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			1.57	0.30	0.0	0.60	0.48	7.48	0.0	0.0	0.0
3 LAND	(10.0)	3712.00	3244.15	671.19	0.0	1342.	1074.	16780.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			0.87	0.18	0.0	0.36	0.29	4.52	0.0	0.0	0.0
4 LAND	(10.0)	2522.00	852.47	90.29	0.0	181.	144.	2257.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			0.34	0.04	0.0	0.07	0.06	0.89	0.0	0.0	0.0
5 LAND	(10.0)	3162.00	5336.08	1089.34	0.0	2179.	1743.	27234.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			1.69	0.34	0.0	0.69	0.55	8.61	0.0	0.0	0.0
6 LAND	(6.0)	979.00	291.38	15.12	0.0	30.	24.	378.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			0.30	0.02	0.0	0.03	0.02	0.39	0.0	0.0	0.0
7 LAND	(5.0)	1325.00	750.19	36.27	0.0	73.	58.	907.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			0.57	0.03	0.0	0.05	0.04	0.68	0.0	0.0	0.0
8 LAND	(7.0)	2739.00	2880.31	602.28	0.0	1205.	964.	15057.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			1.05	0.22	0.0	0.44	0.35	5.50	0.0	0.0	0.0
9 LAND	(10.0)	4141.00	6643.18	1340.00	0.0	2680.	2144.	33500.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			1.60	0.32	0.0	0.65	0.52	8.09	0.0	0.0	0.0
10 LAND	(10.0)	5222.00	4143.62	209.79	0.0	420.	336.	5245.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			0.79	0.04	0.0	0.08	0.06	1.00	0.0	0.0	0.0
11 LAND	(7.0)	2067.00	3826.44	767.61	0.0	1535.	1228.	19191.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			1.85	0.37	0.0	0.74	0.59	9.28	0.0	0.0	0.0
12 LAND	(3.0)	1299.00	812.62	38.66	0.0	77.	62.	967.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			0.63	0.03	0.0	0.06	0.05	0.74	0.0	0.0	0.0
GEORGIA		29658.00	31692.83	5426.53	0.0	10853.	8683.	135664.	0.	0.	0.
GRAND TOTALS		29658.00	31692.83	5426.53	0.0	10853.	8683.	135664.	0.	0.	0.

NO LIVESTOCK - NO LITTER CEDAR CREEK IMPOUNDMENT - CANDLER, TATTNAL & EVANS COUNTIES, GA.
SPECIAL SEDIMENT DELIVERY RATES #E10(20%),#E3,E9(21%),#E5,(8(22%),#E4(23%),#E11(24%),#E2(25%),#E7,E12(26%),#E1,E6(28%)

EROSION & SD FOR 2" PER HR STORM - 1 EVENT/5 YRS. FOR EACH MON JUN JUL & AUG.
LAND UNITS 1-12 ARE DRAINAGE AREAS FOR SAMPLING POINTS E1-E12.
**** SINGLE STORM WITH EI= 88.

UNIT/TYPE	(PLOT AC.)	ACRES	S.L. TONS	* * * TO WATER BODIES * * *							
				SED. TONS	LITTER TONS	NIT.LBS	PHOS.LBS	<K> LBS	BOD LBS	TOC LBS	ACID LBS
1 LAND	(4.0)	928.00	455.81	127.63	0.0	255.	204.	3191.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			0.49	0.14	0.0	0.28	0.22	3.44	0.0	0.0	0.0
2 LAND	(10.0)	1562.00	2456.61	614.15	0.0	1228.	983.	15354.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			1.57	0.39	0.0	0.79	0.63	9.83	0.0	0.0	0.0
3 LAND	(10.0)	3712.00	3244.15	681.25	0.0	1363.	1090.	17031.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			0.87	0.18	0.0	0.37	0.29	4.59	0.0	0.0	0.0
4 LAND	(10.0)	2522.00	852.47	196.07	0.0	392.	314.	4902.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			0.34	0.08	0.0	0.16	0.12	1.94	0.0	0.0	0.0
5 LAND	(10.0)	3162.00	5336.08	1173.94	0.0	2348.	1878.	29349.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			1.69	0.37	0.0	0.74	0.59	9.28	0.0	0.0	0.0
6 LAND	(6.0)	979.00	291.38	81.59	0.0	163.	131.	2040.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			0.30	0.08	0.0	0.17	0.13	2.08	0.0	0.0	0.0
7 LAND	(5.0)	1325.00	750.19	195.05	0.0	390.	312.	4876.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			0.57	0.15	0.0	0.29	0.24	3.68	0.0	0.0	0.0
8 LAND	(7.0)	2739.00	2880.31	633.65	0.0	1267.	1014.	15841.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			1.05	0.23	0.0	0.46	0.37	5.78	0.0	0.0	0.0
9 LAND	(10.0)	4141.00	6643.18	1395.09	0.0	2790.	2232.	34878.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			1.60	0.34	0.0	0.67	0.54	8.42	0.0	0.0	0.0
10 LAND	(10.0)	5222.00	4143.62	828.70	0.0	1657.	1326.	20718.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			0.79	0.16	0.0	0.32	0.25	3.97	0.0	0.0	0.0
11 LAND	(7.0)	2067.00	3826.44	918.33	0.0	1837.	1469.	22958.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			1.85	0.44	0.0	0.89	0.71	11.11	0.0	0.0	0.0
12 LAND	(3.0)	1299.00	812.62	211.29	0.0	423.	338.	5282.	0.	0.	0.
PER ACRE LOADS FOR PERIOD			0.63	0.16	0.0	0.33	0.26	4.07	0.0	0.0	0.0
GEORGIA		29658.00	31692.83	7056.73	0.0	14114.	11291.	176419.	0.	0.	0.
GRAND TOTALS		29658.00	31692.83	7056.73	0.0	14114.	11291.	176419.	0.	0.	0.

APPENDIX D

SAMPLING STATION LOCATIONS

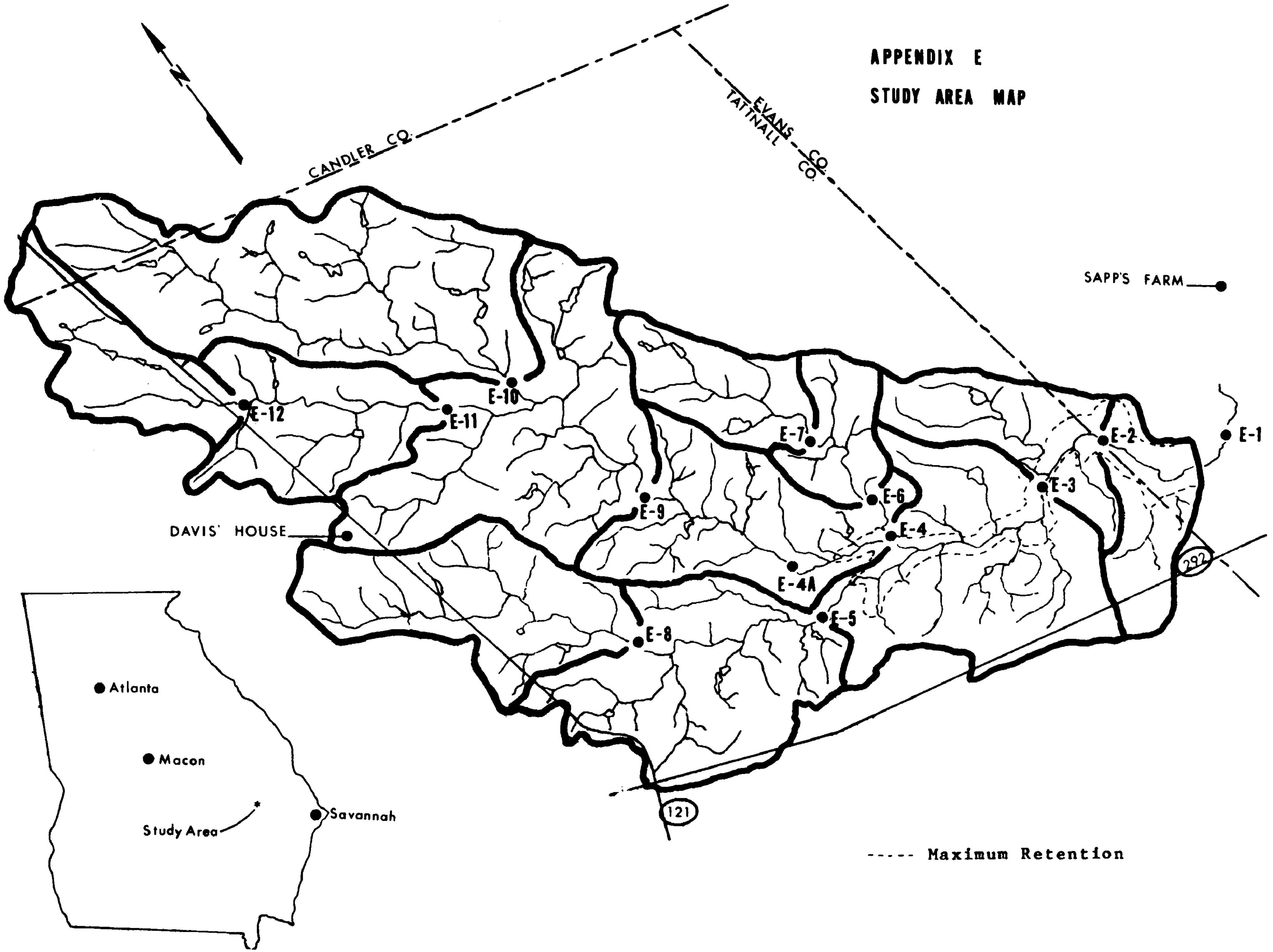
Cedar Creek Impoundment - Evans County Watershed

Station Number	Description
E-1	Cedar Creek at unnumbered county road approximately 0.5 miles downstream of proposed dam site (near Evans-Tattnall county line) - Evans County.
E-2	Cedar Creek where unnumbered county road crosses Evans-Tattnall county line.
E-3	Cedar Creek at FAS Route S1603 - Tattnall County.
E-4	Cedar Creek at FAS Route S1127 - Tattnall County.
E-5	Cypress Flat Creek at FAS Route 1127 - Tattnall County.
E-6 & E-7	Unnamed creeks at unnumbered county roads* - Tattnall County.
E-8	Cypress Flat Creek at FAS Route 1683 - Tattnall County.
E-9	Cedar Creek at FAS Route S1683 - Tattnall County.
E-10	Cedar Creek at unnumbered county road* - Tattnall County.
E-11 & E-12	Unnamed creeks at unnumbered county roads* - Tattnall County.

* For exact station location, refer to study area map (Appendix E)

APPENDIX E

STUDY AREA MAP



APPENDIX F

PROJECT PERSONNEL

FIELD AND MOBILE LAB CREWS

Richard L. Baird	Engineer
Larry Brannen	Co-op
Tom Cavinder	Engineer
Mike Chronic	Co-op
Ralph E. Gentry	Microbiologist
David W. Hill	Engineer
Ray Lassiter	Stay-in-school-student
Raymond Lawless	Chemist
George Leverett	Co-op
Eleanor Maginniss	Typist
Eddie Minchew	Co-op
Eddie Shollenberger	Engineering Technician
T. L. Vaughn	Engineering Technician
H. C. Vick	Environmentalist
Roy Weimert	Engineering Technician
Bob Woodward	Co-op

GATHERING AND TABULATION OF HISTORICAL METEOROLOGICAL AND HYDROLOGICAL DATA

Bryan Green	Stay-in-school-student
Elizabeth Korhonen	Clerk Typist
Ray Lynch	Stay-in-school-student
Debora Talkington	Stay-in-school-student
H. C. Vick	Environmentalist

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- for assistance in gathering animal population-distribution data during the initial phase of the study.

Mr. Arthur Walden, Area Conservationist, Soil Conservation Service, Statesboro, Georgia

- for his follow-up in gathering additional animal population-distribution data after completion of the study.

Mr. Joe A. Stevens, Jr., Planning Staff Leader, Soil Conservation Service, Athens, Georgia

- for assistance in implementing details of the cooperative agreement.