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Effects of Flow Alterations on Trout, Angling, and Recreation in the Chattahoochee River between Buford Dam and Peachtree Creek

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U.S. Army Engineer Waterways Experiment Station
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EFFECTS OF FLOW ALTERATIONS ON TROUT, ANGLING, AND RECREATION IN THE CHATTAHOOCHEE RIVER BETWEEN BUFORD DAM AND PEACHTREE CREEK

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PART I: INTRODUCTION

Background

In 1974 county governments in the Atlanta vicinity realized that demands on the Chattahoochee River for water supply plus the streamflow required for water quality nearly equaled the minimum flow in the river. Increased demands for water supply in the following years could not be supplied under the then existing flow regime in the river. In response to the anticipated shortage of water, the Atlanta Regional Commission, a multicounty agency responsible for comprehensive regional planning in the Atlanta region, was contracted to prepare water demand projections to the year 2010 and identify alternatives for meeting projected water demands. The results of this study are published in an extensive final report, the Metropolitan Atlanta Area Water Resources Management Study (1981). Requests for copies should be directed to the District Engineer, Savannah District.

Many of the identified alternatives to increase future water supply for the Atlanta area would result in modifications to the present flow regime within the Chattahoochee River between Buford Dam (river mile 348.3) and its confluence with Peachtree Creek (river mile 300.5). The present preferred alternative is construction of a reregulation dam at about river mile 342. The proposed reregulation dam would release a much more constant flow than the peaking flows presently released from Buford Dam (generally, a maximum release of approximately 9000 cfs or minimum release of about 550 cfs) by storing the generation releases from Buford Dam for gradual release during non-generation periods. The

anticipated minimum release from the rereg dam would be approximately 1050 cfs (based on contractual obligations to the Southeast Power Administration to supply a minimum of 11 hours of peaking power per week from Buford Dam). The average annual release from the proposed reregulation dam into the Chattahoochee River would be approximately 2000 cfs (based on USGS flow records) and the median release would be approximately 1500 cfs (value obtained from Savannah District). The proposed reregulation dam would have sufficient storage to provide some opportunity for flow management to optimize uses other than water supply and water quality.

Flow modifications (and resultant water quality changes) within this reach of the Chattahoochee River to meet increased demands for water supply may have an effect on other beneficial uses of this important natural resource. In addition to supplying a significant proportion of the water supply for metropolitan Atlanta and providing for water quality, the Chattahoochee River also is used extensively for recreation and supports a valuable trout fishery. Altered flows in the channel to meet water supply needs may have an impact on river recreation and trout habitat.

Objective

This report relates the potential for different types of river recreation and the quality of trout habitat to flow conditions (discharge) in the Chattahoochee River between Buford Dam and the confluence with Peachtree Creek. The investigation was limited to this section of the river because the major waste water return that enters near Peachtree Creek is generally considered the lower boundary of both the trout fishery and recreation area. This report is designed to be used as a planning aid, both to identify the effects of flow alterations in the Chattahoochee River and to provide information for planners to develop management plans that allow optimal use of this natural resource for power generation, water supply, water quality, trout fishery management, and recreation. Although the study design was targeted to the anticipated flow regime of the proposed reregulation dam, the results of this study can be applied to other alternatives as well.

The recreational activities and fish species' life stages targeted for investigation in this study are listed in Table 1. Selection of the items in the list was based on site visits by the authors of this report and by consultation with representatives of agencies having a mission that includes responsibility for some aspect of management on the Chattahoochee River. The fisheries part of this report was limited to trout following the recommendations of other agencies and also because of the uniqueness, value, and popularity of the trout fishery.

Table 1. List of target organisms and recreational activities for the Chattahoochee River Instream Flow Study.

FISH SPECIES AND LIFE HISTORY STAGES
Juvenile Brown Trout
Adult Brown Trout
Adult Rainbow Trout
Adult Brook Trout
ANGLING ACTIVITES
Wade Fishing
Tube Fishing
Nonpower Boat Fishing
Low-Power Boat Fishing
RECREATION ACTIVITIES
Water Contact Wading
Canoeing - Novice
Canoeing - Midlevel
Rafting - Novice (preferred)*
Rafting - Novice
Rafting - Midlevel
Rafting - Landing

* Based on reduced velocity and depth criteria for enhanced safety.

Site Description

Physical Description

The reaches of river investigated in this report (see Figures 1-3) are bounded upstream by Buford Dam (river mile 348.3) and downstream by the confluence with Peachtree Creek (river mile 300.5). Several noteworthy features occur within the study reach. A major water intake is located just upstream of Peachtree Creek and treated waste water enters the Chattahoochee River downstream of Peachtree Creek. Included within the study length of the Chattahoochee River are several other major water intakes and Morgan Falls Dam (river mile 312.5). Morgan Falls Dam (which creates Bull Sluice Lake) is a small Georgia Power hydropower dam. The storage capacity of Morgan Falls Dam has been substantially reduced by siltation to the extent that the daily operation of Morgan Falls Dam is largely determined by the flows entering Bull Sluice Lake. Morgan Falls Dam is currently operated to provide a minimum release of 1050 cfs.

The closing of Buford Dam in 1956 to form Lake Sydney Lanier resulted in substantial flow and water quality changes in the Chattahoochee River below the dam. Summertime releases from Buford Dam are substantially cooler than preimpoundment temperatures because the dam intakes are located in the hypolimnion (depth of approximately 21 m below the surface of the lake) of Lake Sydney Lanier. River water temperatures usually fluctuate between 9-15 C, although water temperatures exceeding 20 C occur in the summer in the lower reaches.

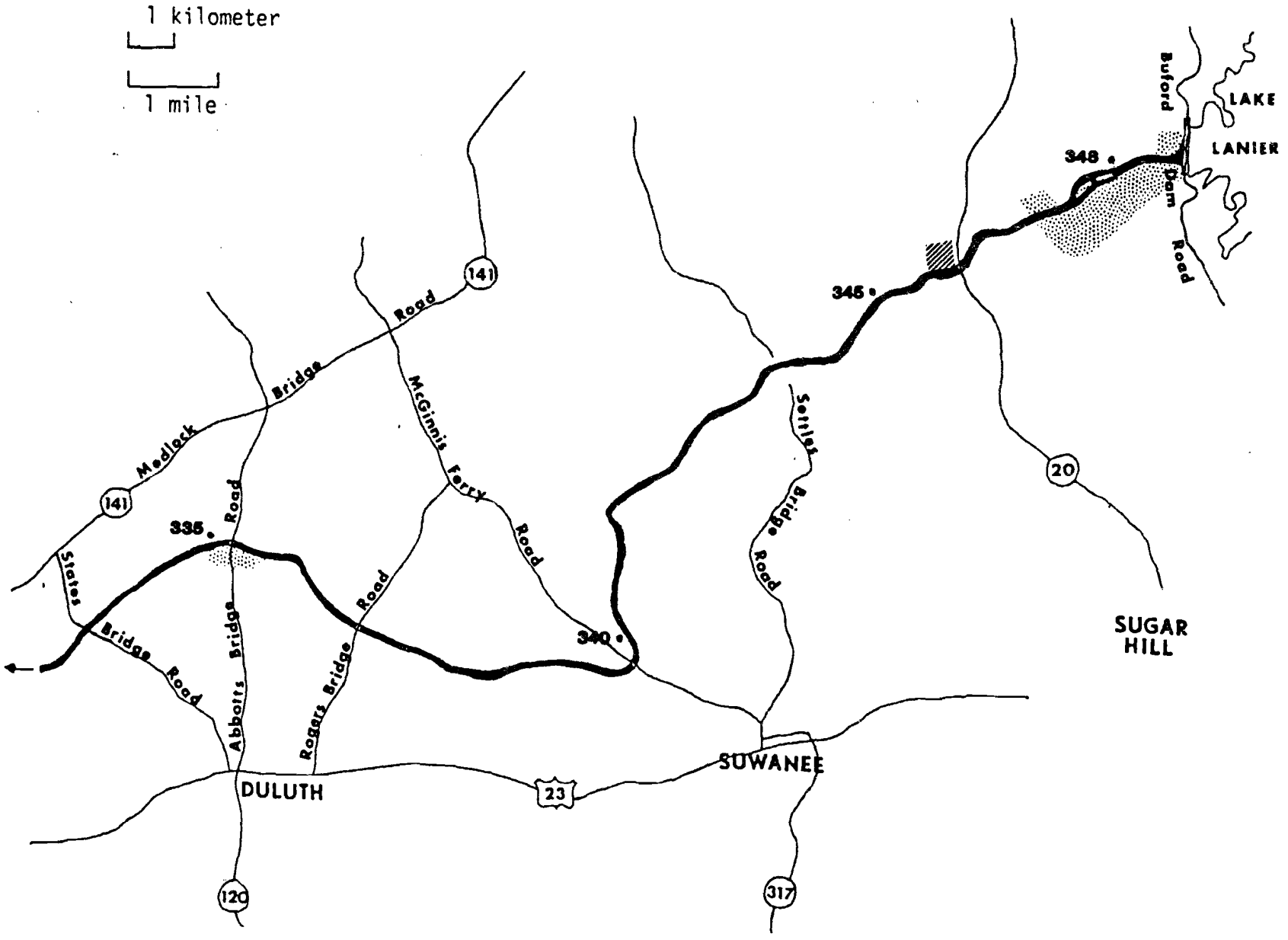

Figure 1. Location map of the Chattahoochee River showing roads, bridges, public lands (spotted) and private recreational lands (cross hatched) from Buford Dam to below States Bridge Road. Modified from Hess (1980).

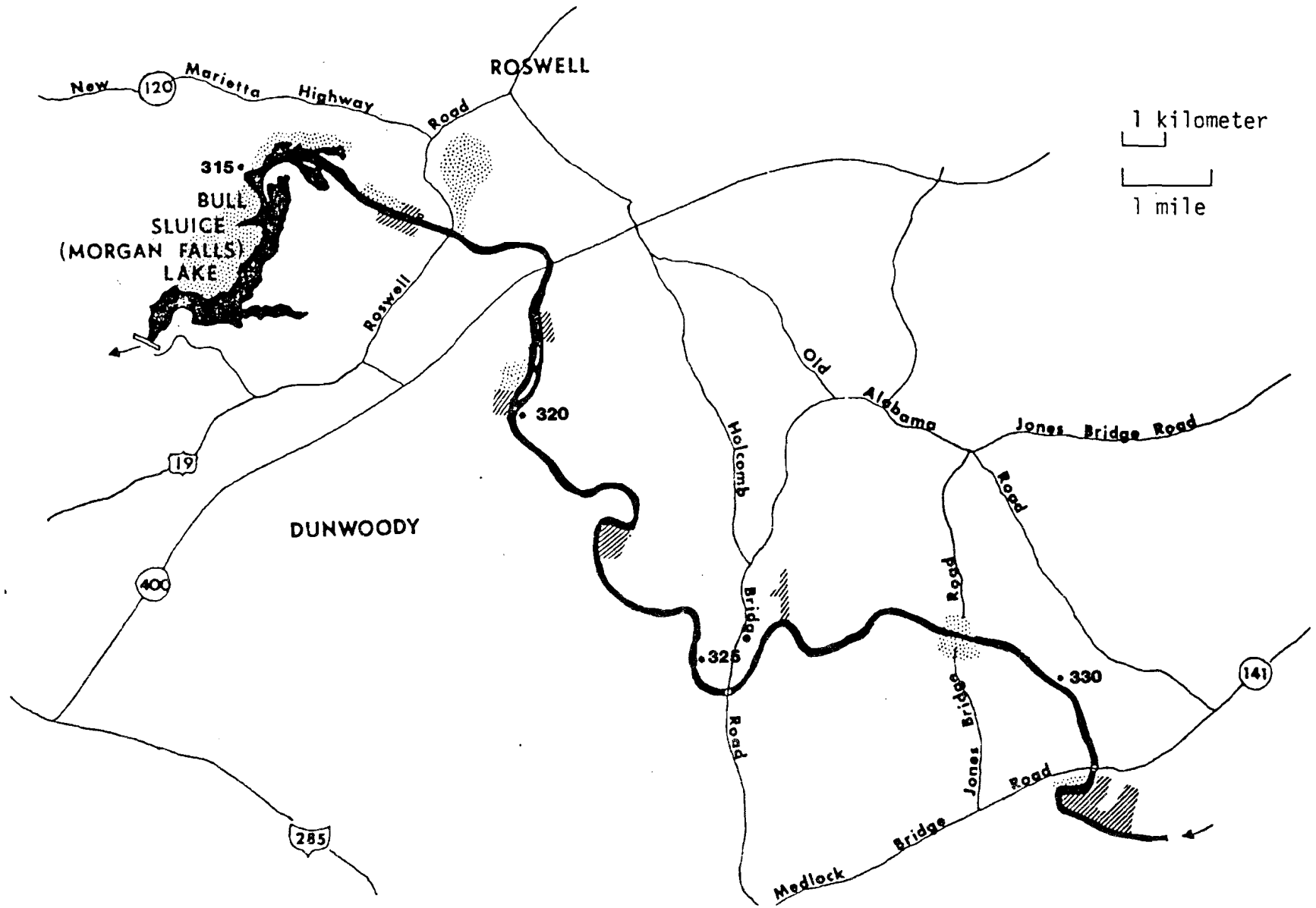

Figure 2. Location map of the Chattahoochee River showing roads, bridges, public lands (spotted) and private recreational lands (cross hatched) downstream of States Bridge Road to Morgan Falls Dam. Modified from Hess (1980).

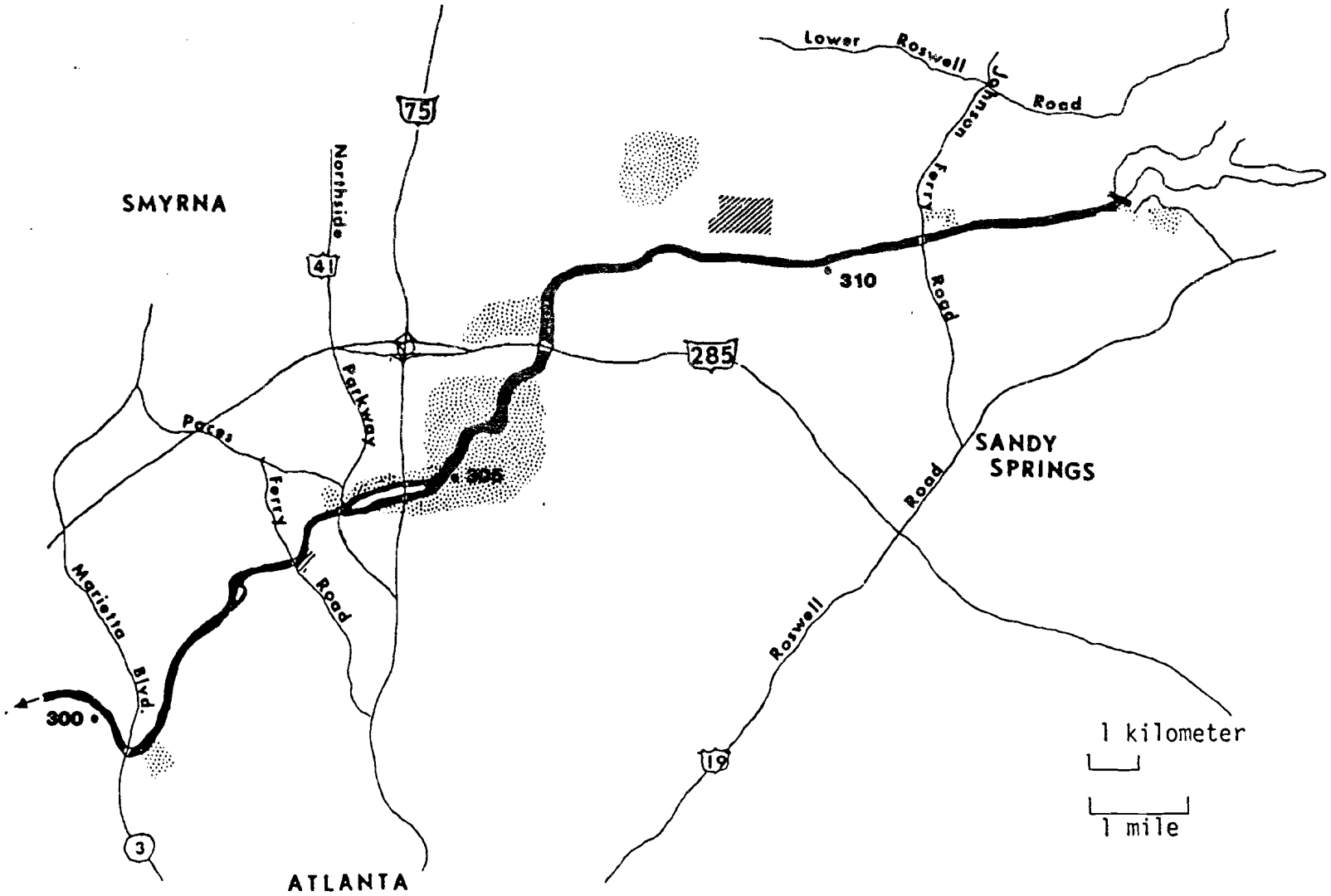

Figure 3. Location map of the Chattahoochee River showing roads, bridges, public lands (spotted) and private recreational lands (cross hatched) from Morgan Falls Dam to Marietta Boulevard (just downstream of the confluence of the Chattahoochee River and Peachtree Creek). Modified from Hess (1980).

Dissolved oxygen concentrations are normally close to saturation, although low oxygen levels and poor water quality of releases occur near Buford Dam during the late summer and autumn.

Operation of Buford Dam to generate peaking hydropower has considerably altered the preimpoundment flow regime. Buford Dam is operated for peaking power generation for a minimum of 11 hours per week. Generally, peak releases of approximately 8000 cfs occur during the afternoon and evenings of weekdays. Minimum releases near 550 cfs are discharged during all other time periods. On autumn weekends, increased flows may be released from the dam to improve water quality conditions at the trout hatchery located near Buford Dam.

Channel morphometry and substrate composition within the Chattahoochee River vary between Buford Dam (river mile 348.3) and Peachtree Creek (river mile 300.5). In general, reaches of the Chattahoochee River can be placed into one of three classifications:

> shoals - where the river is wide (up to 680 feet wide), relatively shallow (can be easily waded at low flow except for an occassional deep channel), stream gradient is steep (12.5 ft per mile) and the substrate is predominantly bedrock (see Appendix A, river mile 305.7 for a representative cross section)

> runs - where the river is moderately wide (up to 300 feet wide), can be waded with difficulty at low flow, stream gradient is moderate (2.0 feet per mile),the substrate is composed of shifting sand, and the banks are composed of a silt and sand mixture (see Appendix A, river mile 346.7 for a representative cross section)

> pools - where the river is narrow (under 200 ft), deep (cannot be waded at low flow), stream gradient is low, and the substrate is composed of silt (see Appendix A, river mile 305.4 for a representative cross section).

In addition to discrete types of channel morphometry, the Chattahoochee River also exhibits several general characteristics. The change in width resulting from change in discharge is not large. Except for one location (the sand/gravel bar at Paces Mill), the change in width with discharge is less than 10 per cent. Also, the change in stage resulting from a change in flow from 1,000 to 7,500 cfs decreases progressively downstream as the river widens and the gradient increases. Table 2 presents a listing of some representative cross sections to further identify the channel characteristics of the Chattahoochee River.

Table 2. Table of representative cross sections.

CROSS SECTION (RIVER MI.)	CHANNEL TYPE	CHANGE IN STAGE (FT) BETWEEN 1000 AND 7500 CFS	WIDTH (FT)		AVERAGE DEPTH (FT)	
			7500 CFS	1000 CFS	7500 CFS	1000 CFS
346.74	RUN	8.0	208	185	11.5	4.4
344.16	RUN	5.8	218	206	12.2	6.0
328.62	RUN	3.14	268	259	8.1	5.2
328.62	SHOAL	3.14	408	390	4.6	1.6
320.72	RUN	3.92	234	218	8.7	5.3
319.66	SHOAL	2.97	630	590	4.7	1.5
305.55	SHOAL	1.7	681	671	3.0	1.4
305.42	POOL	2.4	179	158	11.3	10.2
303.88	RUN/BAR	5.3	426	289	6.2	1.8

For clarity and brevity of presentation, the Chattahoochee River has been divided into three major segments (also referred to as major reaches): from Buford Dam to the site of the proposed reregulation dam, from the site of the proposed reregulation dam to the headwaters of Bull Sluice Lake, and from Morgan Falls Dam to the confluence with Peachtree Creek (Table 3). Subreaches within each major reach were identified through site inspection, consultation with local experts, and reference to existing maps and cross section information.

Table 3. Identification of reaches of the Chattahoochee River from Buford Dam to Peachtree Creek.

SEGMENT AND REACH	RIVER MILE	TYPE OF CROSS SECTION DATA
Buford Dam to site of proposed rereg dam	348.3-342.0	
Bowmans Island Shoals	348.3-347.2	USGS data
Trout Hatchery	347.2-342.0	USGS data and field data
Site of proposed rereg dam to headwaters of Bull Sluice Lake	342.0-317.0	
Site of proposed rereg dam to Medlock Bridge	342.0-330.7	Existing USGS data
Medlock Bridge to Jones Bridge	330.7-328.7	Existing CE data
Jones Bridge Shoals	328.7-328.5	Field data
Jones Bridge Shoals to Island Ford Shoals	328.5-320.0	Existing CE data
Island Ford Shoals	320.0-319.0	Field data
Island Ford Shoals to headwaters of Bull Sluice Lake	319.0-317.0	Existing CE data
Below Morgan Falls Dam to Peachtree Creek	312.5-300.5	
Morgan Falls Dam to Devils Race Course Shoals	312.5-305.9	Existing CE data and extrapolated field data
Devils Race Course Shoals	305.9-305.4	Field data
Miscellaneous Shoals	305.4-303.8	Existing CE data and extrapolated field data
Paces Mill raft take-out point	303.8	Field data
Paces Mill to Peachtree Creek	303.8-300.5	Existing CE data and extrapolated field data

Habitat and Fishery Description

The year-round availability of cool water has allowed the development of a valuable put-and-take trout fishery in this formerly warm water stream. In fact, the Chattahoochee River is one of the southernmost tailwater trout fisheries in the nation. Harvestable-size rainbow, brook, and brown trout are stocked at numerous points in the Chattahoochee River by the Georgia Game and Fish Division. Juvenile brown trout are stocked below Morgan Falls Dam by the Georgia Game and Fish Division with the assistance of Trout Unlimited. The yearly trout stocking totals presented in Table 4 provide an estimate of the importance and value of the Chattahoochee River trout fishery. Long-term survival of stocked brown trout has produced trophy-sized fish, particularily downstream from Morgan Falls Dam.

The value of the different major types of channel morphometry differs for each of the trout species. The shoal areas in the Chattahoochee River provide both fish-food production (aquatic macroinvertebrates) and cover for all sizes of trout. Adequate habitat for larger-sized trout (200-350 mm) can be found in the sandy runs. The largest size trout (over 350 mm) are generally found in deep pools or holes having some type of rock or timber cover.

Table 4. Yearly trout stocking totals for the Chattahoochee River tailwater below Buford Dam (from Hess 1980).

Year	Rainbow Trout	Brook Trout	Brown Trout	Total
1960	7,700	-	4,000	11,700
1961	13,500	-	1,000	14,500
1962	24,500	-	-	24,500
1963	22,580	-	-	22,580
1964	35,960	-	-	35,960
1965	38,279	-	-	38,279
1966	37,890	1,500	-	39,390
1967	41,829	-	4,000	45,829
1968	52,191	-	22,000	74,191
1969	40,612	-	9,000	49,612
1970	82,411	-	4,400	86,811
1971	72,323	26,200	17,000	115,323
1972	82,200	4,000	14,337	100,537
1973	64,200	7,000	40,000	111,200
1974	52,435	4,000	83,300	139,735
1975	69,400	126,600	77,547	273,547
1976	95,381	1,600	54,000	150,981
1977	58,684	24,000	37,928	120,612
1978	67,228	18,268	40,000	125,496
1979	122,787	1,921	6,915	131,623

Although trout are the most sought-after fish by anglers, warm water fish also still occur within the Chattahoochee River (Table 5). Nongame fish species such as gizzard shad, carp, and various suckers dominate below Morgan Falls Dam, while trout and yellow perch are most abundant above Bull Sluice Lake, although other species are harvested in the two main shoal areas (Jones Bridge and Island Ford) above Bull Sluice Lake. The Chattahoochee River below Morgan Falls Dam and upstream of the confluence with Peachtree Creek is one of the prime trout fishing areas probably because of ease of access, nearness to population centers of Atlanta, and availability of excellent trout habitat.

Table 5. A list of fish species electrofished from the Chattahoochee River between Buford Dam and Morgan Falls Dam, and between Morgan Falls Dam and Peachtree Creek from 1977 through 1979. A=abundant (>2.5 fish per hour of electrofishing), C=common (0.5-2.5 fish per hour), R=rare (<0.5 fish per hour) (From Hess 1980)

TAXON	OCCURRENCE	
	Buford Dam to Morgan Falls	Morgan Falls Dam to Peachtree Creek
Amiidae - bowfins		
Amia calva - bowfin		C
Clupeidae - herrings		
Dorosoma cepedianum - gizzard shad		A
Esocidae - pikes		
Esox niger - chain pickerel	R	R
Cyprinidae - minnows and carps		
Cyprinus carpio - carp	C	A
Ericymba buccata - silverjaw minnow		R
Nocomis leptocephalus - bluehead chub	R	
Notemigonus crysoleucas - golden shiner	R	
Catostomidae - suckers		
Carpoides cyprinus - quillback		A
Catostomus commersoni - white sucker		C
Erimyzon oblongus - creek chubsucker	R	R
Hypentelium etowanum - Alabama hogsucker	R	C
Ictiobus sp. - unidentified buffalo		R
Minytrema melanops - spotted sucker	R	R
Moxostoma lachneri - greater jumprock	R	R
Moxostoma poecilurum - greyfin redhorse	C	A
Ictaluridae - freshwater catfishes		
Ictalurus brunneus - snail bullhead		R
Ictalurus melas - black bullhead		C
Ictalurus natalis - yellow bullhead		R
Ictalurus nebulosis - brown bullhead	R	A
Ictalurus punctatus - channel catfish	R	
Centrarchidae -sunfishes		
Lepomis auritus - redbreast sunfish	R	A
Lepomis cynellus - green sunfish	C	C
Lepomis gulosus - warmouth	R	
Lepomis macrochirus - bluegill	A	A
Lepomis microlophus - redear sunfish	R	R

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Table 5 (concluded).

TAXON	OCCURRENCE	
	Buford Dam to Morgan Falls	Morgan Falls Dam to Peachtree Creek
Centrarchidae - sunfishes (continued)		
Micropterus punctulatus - spotted bass	R	R
Micropterus salmoides - largemouth bass	C	C
Micropterus sp. cf. *coosae* - shoal bass		R
Pomoxis nigromaculatus - black crappie	C	A
Percidae - perches		
Perca flavescens - yellow perch	A	A
percina nigrofasciata - blackbanded darter		R
Cottidae - sculpins		
Cottus carolinae - banded sculpin	R	R
Cottus sp. cf. *bairdi*		R

Trout feeding varies seasonally and with location within the study reaches of the Chattahoochee river (Hess 1980, Gilbert and Reinert 1979, and Welch 1966). Trout near the dam feed heavily on threadfin shad (Dorosoma petenense) and yellow perch (Perca flavescens) that apparently pass through the dam from December until April (periods when the reservoir is unstratified). Most of the shad appear to be consumed within 15 miles of Buford Dam and most of the yellow perch are consumed within four miles of the dam. Trout further downstream, particularily in the shoal areas, feed predominantly on benthic invertebrates during this same time period. From June through August trout feed predominantly on terrestrial invertebrates, although in early summer trout near the dam continue to feed on yellow perch apparently exported from Lake Sydney Lanier. Beginning in September, terrestrial invertebrates become less important and wintertime feeding is concentrated on benthic macroinvertebrates.

The average volume of stomach contents decreases sharply downstream in winter, even in fish of comparable size (Welch 1966). In the winter, trout more than 22 river miles below Buford Dam average less than one ml stomach volume, trout immediately downstream of the dam average 20 ml stomach volume (although these fish are somewhat larger than trout in other reaches of the river) and trout in the middle reaches average 5 ml stomach contents. Similar trends are observed in the spring (April). In the fall, trout stomach contents are low, as well as having high percentages of algae and rocks, suggesting that fish food is scarce.

The feeding habits of trout in the study areas of the Chattahoochee River differ from that observed in natural streams. Most of the fish food in the Chattahoochee River, on an annual basis, comes from outside

the system and aquatic macroinvertebrates make up a relatively small amount of the total protein ingested, although they are an important food source in the maintenance of the population through the late fall and early spring. The benthic macroinvertebrate communities, a normal trout food in most unregulated systems, are limited by several factors in the upper part of the study reaches, including depressed year round temperatures, seasonal low dissolved oxygen levels, scarcity of allochthonous material (leaves, bark, etc. - the normal food base for macroinvertebrates in unregulated systems), unstable sand substrate, and fluctuating water levels and velocities.

Recreation Description

Recreational activities on the Chattahoochee River can be broadly broken into angling and non-angling recreational activities (for purposes of this report the latter will be referred to as recreation). Each of these two categories will be discussed separately in this report.

Angling Activities. Several major types of angling activities occur in the Chattahoochee River, determined primarily by ease of access and channel morphology. Near boat ramps, fishing from canoes and small boats with low power outboard engines is popular. In areas where access is more difficult, bank fishing, wade-fishing, and tube-fishing is more popular. Angling activity is most concentrated in the shoal areas of the study reaches and in areas where fish are stocked.

Historically, concentrated fishing activities occur at different time periods than recreational activities as anglers attempt to avoid conflict with other river users. Thus, potential conflicts between these two fundamentally different user groups are avoided. Many of the summertime angling activities occur in the morning and evening when river use by other recreational users is minimal.

Recreation Description. Five public agencies provide recreational facilities or services on the Chattahoochee River between Buford Dam and the confluence with Peachtree Creek. This 48 mile length of river is managed by the National Park Service as the Chattahoochee River National Recreation Area (CRNRA). The National Park Service operates eleven park units, five of which provide boating access to the river (see Appendix B). During 1983, the National Park Service reported 1,081,924 visits to their units in the CRNRA. The Corps of Engineers also accommodates river related recreation at two recreation areas just downstream of Buford Dam. At these areas, the Corps of Engineers reported 130,126 recreation days of use in 1983. Three other parks on the river are managed by Cobb, Fulton, and Gwinnett Counties.

Although not all parks managed by the five public agencies provide all types of recreational facilities, at least one of the following facilities is available at each park unit: boat ramp, picnic area and shelter, nature trail, grassy field for outdoor games, and a jogging/bicycling trail. In addition to the developed areas, users gain access to the river from roads which cross or run parallel to the river and across private land bordering the river.

A variety of recreational activities take place on or next to the river. These include rafting, tubing, canoeing, kayaking, wading, swimming, sunbathing, picnicing, hiking, jogging, and "relaxing". Different activities predominate on different stretches of the river (Hess 1980). The following description of recreational use of the Chattahoochee River is based on several studies performed (Hess 1980, Little 1982, and MacDonald and Hammitt 1979) over a period from 1977 to 1982. It must be noted that recreational use patterns have changed over this time period and the following description should be viewed primarily as background information. According to Hess (1980), between Buford Dam (river mile 348) and Jones Bridge (approximately river mile 328), the dominant activity is sightseeing. Between Jones Bridge and Roswell Road (river mile 317), though, the main activities tend to be sightseeing and swimming/wading. Finally, the stretch from Roswell Road to Peachtree Creek tends to be most popular for rafting/floating and swimming/wading.

Most of the non-angling recreational use of the river occurs in the lower third, between two National Park Service park units, at river miles 311 (Johnsons Ferry) and 304 (Paces Mill). Of the recreational use reported by the National Park Service at all CRNRA units in 1982, 84% occurred in this portion of the river. Several factors contribute to the popularity of this reach of the river. This area is close to Atlanta and is bordered in some areas by major apartment complexes. Concessionaire facilities at three park units within this stretch also contribute greatly to increased use by providing facilities to park users. The concessionaire rents rafts, a limited number of canoes and kayaks, and related supplies. In addition, the concessionaire sells food and beverages and provides a shuttle bus service to transport

rafters to and from their vehicles in the three park units. Between May 1 and September 30, 1983 (excluding the month of August for which figures were unavailable), the concessionnaire rented 15,257 rafts, 368 canoes, and 35 kayaks and transported 70,764 passengers on the shuttle.

A full description of recreational use of the Chattahoochee River must include a social profile of the majority of park users. Based on the results of studies conducted by Little (1982) and McDonald and Hammitt (1979), users of the Chattahoochee River tend to be young and single. They are day users who live close to the area and visit it frequently. Most come to the river with a group of friends intending to relax and socialize, and enjoy meeting other people during their visit. In both studies, a sample of users was contacted on-site, interviewed, and provided with a mailback questionaire. All park users were included in the Little (1982) study, while only rafters and floaters were interviewed in the McDonald and Hammitt study. Despite this difference, the results of the two studies were remarkably similar. This may be due in part to the fact that 63 % of the Little (1982) respondents had been rafting or tubing. Demographic characteristics for both groups are provided in Table 6.

According to the Little (1982) study, the majority of users tend to spend four or less hours in the area (Table 7). In addition, most users are frequent visitors, with two-thirds having visited the river at least once a month during the summer. The reason for going to the river selected by respondents most often in the Little (1982) study was to go rafting/tubing. Following this were "just to relax" and "just to be with friends". The latter two were also most often given by the McDonald and Hammitt (1979) sample of users.

As reflected in the reasons for visiting and length of stay, it appears that for most visitors the trip to the river was a casual experience. In the McDonald and Hammitt (1979) study, it was found that three quarters of the rafters came from within 25 miles and two-thirds had been planning for the trip two days or less. All other activities occurring on the river, with the exception of fishing, require a less specific resource and user preparation. Therefore, it is unlikely that the travel distance and advance planning of most users would have exceeded that of rafters.

Table 6. Demographic and group characteristics of Chattahoochee River users. a

CHARACTERISTICS	STUDIES	
	Little (1982)	McDonald and Hammitt (1979)
Age	28b	28c
Per Cent Married	40 %	- d
White	93 %	- d
With College Education	47 %	55 %
Percent in groups of 5 or less	70 %e	63 %
Social group		
Alone	8 %	0 %
Family	24 %	16 %
Friends	37 %	54 %

a - Little included all park users, McDonald and Hammitt included only rafters and other floaters.
b - Median
c - Mean
d - Not collected in the survey.
e - Group of 1-4 people

Table 7. Trip Characteristics (from Little, 1982).

CHARACTERISTICS	PERCENTAGE OF RESPONDENTS
Length of stay	
0 - 2.0 hours	17.8
2.1 - 4.0 hours	37.7
4.1 - 6.0 hours	31.8
6.1 + hours	8.9
Frequency of visits	
no more than a few times per year	34.1
at least once a month	40.0
at least once a week	23.7

The Chattahoochee River differs from many other popular rafting rivers in that it is not a white-water river. This difference is reflected in the type of rafters using the river. In the McDonald and Hammit (1979) study, 74 % of the rafters rated their floating skills as novice or intermediate and very few said one of their reasons for using the river was to develop their rafting/tubing skills and abilities. This observation was supported by representatives of the Georgia Department of Natural Resources who stated that, in general, serious canoers and kayakers visit nearby (several hours driving distance) rivers that do provide a white-water experience.

Part II: MATERIALS AND METHODS

Study Organization

The environmental and recreational issues addressed by this study were sufficiently broad and diverse to require a multi-disciplinary, team approach. An interagency study team, the Chattahoochee River Instream Flow Study (CRIFS) team, was formed from representatives from the US Fish and Wildlife Service and the Corps of Engineers. The members of the CRIFS team, in turn, contacted other federal and local agencies, as required, during the course of this study both to refine the issues as well as to obtain information required for the study. The agencies involved in the CRIFS had either an agency mission that included responsibility for the Chattahoochee River, possessed a needed expertise, or requested to participate in the study. Table 8 presents a list of the agencies involved in this study along with a brief description of their respective contributions. Consultation with many of the agencies listed in Table 8 produced the issues (Table 1) that the CRIFS would address.

Table 8. List of agencies involved in the Chattahoochee River Instream Flow Study.*

AGENCY	CONTRIBUTION
Georgia Game and Fish Division	identified issues, developed fishery and recreation criteria, assisted in field work
Georgia Environmental Protection Division	developed recreation criteria
U. S. Fish and Wildlife Service	all aspects of study
U. S. Geological Survey	collected field data
U. S. National Park Service	identified issues, assisted in development of recreation criteria
Waterways Experiment Station, CE	all aspects of study
Savannah District, CE	managed study
Atlanta Regional Commission	coordination
U. S. Environmental Protection Agency	coordination

* Participation by an agency does not imply endorsement of either the study results or conclusions.

Methods

Background

After careful examination of the issues related to providing increased water supply to the metropolitan Atlanta area by modifying flows in the Chattahoochee River, the CRIFS team decided to use the Physical Habitat Simulation System (PHABSIM) developed by the Instream Flow Group, U. S. Fish and Wildlife Service as a tool to perform an instream flow study on the Chattahoochee River. PHABSIM was selected for the following reasons:

> it was the only method that could be applied to both the fishery and recreational aspects of this study.

> it is generally accepted by many agencies as a defensible assessment method

> the form of the results of an instream flow study using PHABSIM are amenable to incorporation in studies resolving potential water resources conflicts.

The following paragraph was designed to provide background information on PHABSIM sufficient to provide the reader a general understanding of the approach used in this study. The interested reader should consult Instream Flow Information Paper No. 11 (Milhous et al. 1984) and No. 12 (Bovee 1982) for more details on the use and application of PHABSIM.

HABSIM is based on the observation that most species of fish prefer certain combinations of depth, velocity, and cover and tend to avoid other combinations of these parameters. In addition, the potential for many river-borne recreational activities can be described in terms of water depth and velocity in the channel. For example, beginning canoeists require a minimum depth of water to float their canoes and a minimum water velocity to move the canoe through the water. However, water that is overly deep or currents that are too rapid may create safety hazards for beginning canoeists. Thus, the hydraulic limits within which the activity of canoeing by beginners can be performed can be described by suitability criteria (see Appendix E for examples of suitabilty criteria for canoeing). If the criteria (the relative value of different depths and velocities for each species or recreational activity) are known and the hydraulic conditions within the channel can be described for different discharges, then it becomes possible to determine both the quality of the habitat for each species of fish and the resource potential for different recreational activities at these different discharges.

As described in the above paragraph, an instream flow study can be broadly divided into three distinct, but interconnected parts. The first part involves a description of the depths, velocities, and cover available in the river at discrete discharges. The second part of an instream flow study is the development of criteria for each species of fish and recreational activity. The last part is to combine parts one and two for each discharge of interest to derive an estimate of the value or worth of the river for each species and activity. The next sections will detail how these general steps were applied to the Chattahoochee River.

Flow and Channel Geometry Description

Reach Identification. The first step in the application of PHABSIM to the Chattahoochee River was to divide the river up into study reaches. Once study reaches were identified, then each was described using one or more detailed cross sections (see Trihey and Wegner (1981) for further details on field techniques used in an instream flow study). The quality of the habitat for each species of fish or potential for different types of recreational activities at each discharge was then obtained by summing the values obtained for each reach.

Study reaches of the Chattahoochee River were identified by field inspection of the river by the CRIFS team and consultation with other agencies. Table 3 presents a listing of the major reaches of the Chattahoochee River from Buford Dam (river mile 348.2) to its confluence with Peachtree Creek (river mile 300.5). In general, three types of study reaches can be identified in an instream flow study: representative reaches, conflict reaches, and critical reaches. Representative reaches are segments of the river in which the channel morphometry, slope, and cover are relatively uniform. A long section of river can be described by describing all of its component representative reaches. Conflict reaches are segments of the river in which potentially conflicting activities may occur. Critical reaches are segments of the river which are extremely important to the abundance of a species or utilization for a recreational activity.

Each of the reaches identified in Table 3 was assessed to determine its importance either to fish habitat or to support recreation and then categorized as a representative, conflict or critical reach. Shoal areas were consistently identified as being much more important, both as

habitat for fish, and as sites of concentrated angling and recreational activity, than non-shoal (open river) areas. Thus, the shoal areas were viewed by the CRIFS team as being both conflict and, to a lesser extent, critical reaches.

One reach was included for unique reasons and deserves special mention. The Raft Ramp reach (Paces Mill), consisting of one cross section, was incorporated to describe the flow and channel characteristics facing rafters attempting to land their rafts and remove them from the river. According to U. S. National Park Service representatives, attempts by rafters to take-out at the higher discharges often result in rafters being swept downstream of the take-out point where partly submerged stumps and logs and steep banks can make take-out difficult and dangerous.

The types of input data (i.e. utilization of existing cross section data or collection of detailed field data) used in the study were determined by the classification of the different reaches. Thus, collection of detailed field data was restricted primarily to shoal areas, particularily downstream of Morgan Falls Dam. Reaches that were considered less important were described using information previously collected either by the US Geological Survey (Faye and Cherry 1980) or by the Corps of Engineers (1974).

Field Data Collection Methods. Field data were collected by the US Geological Survey using their standard methods of stream gaging. Collected data were obtained from USGS field sheets and converted to the form required by the PHABSIM analysis.

Hydraulic Simulation. A range of techniques are available in the HABSIM System to simulate cell velocities and water surface elevation in a stream. The Water Surface Profile (WSP) Program (see Milhous et al. 1984 for more detailed information) was used where cross section data (existing data obtained from the USGS or CE) only were available and velocity information was unavailable. For the reaches investigated as part of the field effort for this study a stage-discharge relationship, developed separately for each cross section, was used to determine the water surface elevations at different discharges of interest (see Trihey and Wegner (1981) for more details). The IFG4 program was then used to determine the velocities within the stream channel given the stage-discharge relationship (see Milhous et al. 1984 for more information on the IFG4 program).

Sensitivity analysis performed by the Instream Flow Group of the USFWS of the assumptions made during the simulations indicates that the results from this study are stable and that the selection of an alternative simulation approach would not have a significant impact on the final results.

The value of the results of this study are partly determined by the stability of the channel of the Chattahoochee River. Since much of the channel is composed of sand, there was some concern by the CRIFS team that the habitat relationships developed in this report would be valid only for a short time period and, consequently, of limited value from a management standpoint. The longterm stability of the channel was evaluated by comparing cross section data collected in 1954 and 1971, sensitivity analysis by the Instream Flow Group of the U. S. Fish and Wildlife Service, and by field observation.

Suitability Criteria Curves

Background. The Physical Habitat Simulation System requires suitability criteria curves to relate information about the physical properties in the river at a particular discharge to information about the suitability (or useability) of the river as physical habitat for a fish or to support recreational activity. Thus, developing suitability criteria curves for the species and activities listed in Table 1 of this report was an integral part of the CRIFS. Suitability curves for depth, current velocity and substrate (also referred to as "cover code" or "channel index") are presented for each species investigated in this study. For each recreational activity, suitability curves for depth and current velocity only are included. The suitability curves were broken into two major categories, trout curves and recreation curves, based on the methods used in their development and agency participation.

Trout Suitability Criteria. The criteria for the trout were based initially on information available in Instream Flow Information Paper No. 4 (Bovee 1978), published by the Instream Flow Group of the U.S. Fish and Wildlife Service. However, it was the consensus of the CRIFS team that these curves were unsuitable for use on the Chattahoochee River without modification. The curves in Bovee (1978) were based on trout behavior in trout streams in the western states and their use, without modification, on a highly managed, upper piedmont, put-and-take trout fishery downstream from a peaking hydropower project in the southeast would be problematic, at best.

The suitability criteria were modified to make them more applicable to the Chattahoochee River through consultation with two of the recognized experts on this trout fishery from the Georgia Game and Fish Division. Mr. Tim Hess and Mr. Chris Martin were able to suggest a number of modifications to the depth and velocity suitability curves taken from Bovee (1978) to make them applicable to the Chattahoochee River trout fishery.

The suitability criteria for substrate provided in Bovee (1978) were not used in this study. Completely new suitability curves (Table 9) for substrate were developed following the the recommendations of the Instream Flow Group to design a channel index separately for each specific study (Bovee 1982).

Table 9. The channel index for trout developed specifically for the Chattahoochee River.

Channel Index	Suitability	Description
1.0	0.10	all sand - no cover
1.5	0.15	gravel - no cover
2.5	0.25	sand - some cover
3.0	0.30	sand - extensive cover
4.0	0.40	gravel - extensive cover
5.0	0.50	cobble (75-254 mm) - some cover
6.0	0.60	boulder (> 254 mm) - some cover
7.0	0.70	bedrock - some cover
8.0	0.80	cobble - extensive cover
9.0	0.90	bedrock - extensive cover
10.0	1.00	boulder - extensive cover
11.0	0.50	upland vegetation

The channel index designed for the Chattahoochee River can probably be used, with caution, for other piedmont streams but should not be used for streams outside the piedmont. All of the revised curves for trout life stages are attached as Appendix C.

Recreation Suitability Criteria. All of the recreation activities investigated in this report are related to physical conditions in the river and could be assessed using PHABSIM except "hanging-out". "Hanging-out" refers to the use of rocks for sun bathing, social gathering, and observing other recreationists. The availability of "hanging-out" space at different discharges was assessed using aerial photography performed at two different staged flows: 1000 and 1500 cfs. These particular flows were selected because they bracket the current minimum flow in the river and the anticipated release from the proposed reregulation dam. The selected flows were released from Morgan Falls by Georgia Power on 3 June, 1984 and 15 July, 1984 (both days are Sundays).

The Georgia National Guard conducted the aerial photography of the major reach below Morgan Falls at about 1400 EDT.

Criteria curves for the other recreational activities (Table 10) were initially obtained from Hyra (1978), except for the raft-landing curve and the tube-fishing curve, and evaluated by the CRIFS team for application to the Chattahoochee River. The study team decided that some of the curves could be used directly from Hyra (1978) whereas others would require modification before they could be used on the Chattahoochee River. Both the criteria for non-power boat fishing and low power boat fishing were obtained directly from Hyra (1978).

As was done for the trout suitability criteria, some of the recreation criteria were modified by the CRIFS to more accurately represent the type of activities and level of use actually occurring on the Chattahoochee river. Modification of these curves and creation of new curves was performed in consultation with experts from the Georgia Department of Natural Resources and the U. S. National Park Service. The curves for fishing by wading were modified from the curve in Hyra (1978) by direct field measurement of the flow conditions under which a group of individuals wearing rubber waders could easily move through the water. Depths and current velocities uncomfortable to waders were recorded and served as points of zero suitability. The curve for tubing represents the floating phase of the total tube fishing activity (which includes both floating and wading).

Table 10. Recreation activities for which suitability criteria were obtained, modified or generated.

ACTIVITY		DEFINITION
Canoeing	- novice (river) - novice (shoal)	Depths and velocities preferred by inexperienced canoeists. Depth must be less than four feet to allow canoer to right a turned over canoe
	- mid-level	Depths and velocities preferred by experienced canoers
Rafting	- novice	Depths and velocities preferred by inexperienced slow-water rafters.
	- novice (preferred)	Like criteria for novice rafters except that depths and velocities are reduced for safety.
	- mid-level	Depths and velocities preferred by experienced rafters
	- landing	Depths and velocities preferred to successfully land a raft
Fishing	- wading	Depths and velocities required for wade-fishing
	- tubing	Depths and velocities required for tube-fishing
	- boating (non power) - boating (low power)	Depths and velocities preferred for boat fishing with and without small outboard engines

The curves for rafting and canoeing were first modified from those given in Hyra (1978) based on information obtained in a floating guide to western rivers (Schwind 1974). To further refine these curves, a site visit was made to Devils Race Course Shoals and Jones Bridge Shoals by members of the CRIFS team and several experts on river recreation. During this site visit, depths and velocities in different areas of the shoals were measured to provide the group with several reference points. These data were then used by the study team, with the consultation and assistance of previously identified experts to modify the initial

rafting and canoeing curves obtained from Hyra (1978) for use on the Chattahoochee River. The recreation suitability criteria are attached as Appendix E.

Travel Time and Average Velocity Determination. Discussions held with representatives of the U. S. National Park Service indicated that the travel time of rafters and canoers at different discharges may be an important consideration in determining the quality, and certainly the duration, of the recreation experience. The travel time down the river is at least partly related to the average velocities in the river, even though the actual travel time is also dependent upon where in the channel the rafter or canoer is located. Thus, a knowledge of the average velocities for specific discharges in the channel can provide an estimate of relative differences in travel time to be encountered by a rafter or canoer.

Average velocity for a sub-reach was determined by dividing the discharge by the cross sectional area of the channel at different points along the river. Average velocity for a reach was determined by summing the average velocities for the sub-reach represented by each cross section and then dividing by the total length of river, much as was done in the calculation of weighted usable area.

PART III RESULTS

Evaluation of Channel Change

The long-term management value of the results of any study which documents the flow requirements for fish, angling and recreation is partly determined by the stability of the river channel. If the river channel changes considerably over time, then the study results are of little value. Several processes are presently occurring in the channel of the Chattahoochee River which could affect the results of this study. Channel widening has occurred in the past and is probably continuing. The widening may be important for some considerations, but sensitivity analysis performed by the Instream Flow Group, USFWS indicates that the amount of bank scour will not likely have an appreciable effect on the habitat or recreation space versus streamflow relationships generated by this study (see Appendix F). Evaluation of historical data indicated that bed material has been scoured out below Buford dam to about river mile 346. However, the continued degradation of the channel is unlikely since the river channel has reached bedrock at the State Road 20 Bridge. Again, the results of this study should not be substantially affected by changes in the channel of the Chattahoochee River. Bank sloughing currently occurs between Bowmans Island and about river mile 339. The effects of modified flows within the Chattahoochee River on bank sloughing are unknown. However, since this reach of river is of relatively less value (compared with the other sections of the river) for recreation or for trout habitat, even moderate increases in bank sloughing will not have a substantial effect on overall trout habitat or recreation in the river. Bank sloughing could potentially occur between

Bowmans Island Shoals and the site of the reregulation dam if a reregulation dam is constructed. Also, estimates of the amount of channel change to be expected in this section by flow modifications are further confounded by the activities of commercial sand dredgers.

Interpretation of Results

The results of PHABSIM analyses are ordinarily presented in terms of "weighted useable area" (WUA) per some length of river. WUA is defined as the surface area of river (square feet in this report) available for either a target fish species or recreational activity. The term "weighted" refers to the way that the area calculation is made. The smallest unit of measure for the analysis, the cell within a cross section, can have a value between zero (no value) and one (maximum value). That is, a "weighted" value between zero and one is obtained for each cell. The final summed value obtained for a reach of river is thus a compilation of cells in which the habitat value of each cell is "weighted" between zero and one.

The results of this study are presented as total reach summaries (Figures 4-9 and 11-16) and also as totals for each subreach within major reaches (Appendices G-J). The summary figures present the mean weighted useable area for a length of river 1000 feet long for each of the three major reaches identified in the report (Buford Dam to the site of the proposed reregulation dam, site of of the proposed reregulation dam to headwaters of Bull Sluice Lake, and Morgan Falls Dam to the confluence with Peachtree Creek). The figures were obtained by summing all of the weighted useable areas for each subreach and then dividing

through by the total length of the major reach. This type of data presentation allows for direct comparison between reaches of different lengths. Total weighted useable area for each major reach can be obtained by multiplying the mean values by the total length of the major reach.

The results are also presented by subreach to allow assessment of different flows at specific points along the river. For example, because of channel morphometry, habitat for a lifestage of trout or potential for a particular recreational activity may be optimum along a subreach of river at a particular discharge, whereas it may be marginal for the reach considered as a whole. In some instances, the information presented in this fashion can be a useful management tool.

X Trout Habitat

General Results

The general results for trout of all life-stages for the major reaches were remarkably similar (Figures 4-6). Appendix K presents the WUA versus discharge for trout life stages on an expanded scale to allow for easier comparisons. In all cases, habitat for each species peaked at a discharge under 2,000 cfs and then declined to a minimum at the highest simulated discharges of 12,000 cfs.

The four species life-stages investigated in this report could be placed into two groups. The WUA-discharge relationships for adult rainbow trout and adult brown trout were generally similar. The WUA-discharge curve of both peaked at approximately 1,500 cfs and then declined to a minimum at 12,000 cfs. For the second group, brook trout

and juvenile brown trout, the WUA-discharge relationships peaked at or under 1,000 cfs and declined to a minimum at 12,000 cfs. In general, the amount of habitat available for adult brook trout is less than that available for either adult brown trout or adult rainbow trout.

The habitat value of the different major reaches differed significantly. The largest area of habitat for all trout species and life-stages was found below Morgan Falls Dam, primarily because of the steep stream gradient and numerous shoals that occur in this reach. The large quantity of rocks, boulders, and exposed bedrock in the shoal areas provide substantial cover for fishes.

Adult Brook Trout Habitat

Habitat for adult brook trout in the three major reaches peaked at a discharge near or under 1000 cfs (Figures 4-6). For the reregulation pool reach and below Morgan Falls Dam, habitat dropped substantially below the optimal discharge. Habitat availability as a function of discharge dropped more gradually in the reach of river between the site of the proposed reregulation dam and the headwaters of Bull Sluice Lake. Although the habitat for adult brook trout for each major reach peaked at low discharges, there were several noticable exceptions. Habitat in shoal areas, such as Jones Bridge, Island Ford, and Devils Race Course Shoals, often peaked at discharges near 1500 cfs (Appendix G).

Adult Rainbow Trout Habitat

Habitat for adult rainbow trout in the three major reaches peaked at a discharge between 1,500 and 2,000 cfs (Figures 4-6) and declined to a minimum at 12,000 cfs. The habitat available in all of the subreaches also follows the same trend. There did not appear to be major differences in the habitat-discharge relationship for this species at shoal and non-shoal areas (Appendix G). The habitat value of the major reach below Morgan Falls Dam was greater than that of the two upstream reaches, primarily because of the increased cover associated with the extensive shoals found in this reach.

Adult Brown Trout Habitat

Habitat for adult brown trout followed the same general pattern observed for adult rainbow trout, except that it peaked at a slightly lower discharge, usually around 1000 cfs. Again the habitat-discharge relationship declined from the peak at 1000 cfs to a minimum at 12,000 cfs. The habitat value of the major reach Below Morgan Falls Dam was greater than that of the two upstream reaches, primarily because of the increased cover associated with the extensive shoals found in this reach (Appendix G). There does not appear to be a major differnce in the habitat-discharge relationship among the subreaches that comprise the major reaches, although the shoal areas tend to have a more flattened peak.

Juvenile Brown Trout Habitat

The habitat-discharge relationship observed for juvenile brown trout was similar to that observed for brook trout. In general, habitat for each major reach peaked at or near a discharge of 500 cfs. The habitat value of the major reach below Morgan Falls Dam was greater than that of the other reaches, again, primarily because of the increased cover provided by the shoals (Figures 4-6). A substantial difference was noted between several of the subreaches and the values obtained for the major reaches. Habitat in the shoal areas (Devils Race Course, Island Ford, and Jones Bridge Shoals) either peaked at a discharge above 500 cfs but below 1500 cfs or the rate of decline in habitat with increasing discharge was less pronounced.

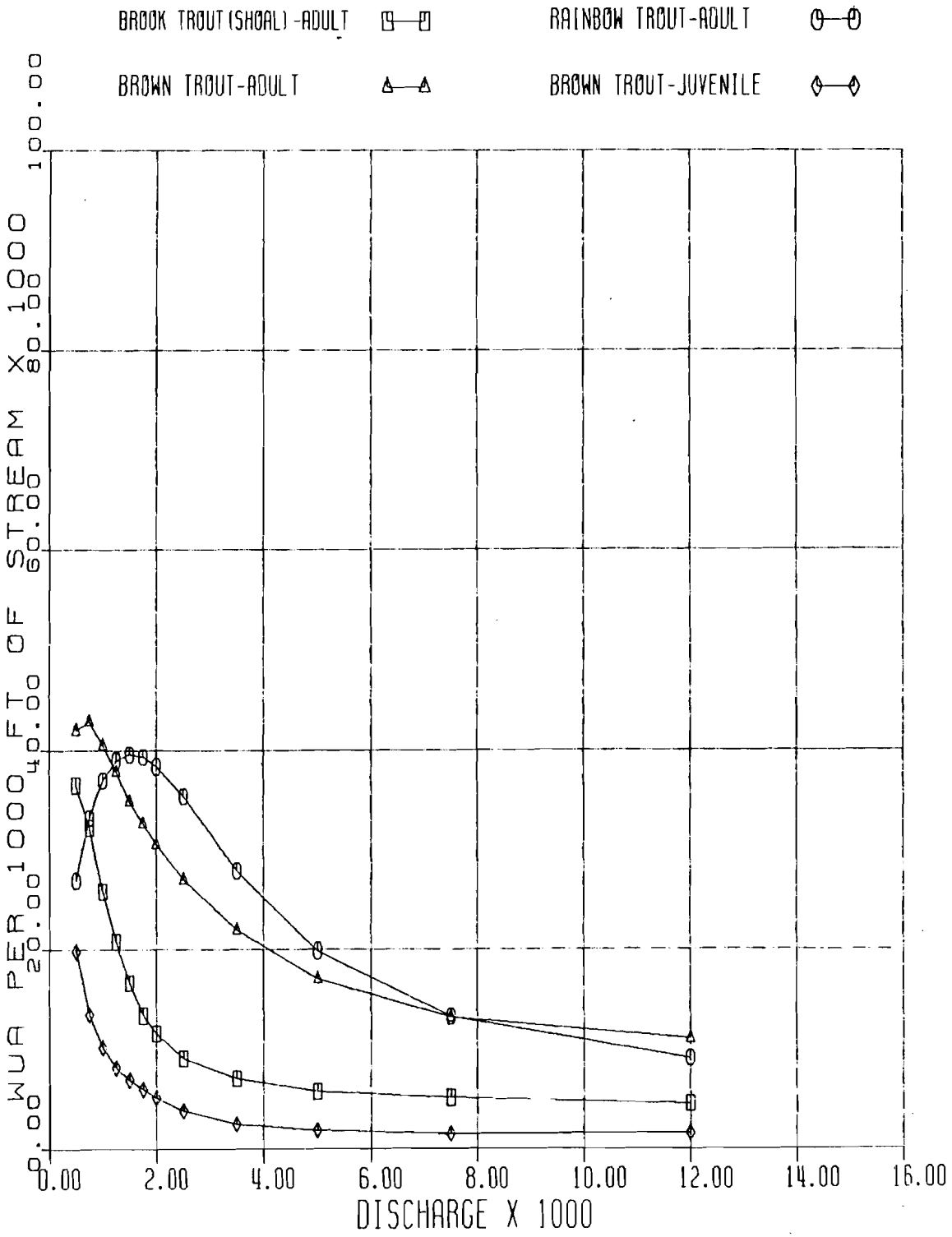


Figure 4. Relationship between WUA (presented as the average weighted useable area for 1000 feet of stream channel) and discharge for trout life stages for the major reach from Buford Dam to the site of the proposed reregulation dam.

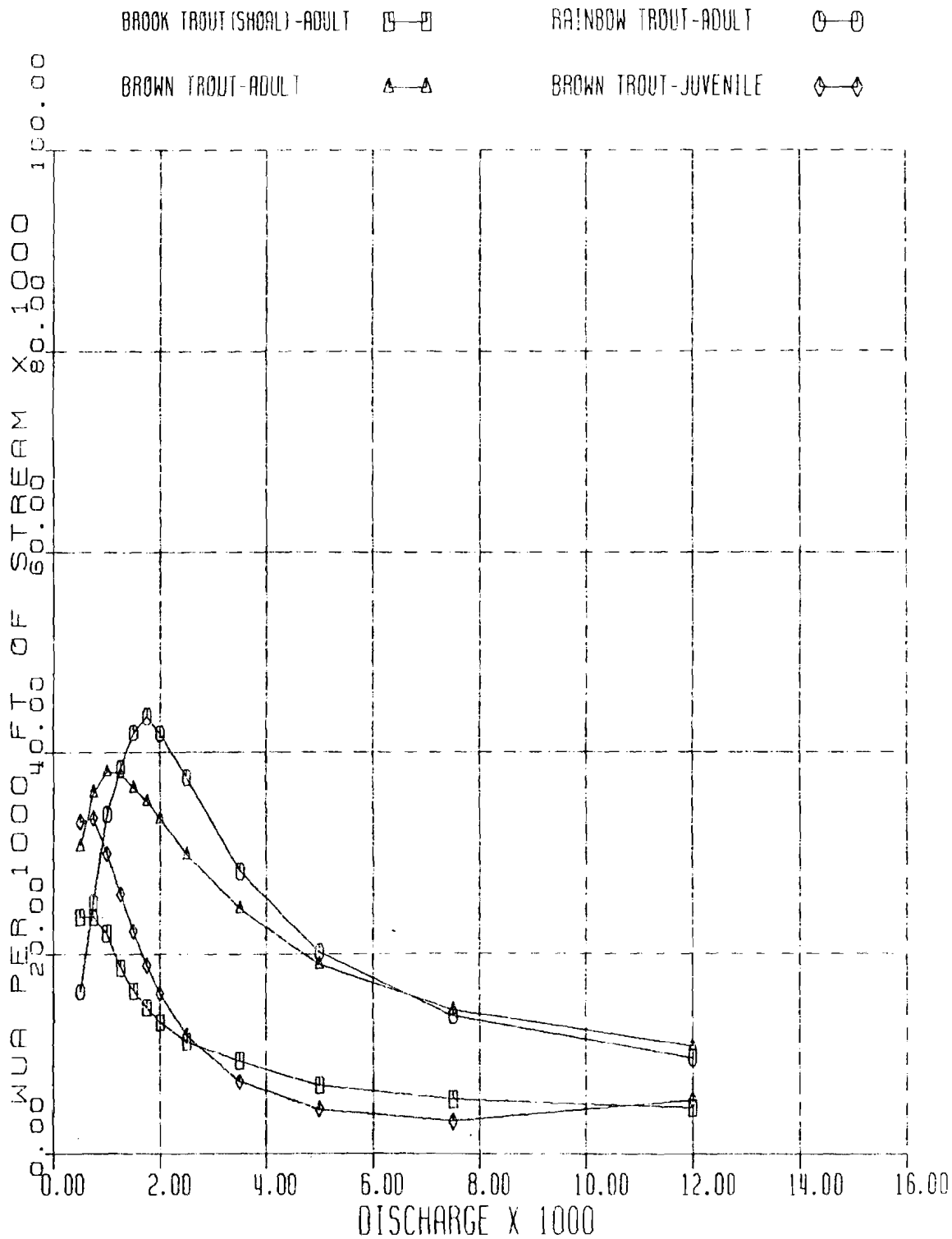


Figure 5. Relationship between WUA (presented as the average weighted useable area for 1000 feet of stream channel) and discharge for trout life stages for the major reach from the site of the proposed reregulation dam to the headwaters of Bull Sluice Lake.

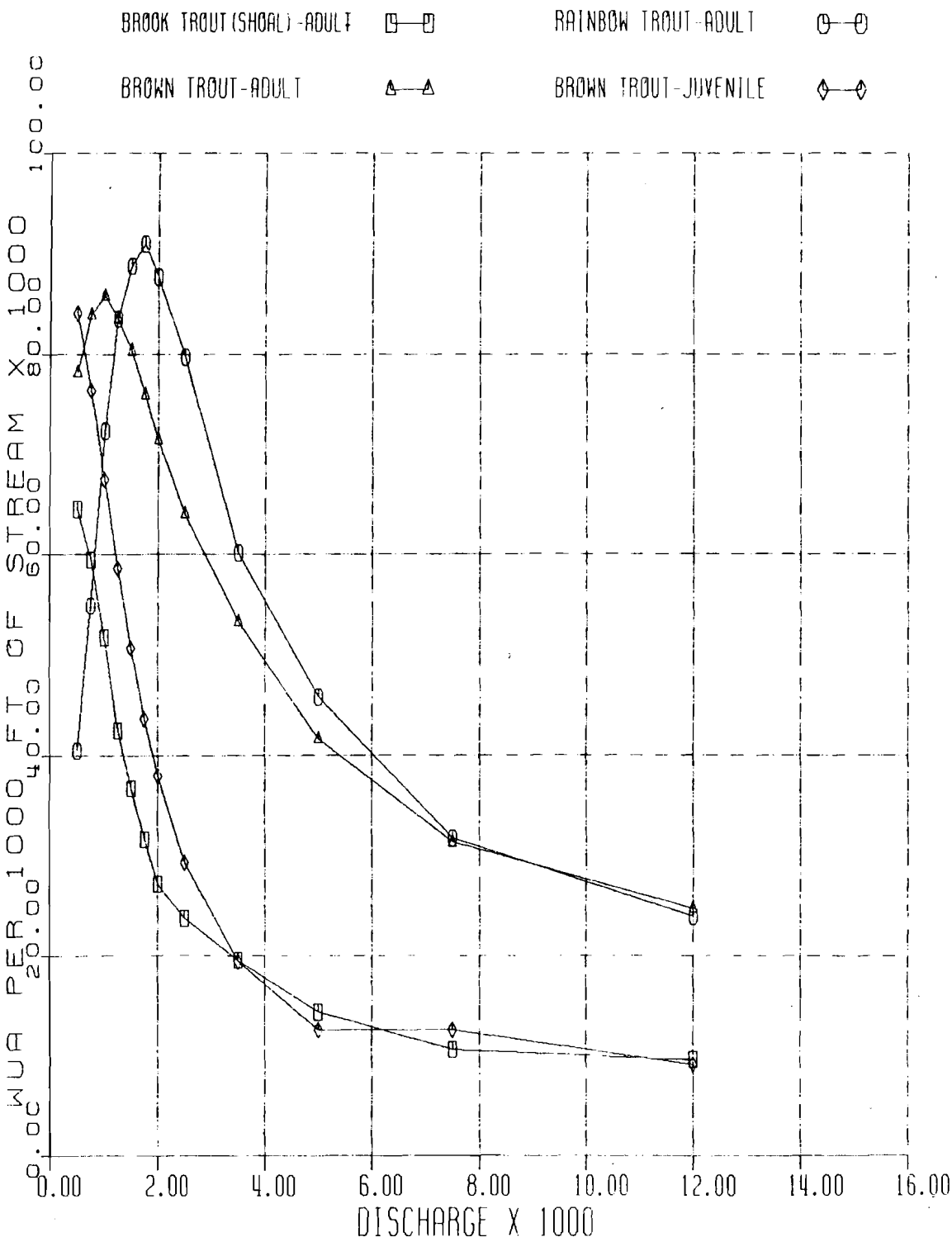


Figure 6. Relationship between WUA (presented as the average weighted useable area for 1000 feet of stream channel) and discharge for trout life stages for the major reach from Morgan Falls Dam to the confluence with Peachtree Creek.

Angling

General Results

The results obtained for angling (see figures 7-9) were not as consistent as the results obtained for trout life-stage habitat. However, angling activities can, like trout life-stages, be broadly broken into two classifications. WUA for both wade- and tube-fishing peaked at lower flows than low-power boat and non-power boat fishing. Wade- and tube-fishing both peaked at or lower than a discharge of 1000 cfs, whereas, low-power boat and non-power boat fishing peaked at a discharge greater than 1000 cfs. The peaks for all activites occurred at less than a discharge of 5000 cfs and then declined to a minimum at 12000 cfs. In all cases except tube-fishing, the highest WUA for angling activities occurred in the major reach between Morgan Falls Dam and Peachtree Creek.

Wade-fishing

WUA for wade-fishing peaked at or below 750 cfs for each of the major reaches. In each case, WUA fell rapidly from the peak to a minimum at 12,000 cfs, particularily in the case of the major reach downstream from Morgan Falls Dam to Peachtree Creek (Figures 7-9). Also, WUA for wading declined substantially with increasing discharge. In each case, WUA for wade-fishing was reduced by a factor of two at or near a discharge of 2,000 cfs compared to the peak value at the lower discharge.

Tube-fishing

The curves presented for tube-fishing are restricted to the floating phase only and do not include the wading phase of this fishing activity. Total WUA for tube-fishing can be obtained by summing the WUAs for wade-fishing and tubing. The results for tube-fishing are very similar to results presented for wade-fishing. In all cases, the optimum discharge for this activity occurs at or below a flow of 1000 cfs and WUA declines rapidly to a minimum at a discharge of 12,000 cfs. The WUA available for this activity at 2000 cfs is considerably less than at 1000 cfs.

Non-power Boat Fishing

Peak WUA for this angling activity occurs at a discharge of 1500 cfs and then drops off quickly in each of the major reaches Figures (7-9). In the major reach downstream from Morgan Falls Dam, the drop in WUA with increasing discharge is less pronounced than the drop in WUA at the other two major reaches.

Low-power Boat Fishing

WUA for low-power boat fishing increased with discharge to a peak between 2,500 and 5,000 cfs at each of the major reaches and then declined to a minimum at 12000 cfs (Figures 7-9).

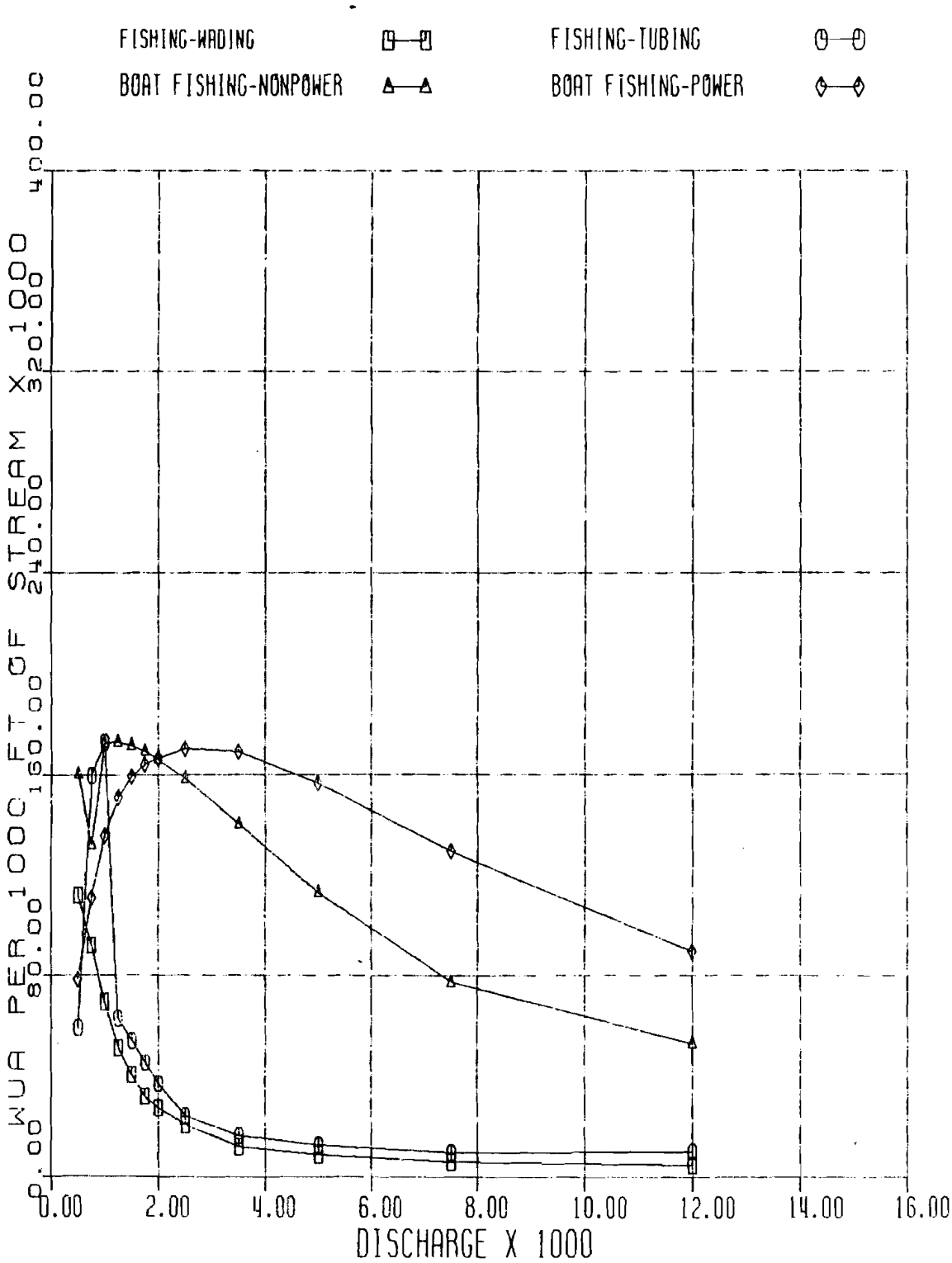


Figure 7. Relationship between WUA (presented as the average weighted useable area for 1000 feet of stream channel) and discharge for different types of angling activities for the major reach from Buford Dam to the site of the proposed reregulation dam.

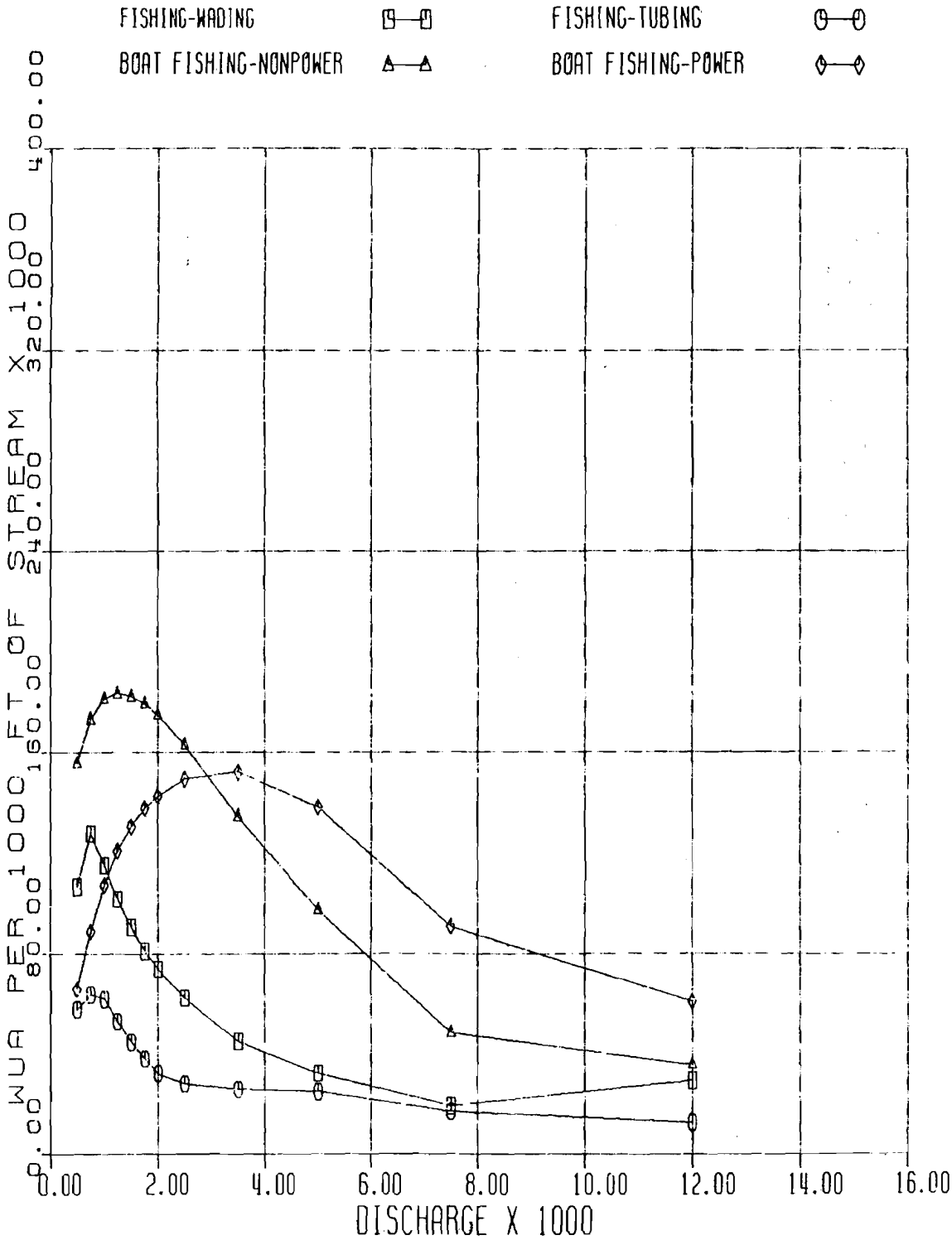


Figure 8. Relationship between WUA (presented as the average weighted useable area for 1000 feet of stream channel) and discharge for different types of angling activities for the major reach between the site of the proposed reregulation dam and the headwaters of Bull Sluice Lake.

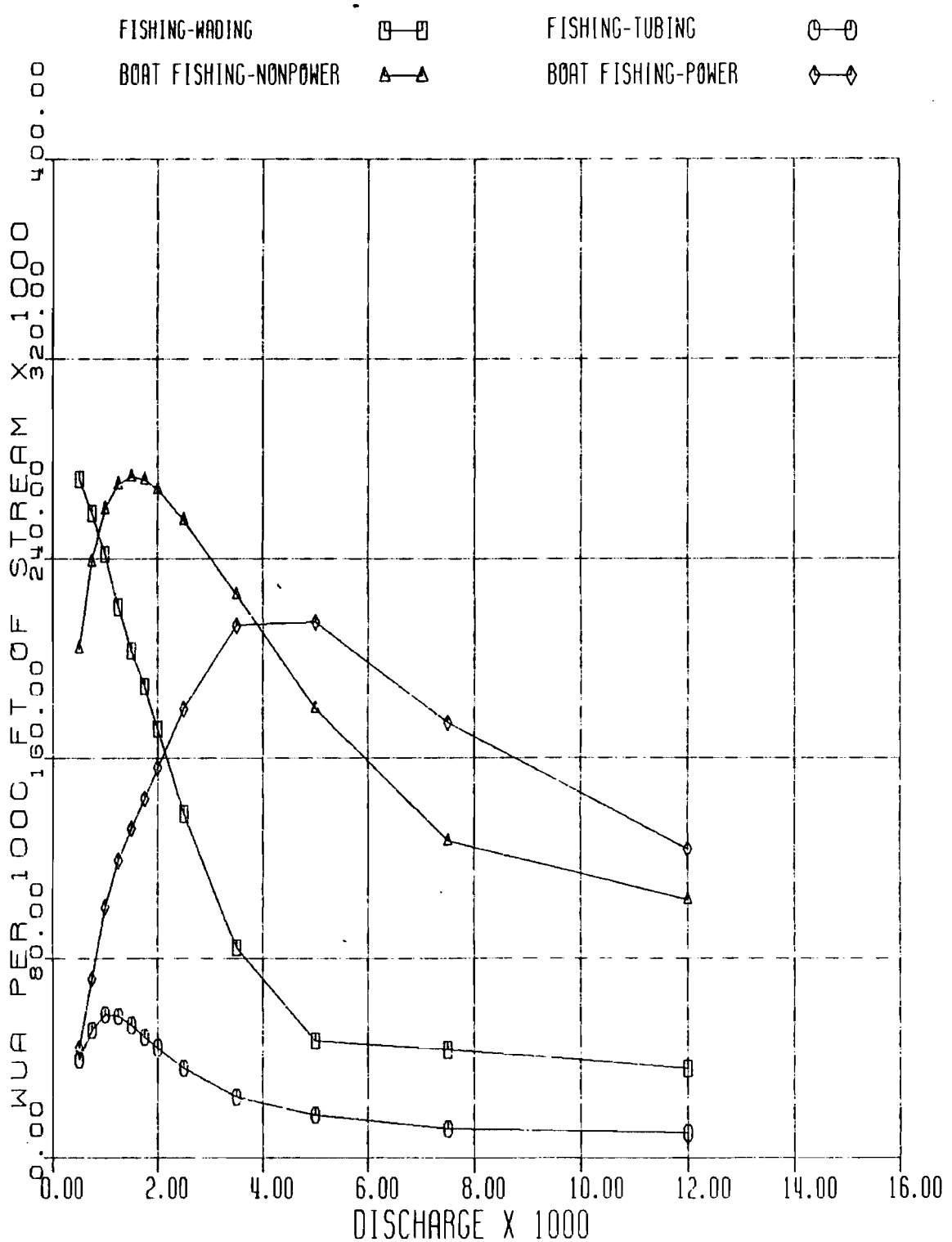


Figure 9. Relationship between WUA (presented as the average weighted useable area for 1000 feet of stream channel) and discharge for different types of angling activities for the major reach from Morgan Falls Dam to the confluence with Peachtree Creek.

Recreation

General Results

Excluding fishing, four types of recreational activities were examined in this analysis: wading, canoeing, rafting and "hanging out". Unlike the fairly consistent results obtained for fish life stages, there were no consistantly optimal flows for all recreational activities. The optimum simulated flows varied from a minimum of 500 cfs, required for raft-landing, to a maximum of 12,000 cfs, for midlevel rafting and canoeing.

The peaks in WUA for wading, "hanging-out", and raft landing (activities in which the water surface elevation is an important consideration) occur within the range of the present and anticipated flow regimes in the river (between 750 and 2000 cfs). Table 11 presents the change in water surface elevation as a function of discharge for several important reaches and can be used to estimate the effects of altered flows in the river.

Wading

The WUA-discharge relationship for water contact-wading was idenitical to the WUA-discharge relationship for wade-fishing, since both activities are based on the same depth and velocity criteria. Like wade-fishing, the amount of WUA for water-contact wading decreased substantially with increasing discharge.

Table 11. Water surface elevations (feet) at three discharge levels for the major shoal areas and Paces Mill. Water surface elevations are based on an arbitrary datum for each reach.

LOCATION	DISCHARGE (CFS)		
	1000	1500	2000
Jones Bridge Shoals (river mile 328.6)	23.66	24.15	24.54
Island Ford Shoals (river mile 319.7)	29.77	30.28	30.66
Devils Race Course Shoals (river mile 305.9)	10.16	10.74	11.21
Paces Mill (river mile 303.9)	12.04	12.58	13.08

Between 1,000 and 1,500 cfs, the percent change in WUA for wading differs greatly by major reach. From Buford Dam to the proposed rereg dam, the WUA decreases by almost one-half; however, between Morgan Falls Dam and Peachtree Creek, WUA decreases by only 17%.

The areas of greatest importance in terms of wading are the shoal areas, specifically Jones Bridge Shoals, Island Ford Shoals, and Devils Race Course and associated shoals. In all these areas, WUA increases from a discharge of 500 cfs up to a maximum of between 1000 and 2500 cfs. At Jones Bridge Shoals, the amount of WUA for wading peaks at 750 cfs but decreases relatively little until 1500 cfs. At Island Ford Shoals, WUA for wading peaks at 1250 cfs, though not until 3500 cfs does WUA drop below the amount available at 500 cfs. Finally, in the Devils Race Course Shoal area, peak WUA for water-contact wading occurs between 750 and 2500 cfs depending upon location. In all cases, however, WUA

stays close to the peak up to a discharge of about 3500 cfs, probably because the change in stage with discharge is not great (Table 11).

Paces Mill also receives some wading use, both as a separate recreational activity and also as part of raft landing activities. Although WUA at Paces Mill decreases with increasing discharge, the decrease is relatively gradual up to a discharge of about 2500 cfs.

Part of the reason for the relatively slow decrease in WUA for wading with increasing discharge at the shoal areas and at Paces Mill is related to the stage-discharge relationship. At these sites, there is an increase of only about six inches from 1000 to 1500 cfs and from 1500 to 2000 cfs (Table 11).

Rafting

Three different categories of rafting; novice-preferred, novice, and midlevel; were included to reflect the different skill levels of this user group. A fourth activity, raft-landing, was included since an important part of the rafting experience on the Chattahoochee River involves socializing with other users. Rafters often socialize by landing their rafts in the shoal areas and along the river banks. Thus, the ease with which a raft can be landed and the amount of space available for landing affect the quality of the recreational experience.

The optimum flow required for each of these rafting categories varied over the entire range of simulated flows (Figures 10-12). As could be expected, midlevel rafting requires the highest flow, while raft-landing requires the lowest. The two categories of novice rafting fall in between, relatively close to each other. For all three rafting

categories, the maximum amount of WUA is found in the major reach between Morgan Falls Dam and Peachtree Creek.

Raft-Landing. The WUA for landing decreases as discharge increases since raft landing requires relatively shallow water and low velocities. The decrease in WUA with increasing discharge is rapid as increasing depth and velocity render the shallow areas and shoals unuseable. Once discharge reaches 2,000 to 3,000 cfs, however, WUA remains relatively constant as only the shoreline is available for raft landing and the shoal areas become unuseable.

The greatest amount of WUA at low flows is found in the shoal areas, hence the section from Morgan Falls Dam to Peachtree Creek offers the greatest WUA of the three major reaches. The least amount of WUA occurs in the major reach from Buford Dam to the proposed rereg dam, probably because of the narrower channel and steep banks.

Much of the raft-landing activity takes place at Paces Mill, where many rafters conclude their rafting trip and return the rented rafts to the concessionaire. Landing is facilitated at this location by a large sand/gravel bar at the end of the boat ramp. The WUA for raft-landing in this location decreases substantially from 500-1000 cfs (which is generally below present minimum flows in the channel). Above this discharge, however, WUA decreases only slightly to a discharge of about 2500. These results can be explained by reference to the cross section taken immediately downstream of the raft ramp and across the sand/gravel bar (Appendix A, river mile 303.9), where most raft landing activity occurs. The sand/gravel is exposed up to a discharge of 1500 cfs and half-exposed at a discharge of 2000 cfs. The inflection point in the rate of decline for the WUA-discharge relationship occurs at the

discharge where the stage begins to encroach on the sand/gravel bar.

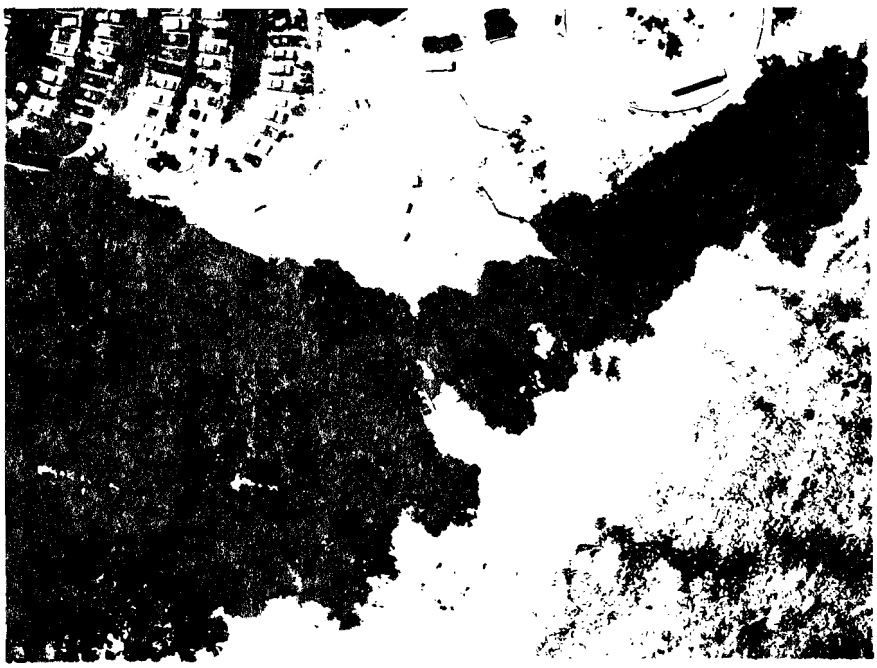
Aerial photography of the sandbar at different discharges supports the conclusions drawn from the PHABSIM analysis. Photographs taken at 1050 cfs and 1500 cfs indicate little change in the surface area of the sandbar available for raft landing (Figure 10). Also, there is only about a 12 inch increase in stage between 1000 to 2000 cfs (Table 11) providing further evidence that raft-landing at Paces Mill would not be substantially affected by flows between 1000 to about 2000 cfs.

Novice Rafting (Preferred). As discharge increases, the WUA for novice-preferred rafting increases to a maximum and then decreases rapidly. In the major reach from Buford Dam to the proposed rereg dam, this maximum occurs at a discharge of 1250 cfs; while at the major reach from Morgan Falls Dam to Peachtree Creek it occurs at a higher discharge, 1,750 cfs. The peak in WUA at the remaining major reach, between the site of the reregulation dam and the headwaters of Bull Sluice Lake, occurs at a discharge near 1500 cfs.

Novice Rafting. The general shape of the WUA-discharge curves for novice rafting are similar to those presented for novice preferred. However, the maximum WUA occurs at much higher discharges and the curves fall off less steeply following the peaks.

Mid-level Rafting. In all three reaches, WUA for mid-level rafting increases as discharges increase. However, the high flow requirement for optimum midlevel rafting is probably somewhat misleading, since at the higher flows most of the shoal areas are completely submerged. Thus, the river surface is slick and the experience of rafting through a diversity of hydaulic conditions is gone.

1500 CFS



1050 CFS

Figure 10. Comparison of the sand/gravel bar at Paces Mill at staged flows of 1050 and 1500 cfs.

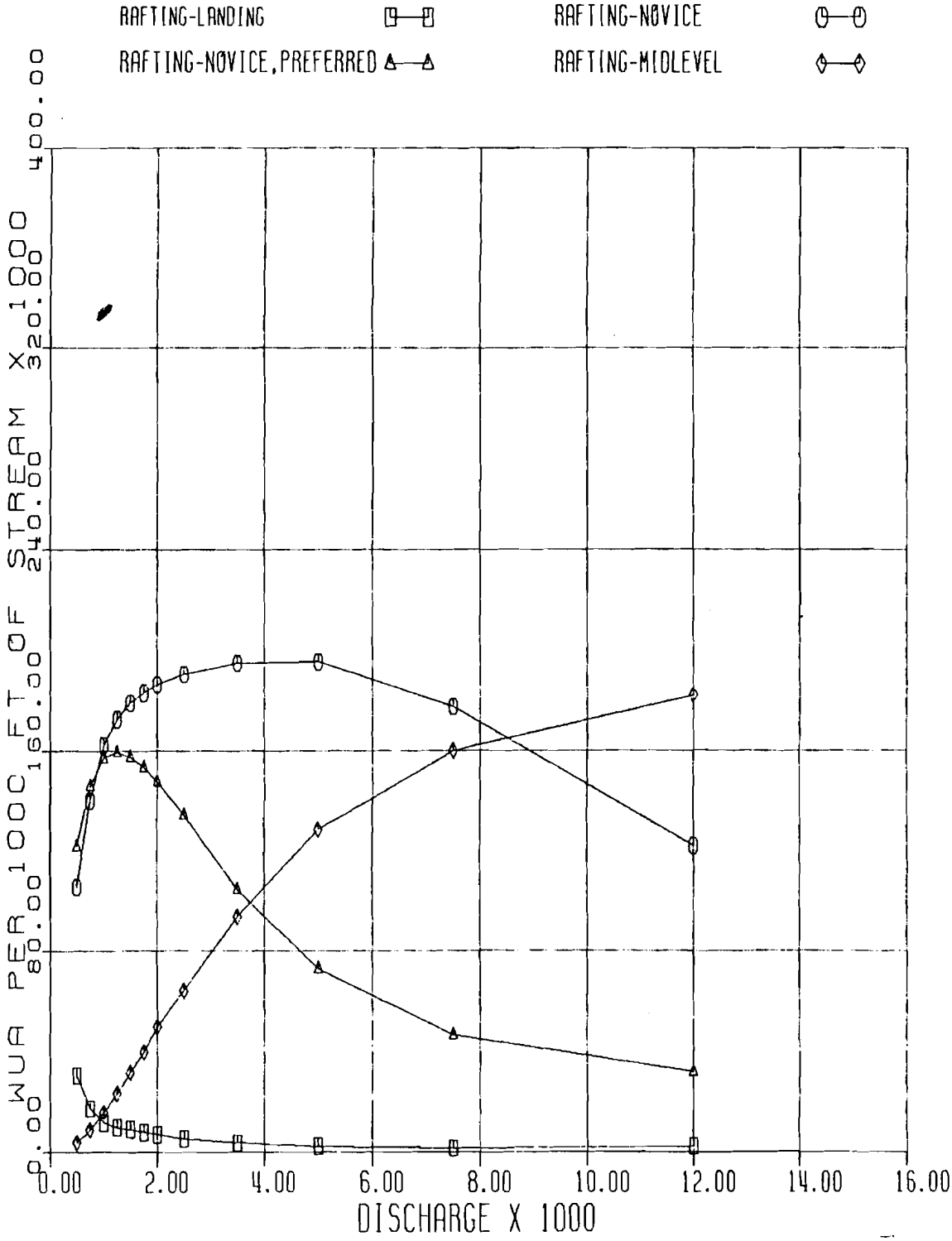


Figure 11. Relationship between WUA (presented as the average weighted useable area for 1000 feet of stream channel) and discharge for different types of rafting activities for the major reach from Buford Dam to the site of the proposed reregulation dam.

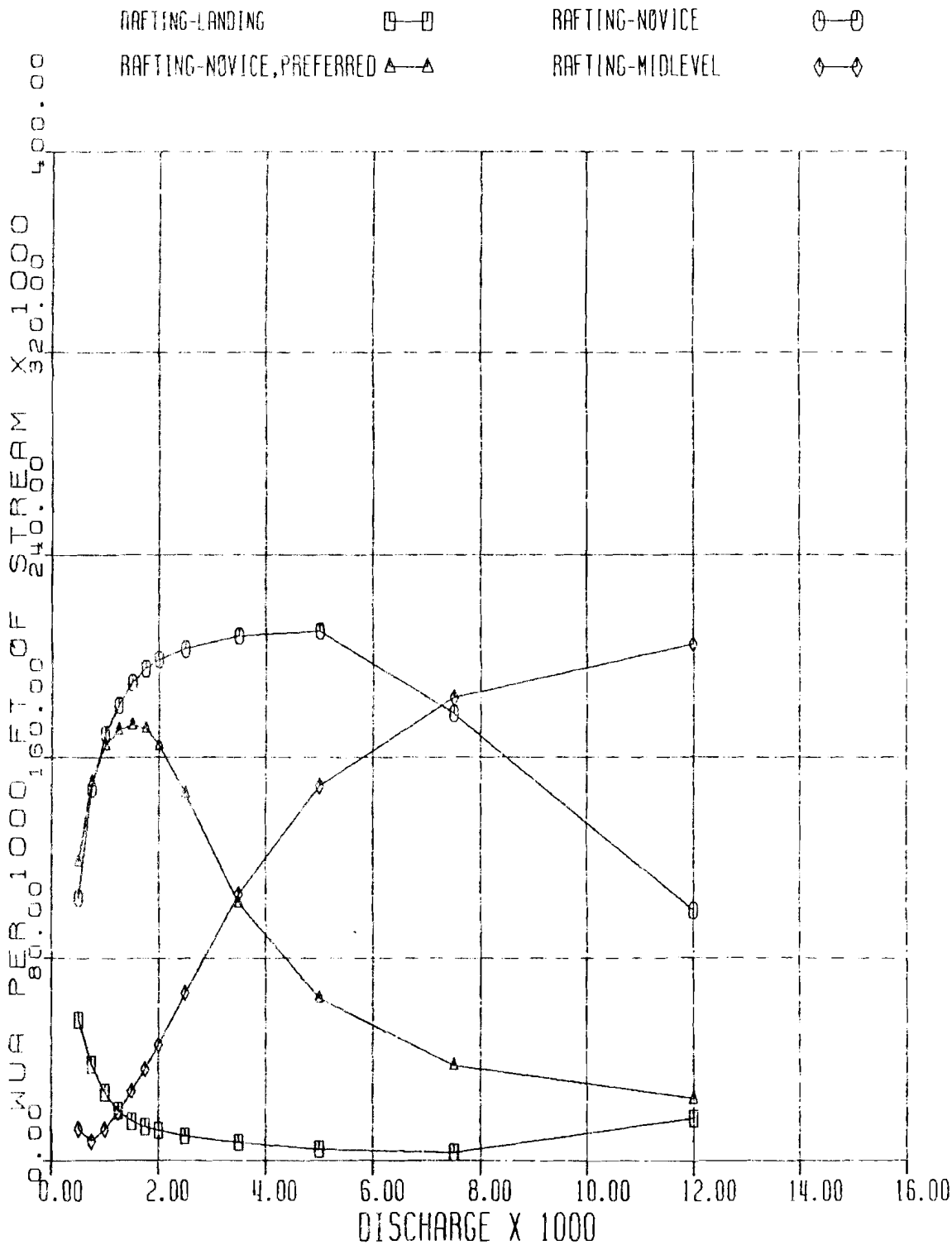


Figure 12. **Relationship between WUA (presented as the average weighted useable area for 1000 feet of stream channel) and discharge for different types of rafting activities for the major reach between the site of the proposed reregulation dam and the headwaters of Bull Sluice Lake.**

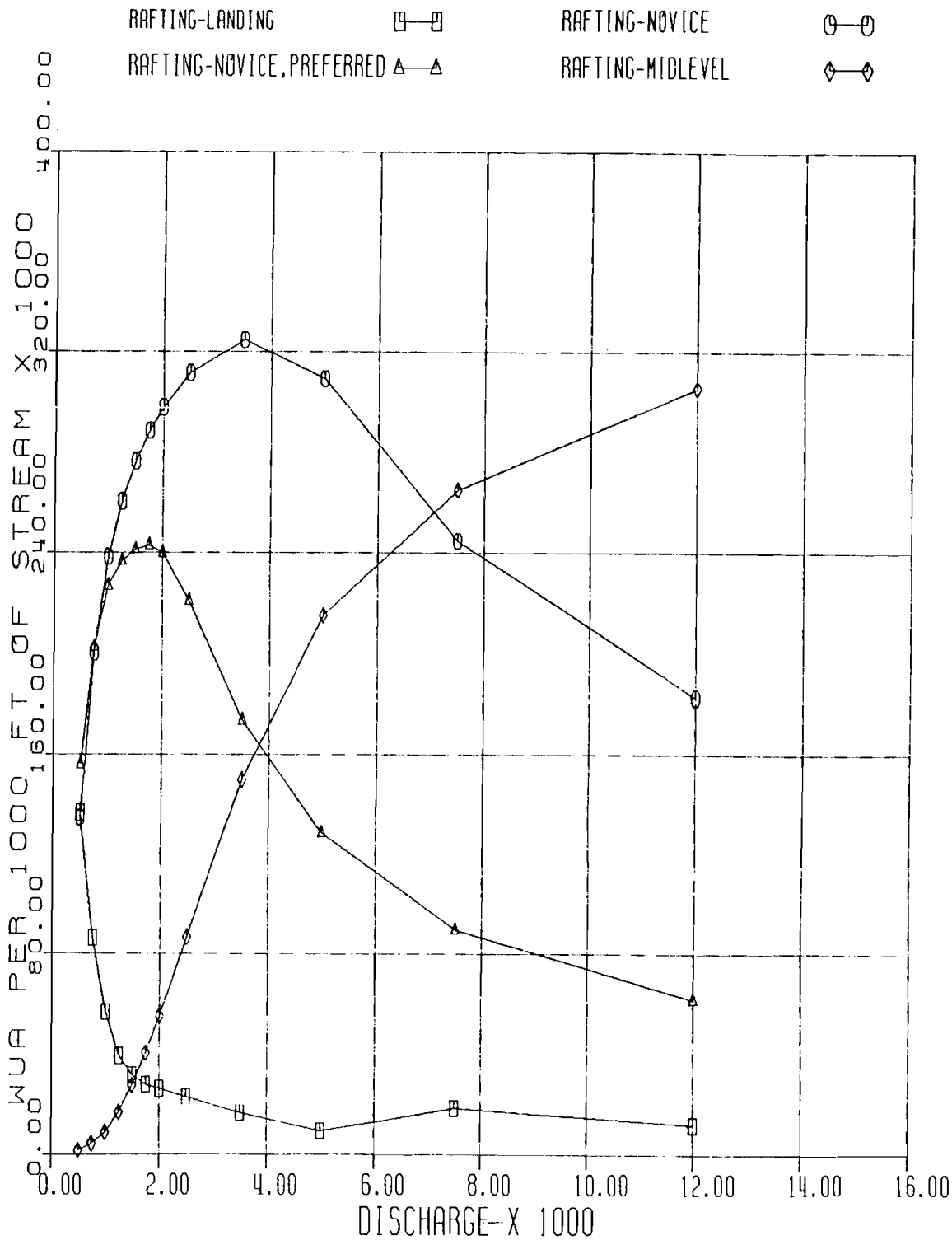


Figure 13. Relationship between WUA (presented as the average weighted useable area for 1000 feet of stream channel) and discharge for different types of rafting activities for the major reach from Morgan Falls Dam to the confluence with Peachtree Creek.

Canoeing

General Results. As with rafting, canoeing was divided into novice and midlevel categories to reflect the different skill levels of canoers. Again, WUA for the novice category is optimal at discharges lower than the mid-level category (Figures 14-16). The maximum WUA for both novice and mid-level canoeing occurs between Morgan Falls and Peachtree Creek. For two of the cross sections, river mile 305.11 and 305.44, WUA for canoeing does not rise above zero until a discharge of 1250 cfs is reached, indicating that low flows may significantly impede canoeing. This result reflects the experience of members of the CRIFS team when they canoed and boated through the shoals on the river. Passage of canoes through some of the shoal areas was difficult at the lower discharges.

Novice Canoeing. The optimum WUA for novice canoeing on all three major reaches occurs between 1,500 cfs (Buford Dam to the site of the proposed reregulation dam) and 2,000 cfs (Morgan Falls Dam to Peachtree Creek).

Mid-Level Canoeing. In all three major reaches, WUA for midlevel canoeing increases substantially as flows increase until a flow of about 7000 cfs is reached. Although increasing discharges provide for more WUA for mid-level canoeing, canoers using the river at the very high flows will encounter the same lack of diversity in river hydaulic conditions as noted for midlevel rafting as the shoal areas are covered by the rising water.

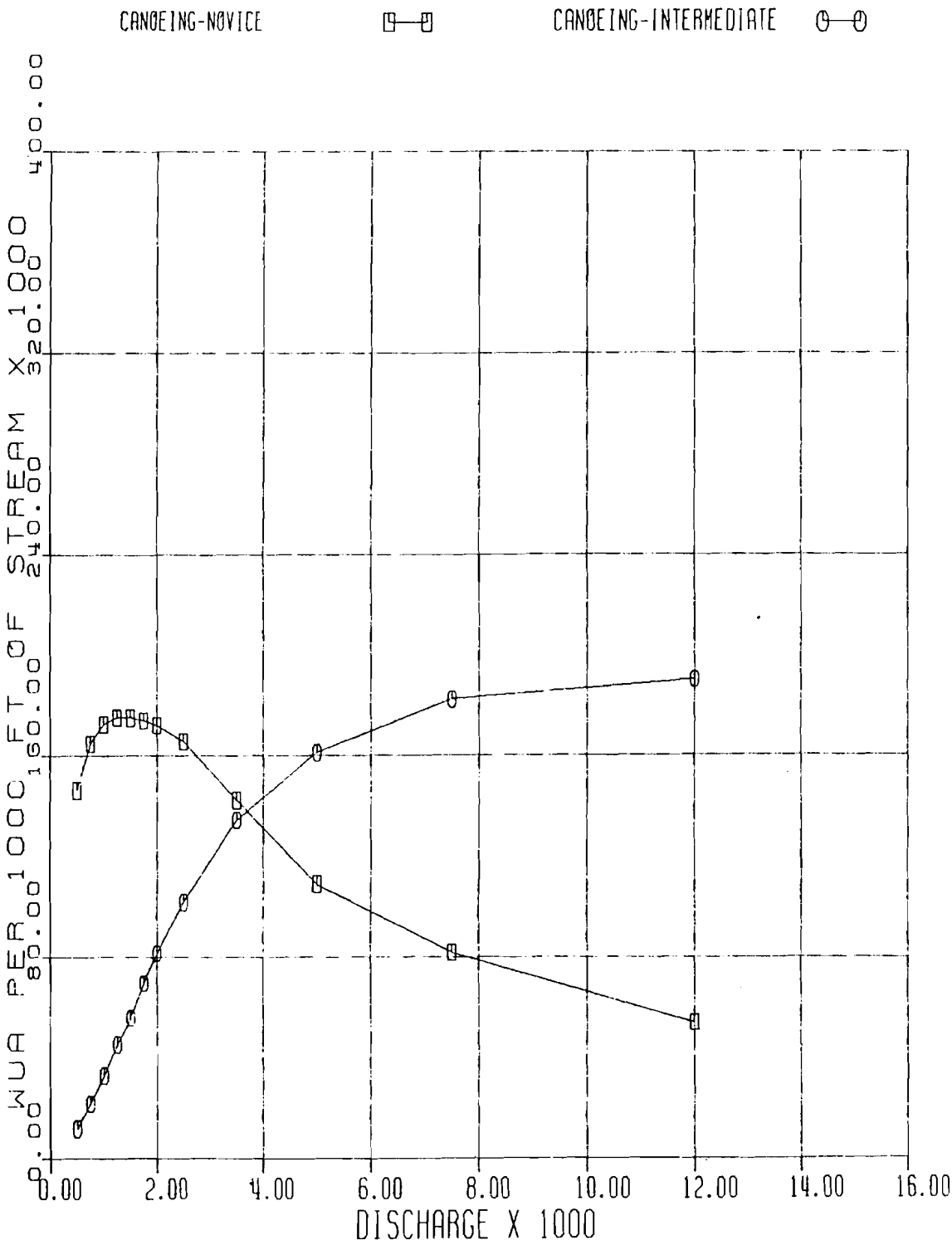


Figure 14. Relationship between WUA (presented as the average weighted useable area for 1000 feet of stream channel) and discharge for novice and midlevel canoeing for the major reach from Buford Dam to the site of the proposed reregulation dam.

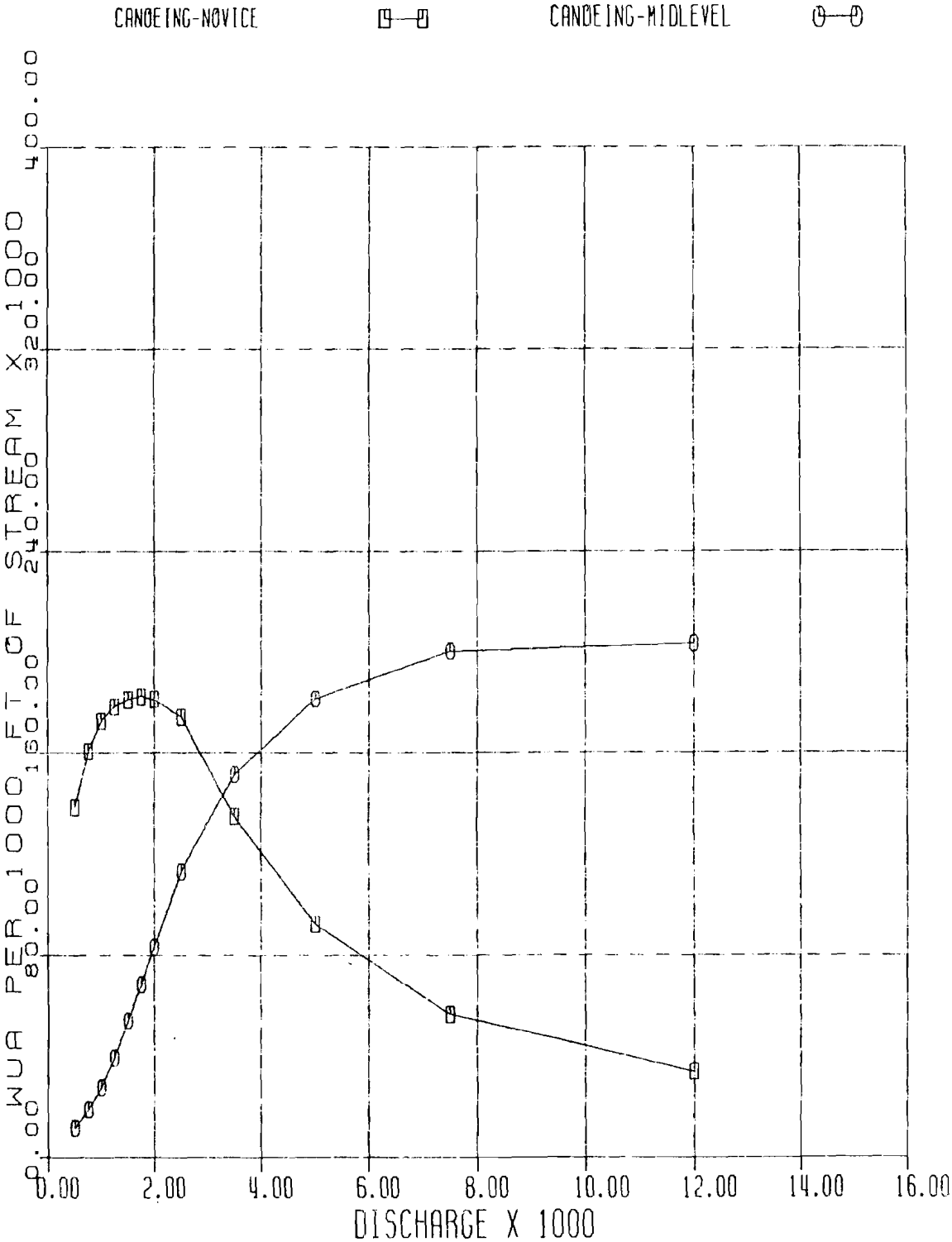


Figure 15. Relationship between WUA (presented as the average weighted useable area for 1000 feet of stream channel) and discharge for novice and midlevel canoeing for the major reach between the site of the proposed reregulation dam and the headwaters of Bull Sluice Lake.

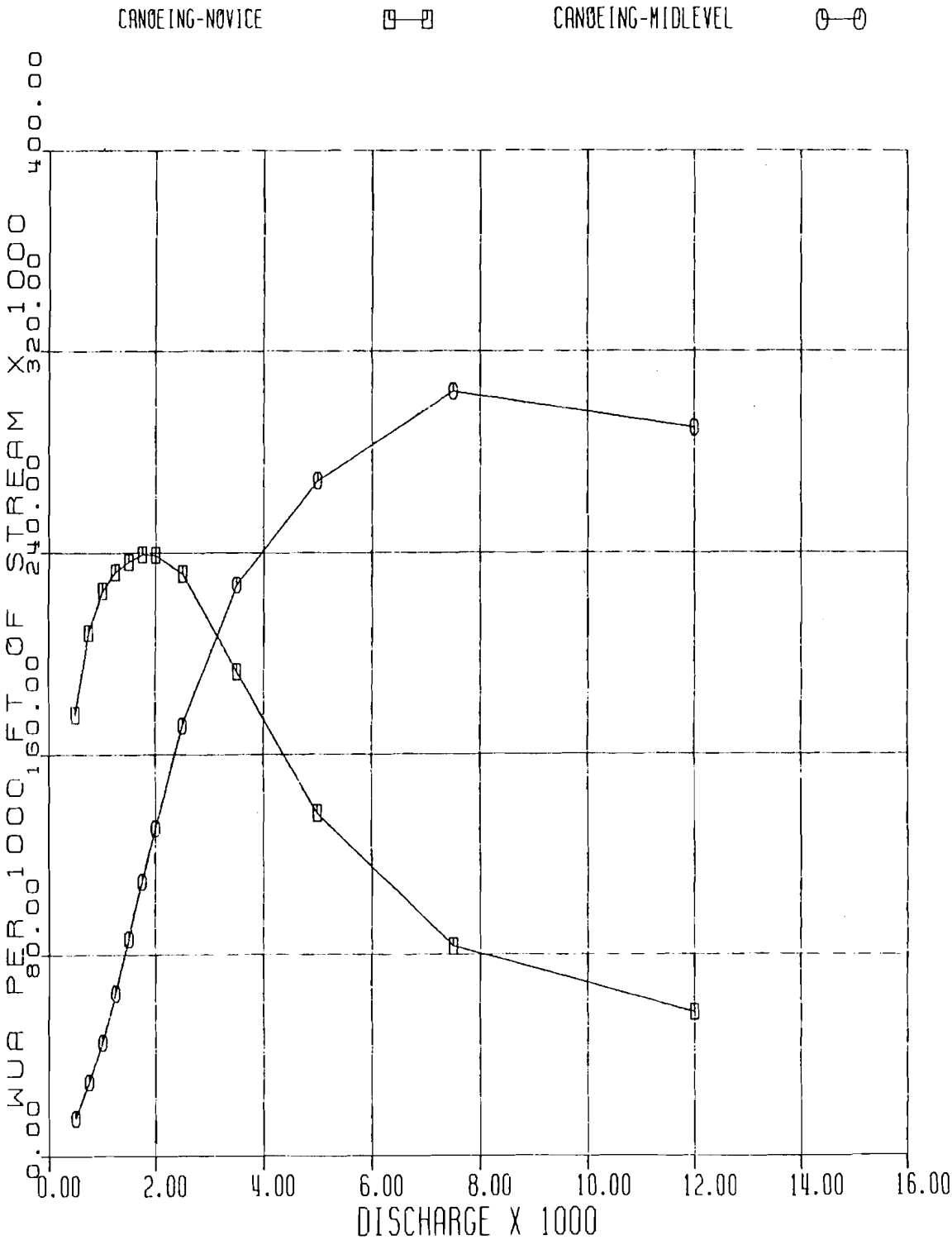
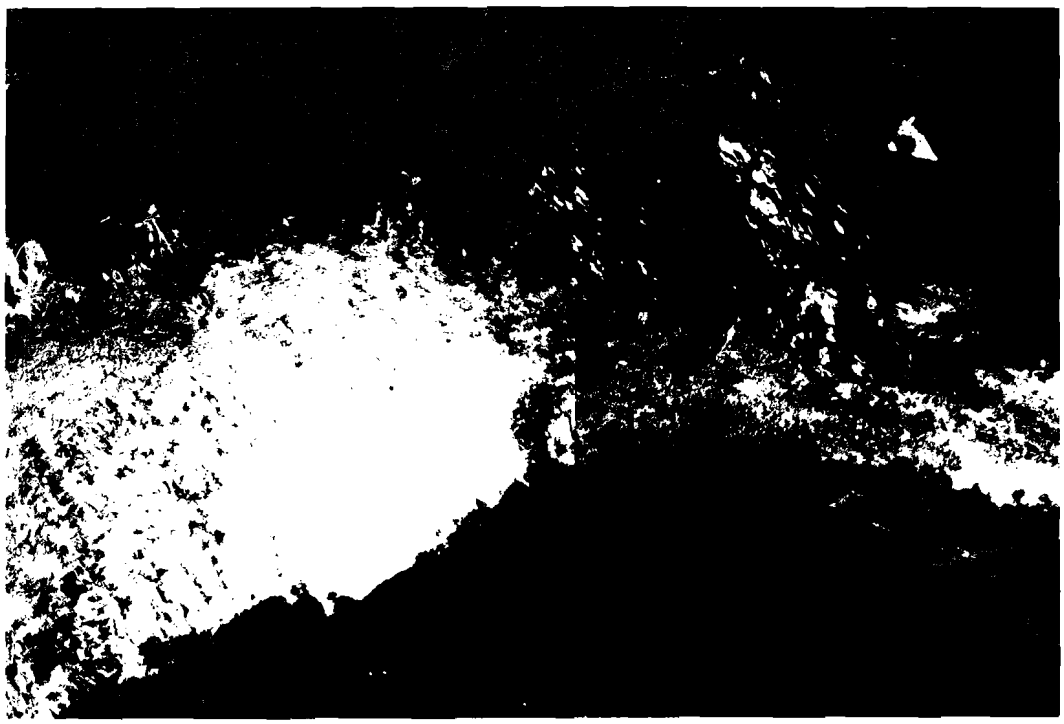


Figure 16. Relationship between WUA (presented as the average weighted useable area for 1000 feet of stream channel) and discharge for novice and midlevel canoeing for the major reach from Morgan Falls Dam to the confluence with Peachtree Creek.

Hanging-out. "Hanging-out" is accommodated both on the banks of the river and on the rocks in the shoal areas. Bank use is relatively unaffected by changes in discharge, except perhaps that access to bank hanging-out sites from the river becomes more difficult because raft-landing becomes increasingly more difficult at the higher flows. Use of emergent rocks for "hanging-out" will be affected by increases in discharge both because the rocks become covered by the rising water and because flows increase to the point that landing a raft or canoe becomes difficult. The results of this study indicate that there is relatively little change in available "hanging-out" area on the rocks at the lower flows. Comparison of aerial photographs of the river downstream from Morgan Falls Dam taken at a discharge of 1050 and 1500 cfs indicate no noticeable difference in the amount of rock surface area available for "hanging-out" (Figure 17).



1500 CFS

1050 CFS

Figure 17. Aerial photograph of a shoal area in the major reach downstream of Morgan Falls Dam taken at staged flows of 1050 and 1500 cfs.

Travel Time and Average Velocities. The results of the calculation of relative travel time are given in Table 12 as a ratio of the travel time expected for a discharge of 1000 cfs. Thus, a discharge of 2000 cfs compared to the reference discharge of 1000 cfs would probably shorten a float trip from Morgan Falls to Peachtree Creek by a factor of 0.71. This table can also be used to calculate the travel time at a discharge for which the travel time is unknown. For example, if the travel time from Powers Landing to Paces Mill is 5 hours at a discharge of 1250 CFS, then the travel between the same two points at 3500 cfs is

TIME (AT 3500 CFS)=(5 HOURS) x 0.48/0.88=2.7 HOURS

The velocities used to calculate relative travel time are provided in Appendix L. Relative travel times for the Chattahoochee River between Morgan Falls Dam and Peachtree Creek are provided in Figure 18.

Table 12. Relative travel time in the Chattahoochee River downstream of Buford Dam and upstream of Peachtree Creek. The reference discharge is 1000 cfs.

FLOW (CFS)	UPSTREAM OF SR20 BRIDGE	SR 20 TO MEDLOCK BRIDGE	MEDLOCK BR. TO BULL SLUICE L.	MORGAN FALLS TO POWERS IS.	POWERS IS. TO PACES MILL	MORGAN FALLS TO PEACHTREE CREEK
500	1.59	1.50	1.53	1.35	1.49	1.40
750	1.22	1.16	1.21	1.13	1.17	1.14
1000	1.00	1.00	1.00	1.00	1.00	1.00
1250	0.86	0.89	0.86	0.90	0.88	0.89
1500	0.76	0.82	0.76	0.83	0.79	0.82
1750	0.70	0.76	0.69	0.78	0.72	0.76
2000	0.64	0.71	0.63	0.73	0.67	0.71
2500	0.56	0.64	0.55	0.66	0.58	0.64
3500	0.46	0.54	0.44	0.57	0.48	0.54
5000	0.39	0.46	0.35	0.48	0.38	0.45
7500	0.33	0.38	0.28	0.41	0.29	0.37
12000	0.28	0.32	0.23	0.34	0.21	0.30

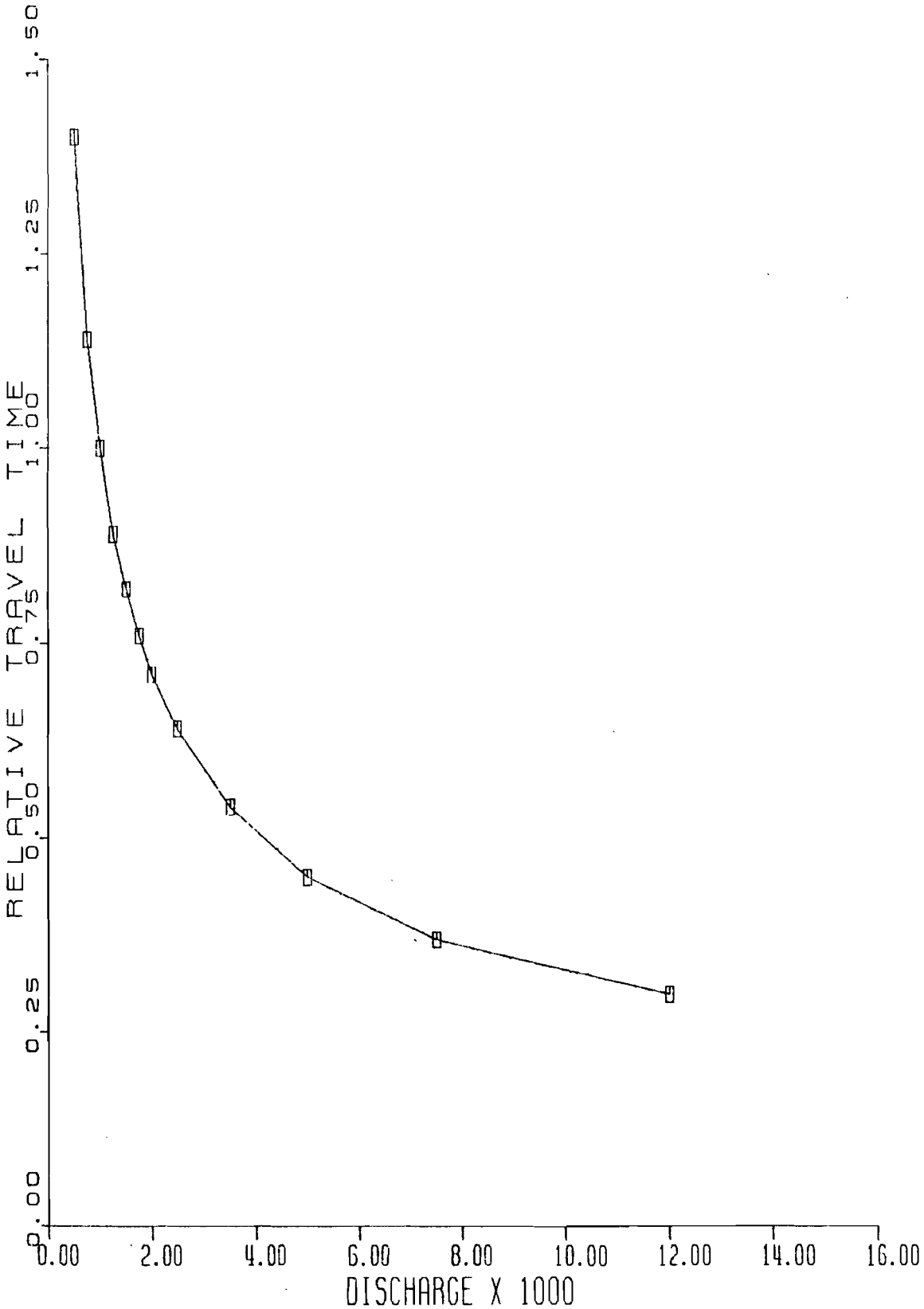


Figure 18. Relative travel time in the Chattahoochee River from Morgan Falls Dam to Peachtree Creek. Reference discharge is 1000 cfs.

PART IV DISCUSSION

Comparison and Evaluation of Reaches

The 48 mile reach of the Chattahoochee River investigated in this study may, at any one time, be subjected to different flow regimes along its length both presently and in the future because of:

> local inflows and withdrawals.

> the time of travel required for flows to move through the system. For example, a release optimum for angling in the most upstream major reach may not travel to the lower reach until the following night.

> the operation of Morgan Falls Dam.

> the potential construction of a reregulation dam below Buford Dam.

The potential for differences in flow to occur along the length of the river requires a prioritization of the major reaches of the river to ensure that management plans developed for the system are targeted to the most valuable portions of the river. The following paragraphs prioritize the three major reaches identified in this study. It must be emphasized that just because a major reach receives the lowest priority does not mean that is of no value. Rather, it means that in a situation where a target cannot be simultaneously optimized in each major reach then the target should be optimized in the major reach of highest priority.

Trout Habitat

The best habitat for trout is concentrated in the shoal areas of the river. The major reach downstream of Morgan Falls Dam to Peachtree Creek provides the most valuable habitat because it is composed of the highest percentage of shoals (nearly 40 %). In addition, the habitat requirements of trout-food organisms are similar to the habitat requirements of trout; thus, these shoal areas are also valuable from the standpoint of trout food production.

The other two major reaches are not composed of the same high percentage of shoal area as is the most downstream reach. Thus, from both a habitat and fish-food production standpoint, the reach from Buford Dam to the site of the proposed reregulation dam and the reach between the headwaters of Bull Sluice Lake and the site of the proposed reregulation dam should be of a lower priority.

Two areas of prime habitat, Jones Bridge Shoals (river mile 328.6) and Island Ford Shoals (river mile 319.5) occur within the major reach between the site of the proposed rerergulation dam and the headwaters of Bull Sluice Lake. Additional short shoal areas, particularly downstream of Medlock Bridge, also provide habitat for trout. These shoal areas warrant special consideration in the development of a management plan for the Chattahoochee River. Although the Chattahoochee River from the site of the reregulation dam to Medlock Bridge has less trout habitat than the other reaches, it does support some angling activity, particularily where trout are stocked, and provides some habitat for trout.

The major reach between Buford Dam and the site of the proposed reregulation dam contains one shoal area immediately downstream of the dam, Bowmans Island Shoals (river mile 347.5). This shoal area provides optimum trout habitat on a seasonal basis when water quality is not limiting. This reach is, however, relatively short (less than one mile long). Several additional small shoal areas are also found elsewhere in this major reach.

Angling

Angling is concentrated at areas where access is provided and where trout are abundant. Trout are abundant in the shoal areas because of increased cover and food production and in areas where they are routinely stocked. Again, like trout habitat, much angling is concentrated at the shoal areas, which are most prevalent in the reach downstream of Morgan Falls. This reach is nearest population centers, thus reducing the travel time of fishermen, and has a number of access points. Trophy brown trout are occasionally taken in the reach downstream of Morgan Falls Dam. From the standpoint of trout habitat, and perhaps potential wade-fishing oppurtunities, the most valuable reach is the lowest major study reach.

Of the remaining two major reaches, the reach between the site of the proposed reregulation dam and the headwaters of Bull Sluice Lake is the next most significant because of the presence of two extensive shoal areas, Jones Bridge Shoals and Island Ford Shoals, and other small, localized shoal areas. The shoal areas are popular for wade- and tube-fishing. Although the non-shoal portions of this reach do not

provide the quality trout habitat provided by the shoal areas, they do receive considerable fishing pressure by bank and boat fishermen at points in the reach where catchable-sized trout are stocked. Changes in stocking practices in the three major reaches could potentially provide alternate angling opportunities.

The major reach between the site of the proposed reregulation dam and Buford Dam should receive the lowest priority for angling since total habitat for trout is less. Only one relatively short (about one mile long) shoal area, Bowmans Island Shoals, occurs in this major reach.

Recreation

The reach between Morgan Falls Dam and the confluence with Peachtree Creek is the most important of the major reaches for supporting non-angling recreation. A number of factors contribute to the importance of this major reach. The extensive shoal areas that characterize this major reach are a popular place for rafters and canoers to land their vessels, congregate, and socialize. This major reach is in proximity to many potential users, since it is nearer to metropolitan Atlanta than the other two major reaches. A number of parks are available to facilitate access to the river. Additionally, several major apartment complexes provide shoreline access to residents. Concessionaire facilities at several of the parks in this major reach provide users with raft rentals, shuttle bus service, and other support facilities.

The reach between the site of the proposed reregulation dam and the headwaters of Bull Sluice Lake is the next most important in terms of non-angling recreation. Again, the presence of two extensive shoal areas, Jones Bridge Shoals and Island Ford Shoals, provide an area suitable for wading, swimming, rafting, and canoeing, although the support facilities are not as extensive, particularily at Island Ford Shoals. Future demand for and use of these resources can be anticipated with growth of the surrounding populations and the potential for displacement of users from the most downstream major reach because of overcrowding. Some development is now occurring in this major reach which will provide additional recreational facilities and access.

The major reach between the site of Buford Dam and the site of the proposed reregulation dam should receive the lowest priority for non-angling recreation. The natural resource settings, river conditions, and lack of support facilities here are less conducive to non-angling recreational use than at the other two reaches. This major reach does have potential for development since the National Park Service manages a large section of land at the northern end.

Effects of Flow Alterations

Efforts to meet the projected water supply needs for the metropolitan Atlanta area, primarily by increasing the current minimum flows in the river, will impact fish habitat, angling, and recreation. The following paragraphs describe the effects of flow alterations on these beneficial uses of the river.

Trout Habitat

The potential effects of flow alterations in the Chattahoochee River can be broadly classified as fish habitat modifications resulting from changes in depths and velocities, water quality changes caused by construction of the proposed reregulation dam (operation of a reregulation dam will slow the travel time of water through the system thereby resulting in more warming of the water and increased water temperatures over current conditions), changes in cover in the channel, and changes in the channel itself (i. e. bank sloughing).

Under current operating conditions, trout habitat at any point within the entire study length of the Chattahoochee River varies between optimum and near-optimum at the lower flows (550 to 1050 cfs, depending upon location in the river) to a minimum at the higher discharges (near 10,000 cfs depending upon discharge from Buford Dam and local inflows). Additionally, habitat can vary from a maximum to a minimum several times in a 24 hour period. Thus, fish habitat may be optimal for much of the day and minimal for several hours. Under the proposed revised operating schedule, the minimum in habitat that occurs on a daily basis will be eliminated and the overall flow regime will more nearly approximate the optimum flow required by the four trout life-stages. The benefit to the fishery obtained by this change is difficult to quantify because relative difference in habitat value between a steady flow and a fluctuating flow cannot be defensibly quantified, although from a qualitative standpoint considerable information exists suggesting that daily fluctuating flows are more detrimental to fishes than steady flows. In addition, steady flows in the river will be more conducive to

increased primary (algae and aquatic macrophytes) and secondary (aquatic macroinvertebrates) production than the fluctuating flows. Neither aquatic vegetation nor aquatic macroinvertebrates will be subjected to alternate scour and stranding by fluctuating water levels under the revised operations to meet water supply needs. From a fish habitat standpoint, the revised flow in the river obtained by eliminating the peak flows associated with demand for power will be beneficial for the reaches downstream of the site of the proposed reregulation dam, assuming that detrimental water quality conditions do not occur.

The fish habitat benefits derived from flow alterations vary somewhat by lifestage. The habitat available for juvenile brown trout and adult brook trout is negligible at the discharges above 4,000 cfs. Thus the elimination of the daily peaking flows would be of considerable benefit to the habitat available to these two species. This is particularly true if the success of these two lifestages is limited by the lack of habitat at the high daily discharges. This may, in fact, be the case based on discussions with representatives of the Georgia Game and Fish Division. Brook trout are not stocked in appreciable numbers since this species has not provided the return rate (harvest) of rainbow and brown trout. Juvenile brown trout are stocked in the Chattahoochee River below Morgan Falls Dam. Based on the PHABSIM analysis presented in this report, habitat at a higher flow (1000-1500 cfs) is available at the shoal areas. An upward shift in the current minimum low flow to a more constant release may cause an overall moderate decline in habitat available at the lower discharges since both of these lifestages have optimum habitat at a discharge lower than 1000 cfs in all of the major

reaches. However, since the optimum is somewhat higher in some of the subreaches, particularily in the widest shoal areas, some areas of good habitat will be available at discharge above the current minimum flow.

Firm conclusions concerning the effect of flow modification cannot be reached downstream of Morgan Falls, since it is operated independently by Georgia Power Company. If Morgan Falls Dam is operated as a run-of-the-river project, in which discharges equal inflows, then the trout fishery downstream from Morgan Falls Dam will be enhanced in much the same manner as the reach between Bull Sluice Lake and the site of the proposed reregulation dam. However, if Morgan Falls Dam is operated in pond-and-generate or in peaking mode then the effects of flow modifications could be considerably different.

If no reregulation dam is constructed and flows necessary to meet water requirements are obtained by modifying Buford Dam, then the effects of these modifications on the trout fishery will be similar to the effects downstream from the site of the proposed reregulation dam. However, if a reregulation dam is constructed then firm conclusions cannot be made for the reach between Buford Dam and the site of the proposed reregulation dam since neither the size, storage-capacity/elevation relationship, nor operation of the reregulation dam are currently known.

The general effects of operating a reregulation dam on this reach will be determined by how low the water level drops within the pool of the reregulation dam. If the pool of the reregulation dam falls enough to dewater Bowmans Island Shoals and minimum flows from Buford Dam are

stopped, then much of the prime trout habitat in this major reach may be lost. The effects further downstream but within the pool of the reregulation dam cannot be estimated since the details of operation are unknown.

Water quality, particularily temperature, is a major concern downstream of Morgan Falls Dam and, in fact, in the summer may be of greater concern than the depths and velocities available for trout habitat, since lethal temperatures can occur at very low flows. Water quality modifications in the Chattahoochee River caused by operation of a reregulation dam are being addressed in a separate study by the U. S. Army Engineer Waterways Experiment Station.

The effects of flow modification on channel morphometry (related only to impacts on fish habitat) are partially described in Appendix F attached to this report.

Angling

The potential effects of flow alterations in the Chattahoochee River can be directly related to the altered depths and velocity that anglers will encounter in their angling efforts. Under the existing flow conditions in the river, the potential for angling activities varies considerably between the minimum and maximum flow in the river and also by the type of angling activity, since the optimum flows for non-boat (wade-fishing and tube-fishing) or boat (non-power and low-power) differ considerably.

The potential for wade- and tube-fishing peaks at or near the current minimum low flow in each of the major reaches. However, wade- and tube-fishing become virtually impossible above a flow of approximately 4000 cfs in the major reaches. Thus, these two types of non-boat angling are presently restricted to low flow periods.

The potential for non-boat fishing (wade- and tube-fishing) will vary somewhat by major reach under the revised operating schedule. In the reach between the site of the proposed reregulation dam and the headwaters of Bull Sluice Lake, non-boat angling may be possible during all time periods (except under flooding conditions) but with some reduction in potential since the optimum flows for these activities occur at less than the anticipated flows in the river. The potential for angling activities under revised operating conditions in the major reach downstream from Morgan Falls Dam depends, like fish habitat, on how Morgan Falls Dam is operated. If it is operated as a run-of-the-river project, then the effects of the revised flows will be similar to the reach upstream of Bull Sluice Lake. However, if Morgan Falls Dam is operated in pond-and-generate or in peaking mode then the effects of flow modifications on angling could be considerably different. Predicting the effects of other than run-of-the-river operation of Morgan Falls Dam is outside the scope of this investigation.

The potential for non-boat angling in the major reach downstream from Buford Dam is dependent on whether or not the reregulation dam is constructed. The Bowmans Island Shoals area is popular for wade- and tube-fishing. If modified flows to meet projected water supply needs

are released directly from Buford Dam then the effects on angling will be similar to those observed in the major reach downstream from the site of the proposed reregulation dam. If a reregulation dam is built to supply the necessary flows for water supply then the effects on angling will be determined by project operation. If minimum flows are no longer released from Buford Dam and the water level within the pool drops sufficiently, then the Bowman Island Shoals area may be lost for angling due to dewatering as the volume in the reregulation pool drops to supply water downstream. Conversely, much of the Bowmans Island Shoal area may become unuseable for wade- and tube-fishing if the pool becomes too deep during generation.

Under current operating conditions, the minimum flow occurs at considerably less than the optimum flow for power boat angling and near the optimum for non-power boat angling. The decline in WUA for boat angling is more gradual than for non-boat angling. Consequently, boat angling can occur even at discharges of 4000-6000 cfs.

Under the revised operating conditions, the potential for boat angling may vary somewhat by major reach. In the reach downstream from the site of the reregulation dam, conditions for boat angling will be generally improved since the optimum flow will be near the anticipated flow in the channel. The effects of modified flows downstream of Morgan Falls Dam will be determined by the operation of Morgan Falls Dam. If it is operated as a run-of-the-river project then the effects will be generally similar to those observed for the major reach downstream from the site of the reregulation dam. The effects of other types of operation will vary depending upon release patterns.

The effects of flow modification on boat angling in the major reach downstream from Buford Dam will depend on whether or not a reregulation dam will be constructed. If the reregulation dam is not constructed then the effects of flow modification on boat angling will be similar to those projected for the reach downstream of the site of the proposed reregulation dam. If the reregulation dam is constructed, then the effects on boat fishing in this major reach will be partially determined by how low the water levels drop within the pool of the reregulation dam. Two detrimental effects on boat angling will be observed in this major reach if the pool of the reregulation dam drops enough to dewater Bowmans Island Shoals and minimum flows are not released from the dam. First, it will have a negative effect on boat fishing because the boat ramp used to access Bowmans Island Shoals is located in the dewatered reach. Second, since the trout in the dewatered reach will either move downstream or be stranded, there would be no motivation for angling. Boat angling within the rest of the reregulation dam pool would probably not be affected.

Recreation

Currently, a variety of recreational activities occur on the Chattahoochee River. Changes in stream flows will affect the WUA for these activities in different ways because of the differing depth and velocity requirements for each.

Canoeing. Under existing conditions, the minimum low flow provides less WUA than would be provided by increased flows. Therefore, a modified flow to provide water supply will probably have a beneficial effect on the amount of area available for both novice and midlevel canoeing. The elimination of generation flows that currently exist in the river system will also have a beneficial effect on novice canoeing since the high discharges are largely unuseable for this activity. In terms of midlevel canoeing, the greatest amount of WUA occurs at or near the highest simulated discharge. At this point, however, the shoals are covered and the river lacks the desired hydraulic diversity. Therefore, the optimum discharge, in terms of a satisfactory experience, would be somewhat lower than the highest simulated discharge.

The effects of increased flows for water supply will vary by major reach. The current minimum releases can cause passage problems through the shoal areas for canoers. Thus, canoeing in the major reach between Morgan Falls Dam and the confluence with Peachtree Creek, which is composed of a high proportion of shoal areas, may benefit considerably from increased flow in the river. In the other two major reaches, however, the effects of small flow increases will probably be negligible, except for the area of Jones Bridge Shoals and Island Ford

Shoals. If the reregulation dam is constructed, then the effects on canoeing in that portion of the river will be determined by the operation of the project. If the water levels fall below the boat ramp near Buford Dam, then canoeing will become difficult in this major reach because of access and passage problems.

Rafting. The effects of flow alterations on rafting are more complex than the effects of flow alterations on canoeing since the total rafting experience is a composite of rafting, raft landing, and raft take-out. The WUA for each of these facets of rafting peaks at different discharges. Thus, while the optimum discharge for novice rafting (preferred) occurs near a discharge of 2000 cfs, the optimum discharge for raft landing occurs near a discharge of 500 cfs.

Any increase in stream flows will increase the WUA for both novice and midlevel rafting. The effects of flow alterations on raft landing and take-out will generally be detrimental, but not to a large degree. Although maximum WUA for raft landing in shoal areas and on riverbanks occurs at 500 cfs, the lowest simulated discharge, this is generally lower than current flows. Examination of aerial photographs taken at staged flows indicates that a negligible surface area of exposed rock is lost between a flow of 1050 cfs and a flow of 1500 cfs. However, with the aerial photographs it is not possible to extrapolate the change in area with discharge above a flow of 1500 cfs. To minimize loss of exposed rocks in the shoal areas, then, flows should not exceed approximately 1500 cfs. Examination of the aerial photographs, results of the PHABSIM analysis, and field observations by the CRIFS team indicate that the sand/gravel bar at Paces Mill used for taking out

rafts becomes mostly inundated at a discharge above 1750 cfs, but is still useable up to a discharge of about 2500 cfs. There will also be some decrease in float time with increasing flows. The proposed increase in minimum flows from 1000 to 1500 cfs would decrease float time by approximately 20%. Many rafters currently lengthen their float trip by stopping at various points along the river. Therefore, it seems likely that rafters could compensate for the increased minimum flow by stopping either more frequently or for longer periods.

Flow alterations will have a considerably different effect on each of the major reaches of the Chattahoochee River investigated in this study. Presently, rafting activity is concentrated in the major reach between Morgan Falls Dam and the confluence with Peachtree Creek because of availability of concessionaire facilities, presence of numerous access points, availibility of park facilities, and the high percentage of shoals in this reach. The restrictions discussed in the previous paragraphs, in terms of raft landing and take-out, apply directly to this major reach. In general, any flow increase above current minimum flows will increase WUA for rafting. It will, however, decrease the area available for raft landing and take-out. The amount of decrease appears to be minor at the flows being considered, though it is substantial at higher flows.

Flow alterations on the other two major reaches will not be affected to nearly the same degree as in the most downstream reach. These reaches have much less area for raft landing and take-out at any flow. In addition, there is currently less rafting in these two reaches since they provide neither the park facilities nor the concessionaire

facilities of the most downstream major reach.

Wading. Since WUA for wading decreases as discharges increase, it appears as though the proposed flow alterations would have a detremental effect on wading. This, in fact, may not be the case. The major reach most affected by the increase in flows, Buford Dam to the proposed reregulation structure, currently receives very little wading use (most likely due to the channel shape and lack of public access). Most wading use is concentrated in the shoal areas of the other two major reaches. In the shoal areas, WUA for wading peaks between 1,000 and 2,500 cfs. An analysis of the stage/discharge relationship for many of the cross sections showed an increase in water depth of only one foot from 1,000 to 2,000 cfs. Therefore, the proposed flow alterations would actually increase the space for wading in the areas where it is currently occuring.

Hanging-out. For the most part, "hanging-out" seems to occur in the shoal areas of the two downstream major reaches (this probably occurs for the same reasons cited under "Wading"). Use of the exposed rocks in the river for "hanging-out" is affected both by the amount of exposed rock and the ability of the users to wade out to these rocks. As described under "Rafting", the proposed flow increases should have a minor effect on the amount of exposed rock available. In addition, it appears as though wading will not be adversely affected in the shoal areas. Use of the banks for "hanging-out" is unlikely to be affected by the proposed flow increase in any of the three major reaches.

Conflict Identification

The Chattahoochee River is a valuable resource that is used by a variety of potentially competing user groups and, consequently, conflicts between user groups are inevitable. Use of the river for water supply has the potential to affect other uses of the river, and as this study has demonstrated, conflicts among the remaining users of the river may also arise. For example, there is a conflict between users engaged in wade-fishing or tube-fishing and users engaged in boat fishing since the flows optimum for one type of angling are not optimum for another type of angling. Note that this does not mean that conflicting river uses are mutually exclusive. Rather, it means that a flow optimum for one use may be sub-optimum (but still possible) for another use.

Development of a reasonable management plan for the Chattahoochee River first requires identification of the user conflicts that could occur. Table 13 presents a matrix of the conflict relationships between potential angling, potential recreation, and trout life stages, based upon flow requirements, that are a concern on the Chattahoochee River.

Table 13. Conflict relationships, based on optimum flow requirements, between angling, recreation, and trout life stages for the Chattahoochee River.

		TROUT				ANGLING					RAFTING				CANOEING		WATER SUPPLY
		BROWN TROUT JUVEN	BROWN TROUT ADULT	ADULT BROOK	ADULT RAINB	WADE	TUBE	BOAT NOPWR	BOAT POWER	NOVICE	NOVICE PREFR	MDLVL	LANDING	NOVIC	MDLVL		
TROUT	JUVEN BROWN		0	0	M	0	0	M	X	X	M	XX	0	M	XX	+	
	ADULT BROWN			0	M	0	0	0-M	X	X	0-M	XX	0	M	XX	+	
	ADULT BROOK				M-X	0	0-M	X	XX	X	M	XX	0	M	XX	+	
	ADULT RAINBW					M	M	0	X	X	0	XX	M	0	XX	+	
ANGLING	WADE						0	0-M	X	XX	M	XX	0	XX	XX	-	
	TUBE							0-M	X	XX	M	XX	0	XX	XX	-	
	BOAT-NONPOWR								X	XX	0	XX	M-X	0	XX	+	
	BOAT-POWER									0	X	XX	XX	X	XX	+	
RAFTING	NOVICE										XX	XX	XX	XX	XX	+	
	NOV. PREFERR											XX	XX	0	XX	+	
	MID-LEVEL												XX	XX	0	+	
	LANDING													X	XX	-	
CANOEING	NOVICE														XX	+	
	MID-LEVEL															+	

NOTES: Recreational wading is identical to wade-fishing.
"Hanging-out" is not included since this activity was not investigated using HABSIM.

* KEY: 0 - no conflict, optima usually within 500 cfs
M - moderate conflict, optima usually between 500-1000 cfs of each other
X - extensive conflict, optima between 1000-2000 cfs apart
XX- very extensive conflict, optima usually more than 2000 cfs apart
\+ - increased flows beneficial
\- - increased flows detrimental

This table is based on the assumption that Morgan Falls Dam will be operated in run-of-the-river mode. The Table is invalid if Morgan Falls Dam is not operated in this fashion. The table also ignores the effects caused within the pool of the reregulation dam.

Examination of Table 13 provides several pieces of information. First, several activities; midlevel canoeing, midlevel rafting (the criteria for both previous activities are reflective of what may loosely be referred to as a "white-water" experience), and low power boat fishing; conflict with all trout life stages and all other activities because they consistently require a flow greater than 4000 cfs. These activities currently conflict with other uses of the river and would conflict with other uses under a revised flow regime. However, these high flow activities are currently not popular on the river. Representatives of the Georgia Department of Natural Resources indicate that most users who wish a "white water" experience travel to other nearby rivers. Also, user profiles indicate that the majority of recreationists utilizing the Chattahoochee River seek what may be best described as a social experience. One exception to the above statement occurs at Powers Landing (see Appendix B, map of the major reach downstream from Morgan Falls Dam) in which a kayak course is located. Although the flows required in the river to use this course were not assessed, the members of CRIFS felt that well over 2000 cfs would be required. Low-power boat fishing does not appear to be a popular form of angling. The extensive shoal areas that provide the best habitat for trout are difficult to traverse in an outboard powered boat. Thus, low-power boat fishing is restricted to the non-shoal areas of the river

that provide neither the habitat nor the aesthetics that the shoal areas provide. Some fishermen do, however, put in at an access point, then travel to the upper or lower part of a shoal area.

Table 13 also presents the expected effect of increased flows for water supply on each life stage and activity. A "-" indicates a negative effect and a "+" indicates a positive effect. Ignoring the three high flow activities, the table indicates that higher flows in the river will be beneficial in 8 occurrences and detrimental in 3. Trout habitat was considered to be improved in all cases because of the elimination of the peaking flows (trout do not have the option of leaving the water like anglers and recreational users).

The trout life stages and remaining activities can be further categorized into those that require primarily lower flows (less than 1000 cfs) and those requiring moderate flows (1000-2000 cfs). The life stages and activities in the low flow category conflict somewhat with the trout life stages and activities in the moderate flow category. A general categorization of life stages and activities by flow requirement is presented in Table 14.

Table 14. Categorization of trout life stage, angling, and recreation by flow requirement.

FLOW REQUIREMENT	ACTIVITY OR LIFE STAGE
LOW (< 1000 CFS)	JUVENILE BROWN TROUT ADULT BROOK TROUT WADE-FISHING TUBE-FISHING RAFT LANDING WADING
MODERATE (1000-2000 CFS)	ADULT BROWN TROUT ADULT RAINBOW TROUT NON-POWER BOAT FISHING NOVICE RAFTING NOVICE (PREFERRED) RAFTING NOVICE CANOEING
HIGH (OVER 2000 CFS)	LOW-POWER BOAT FISHING MIDLEVEL RAFTING MIDLEVEL CANOEING

It is important to realize that although the PHABSIM analysis can provide useful information for planning purposes, it does not present a complete description of the relationship between actual recreational use and discharge. First of all, the criteria used for these activities were established through reference to the literature and consultation with experts familiar with the Chattahoochee River. Further study would be required to more accurately estimate the criteria of actual users. Second, WUA is only a measure of the resource potential for a particular activity; it does not represent user demand for that activity. If the resource is not currently being used to its capacity for that activity, then an increase or decrease in WUA may have little or no effect on recreational use. Although total use figures do exist for the Chattahoochee, there is no breakdown on the number participating in the

various activities. The distinction between novice preferred, novice, and midlevel rafting also needs examination. Based on the user motivations described in the introduction, it appears as though many midlevel rafters may actually prefer novice rafting conditions - not for skill considerations, but for social considerations. Additional data is needed to relate actual use patterns and preferences. Therefore, demand analyses cannot be performed. Finally, the data on users cited in the "INTRODUCTION" was collected some time ago; it is possible that the characteristics reported have changed since then. Even if they are accurate, they do not include much of the information necessary to address the issues described.

Conflict Resolution

An examination of the conflicts identified in the previous section indicates that relatively minor flow manipulations downstream of the site of the proposed reregulation dam may alleviate many of the conflicts between the habitat requirements of the trout life stages, angling, and recreation. Unfortunately, reconciling increased flows for water supply with the activities in the high flow group will not be possible as a management option. However, this should not be a serious conflict since low power boat angling and "white water" rafting and canoeing are presently not popular uses of the Chattahoochee River. It would seem unreasonable to modify the operation of the river to provide flows for kayaking in the course since a small user group is involved and since such a short length of river is in question. Based on the observations of the CRIFS team, many of the shoal areas at flows between

1500-2000 cfs will provide adequate river surface area for kayaking (flow requirements for kayaking are very similar to flow requirements for canoeing) with loss only of the marked course and the ease of access and facilities at the present site.

The conflicts of the low flow group of trout life stages and recreational activities versus the moderate flow group can be resolved in most cases with some flow manipulation either directly at Buford Dam or by a reregulation dam. This manipulation will allow for increased flow in the river for water supply without substantially degrading trout habitat, angling, and recreation.

The following paragraphs outline the manner in which these conflicts can be resolved. Brook trout are not stocked in appreciable numbers since, as pointed out earlier, they do not appear to have thrived in appreciable numbers. Rainbow and brown trout are preferentially stocked. Thus, the conflict between water supply and adult brook trout is not significant. Juvenile brown trout habitat for each of the major reaches is optimal at a low flow and appears to conflict with increased flows in the river. However, juvenile trout are stocked primarily downstream of Morgan Falls Dam which is composed of about 39 % shoal areas. The optimum habitat for juvenile brown trout occurs at a higher flow in the shoal areas than in the non-shoal areas (although still slightly lower than the anticipated flow in the river). Thus, stocking of juvenile brown trout only at or near shoal areas will reduce much of the negative impact of increasing flows in the Chattahoochee River. Neither adult brown trout nor adult rainbow trout habitat requirements conflict significantly with increased flows in the

river.

Conflicts in required flow occur, both within and between angling and rafting. However, a separation in time between these activities may eliminate these conflicts. Both wade-fishing and tube-fishing require flows less than the anticipated flow in the river. However, since most angling activity occurs on weekends, it should be possible to reduce flows from either Buford Dam or a reregulation dam over a weekend, specifically for enhanced wade-fishing and tube-fishing.

The optimum flow required for non-power boat angling does not currently occur in the Chattahoochee River. The revised flow in the river would enhance WUA for non-power boat fishing, as it will fall close to the optimum flow required for this activity. The increased flows in the river for water supply will also enhance low-power boat angling, but will still be significantly below the optimum for this activity. Thus, reduced flows for weekend wade- and tube-fishing and recreation may conflict with boat angling; however, boat angling would be enhanced on weekdays.

Much the same recommendation would eliminate conflicts between water supply and rafting. The flow requirements for rafting involve several considerations:

> optimum flows for rafting

> optimum flows for raft landing (for pulling rafts up on shoal areas and river banks).

> optimum flows for take-out at Paces Mill.

This mix of considerations suggests that the optimum flow for novice

rafting and novice canoeing certainly occurs between 750-2000 cfs (about 2000 cfs strictly for rafting, a maximum of about 1500 cfs to keep shoal areas exposed, a maximum of 750 cfs for raft landing on the shoal areas, and a maximum of about 1750 cfs for raft take-out at Paces Mill). Probably, a flow between 1000-1500 cfs would provide the best rafting or canoeing experience. Thus, the proposed weekend reduction in flows from either the reregulation dam or Buford dam for angling would also enhance novice rafting and canoeing. Further study would be required to more closely define actual user preferences for rafting and canoeing.

Table 15 summarizes the effects of the flow recommendations on angling and recreational activities. Trout habitat is not considered since both flow regimes are close to the optima for adult brown trout and adult rainbow trout and certainly more benign than the current peaking flows.

Table 15. Effects of flow recommendations to minimize conflicts between beneficial uses of the Chattahoochee River.

ACTIVITY	WEEKDAY FLOW (~1500-2000 CFS)	WEEKEND FLOW (~1000-1500 CFS)*
Wade-fishing	Possible	Optimum
Tube-fishing	Possible	Optimum
Nonpower boat fishing	Optimum	Possible
Novice rafting	Possible	Optimum
Novice canoeing	Possible	Optimum
Hanging-out	Possible	Optimum
Wading	Possible	Optimum

* lowest summertime flow to be determined by water temperature considerations

The revised flow regime may cause a shift in some recreational uses of the river. The higher flows on the weekdays will cause raft and canoe trips to be shorter, faster, and there will be less opportunity for "hanging-out" since some shoal areas will be more inundated and raft landing and take-out may be slightly more difficult. However, some groups may prefer this slightly more exciting experience to the lower flow rafting or canoeing experience.

It must be emphasized that the weekend reduced flows recommended for rafting and angling must not cause undue warming of the Chattahoochee River below Morgan Falls Dam that would jeopardize the trout fishery. Thus, weekend flow requirements for habitat or recreation may be partially determined by water quality considerations.

If the reregulation dam is constructed, then consideration should be given to operating the reregulation dam to protect boating, angling, and trout habitat within the pool of the reregulation dam. Either the pool of the reregulation dam should be maintained at a level sufficient to prevent dewatering of Bowmans Island Shoals or minimum flows from Buford Dam should be released if the water level in the reregulation dam drops to the point that the boat ramp becomes unuseable. This will protect the trout and trout-food organisms from dewatering and stranding and also allow continued use of the reach by boaters and anglers.

Conclusions and Recommendations

Increasing flows in the Chattahoochee River to meet the water supply needs of the metropolitan Atlanta area will affect all current uses of the river that are flow related. Some of the effects will be beneficial and some detrimental. However, flow modifications in the channel to provide for water demand can be made that are consistent with all important present uses of the river. The following general recommendations are designed to both provide for increased flow in the river and also to optimize as many uses of the river as possible:

> Perform studies on the effects of a reregulation dam on downstream water temperatures.

> Release higher flows on weekdays and lower flows on weekends (1000 cfs or lowest flow that does not result in detrimental water temperatures for trout).

> Operate Morgan Falls Dam primarily as a run-of-the-river project with some provision for special releases for weekend angling and recreational activities.

> Operate Buford Dam, proposed reregulation dam, and Morgan Falls Dam as a system to provide for water supply, recreation, and fish habitat between Morgan Falls and Peachtree Creek.

> Concentrate stocking of juvenile brown trout to wide shoal areas where optimum habitat occurs at discharges closer to the mean annual discharge than at non-shoal reaches of the river.

> If a reregulation dam is constructed, then consideration should be given either to maintaining water levels high enough to prevent dewatering of Bowmans Island Shoals or to releasing flows from Buford

Dam as the pool within the reregulation dam drops below the level required for use of the boat ramp immediately downstream from Buford Dam. A combination of these two approaches to prevent dewatering of Bowmans Island Shoals may be needed based upon seasonal water quality considerations.

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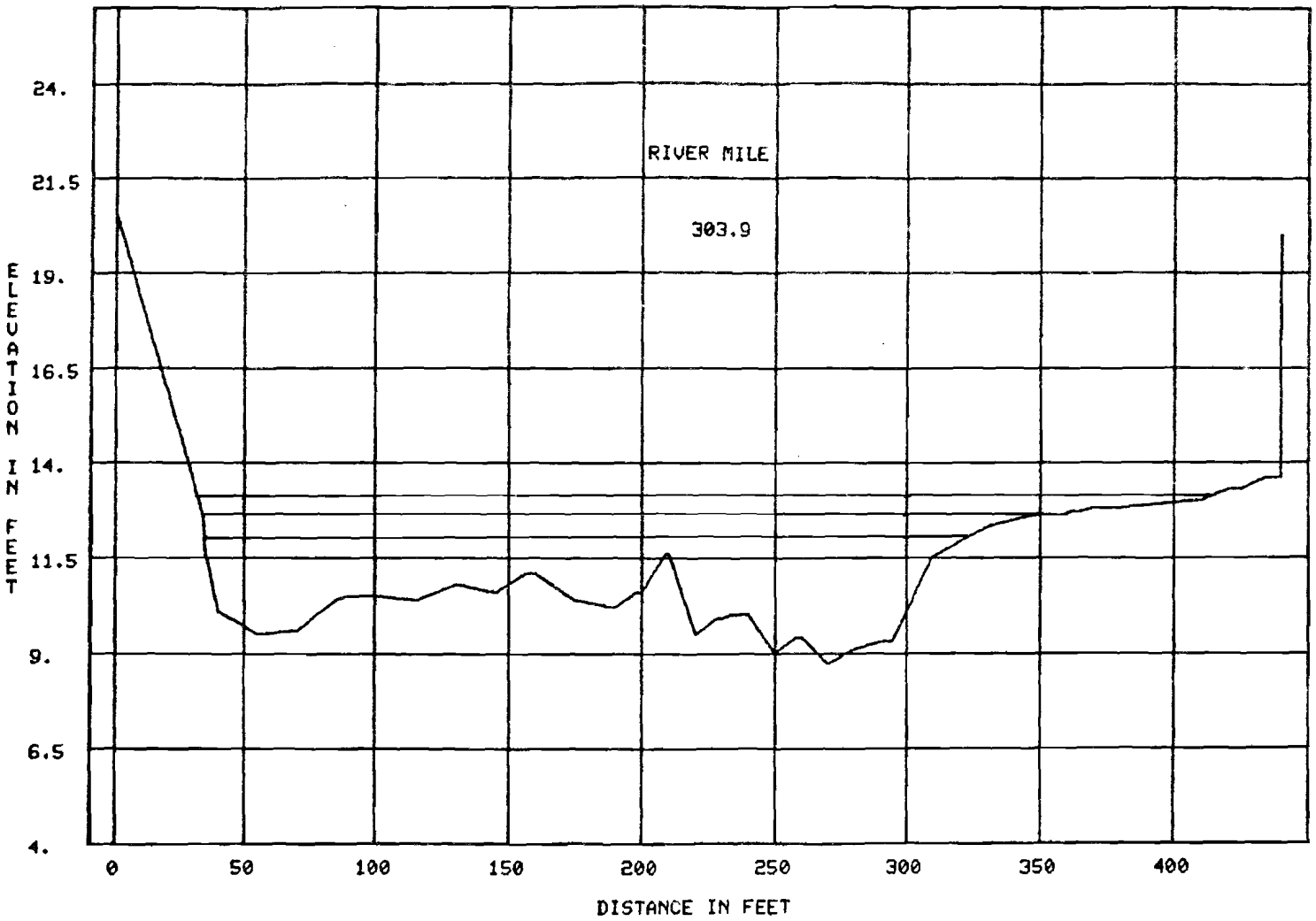
APPENDIX A

CROSS SECTIONS

APPENDIX A

Cross sections collected as part of the field work for this study. Lines drawn on each plot represent the water surface elevations at 1000, 1500, and 2000 cfs.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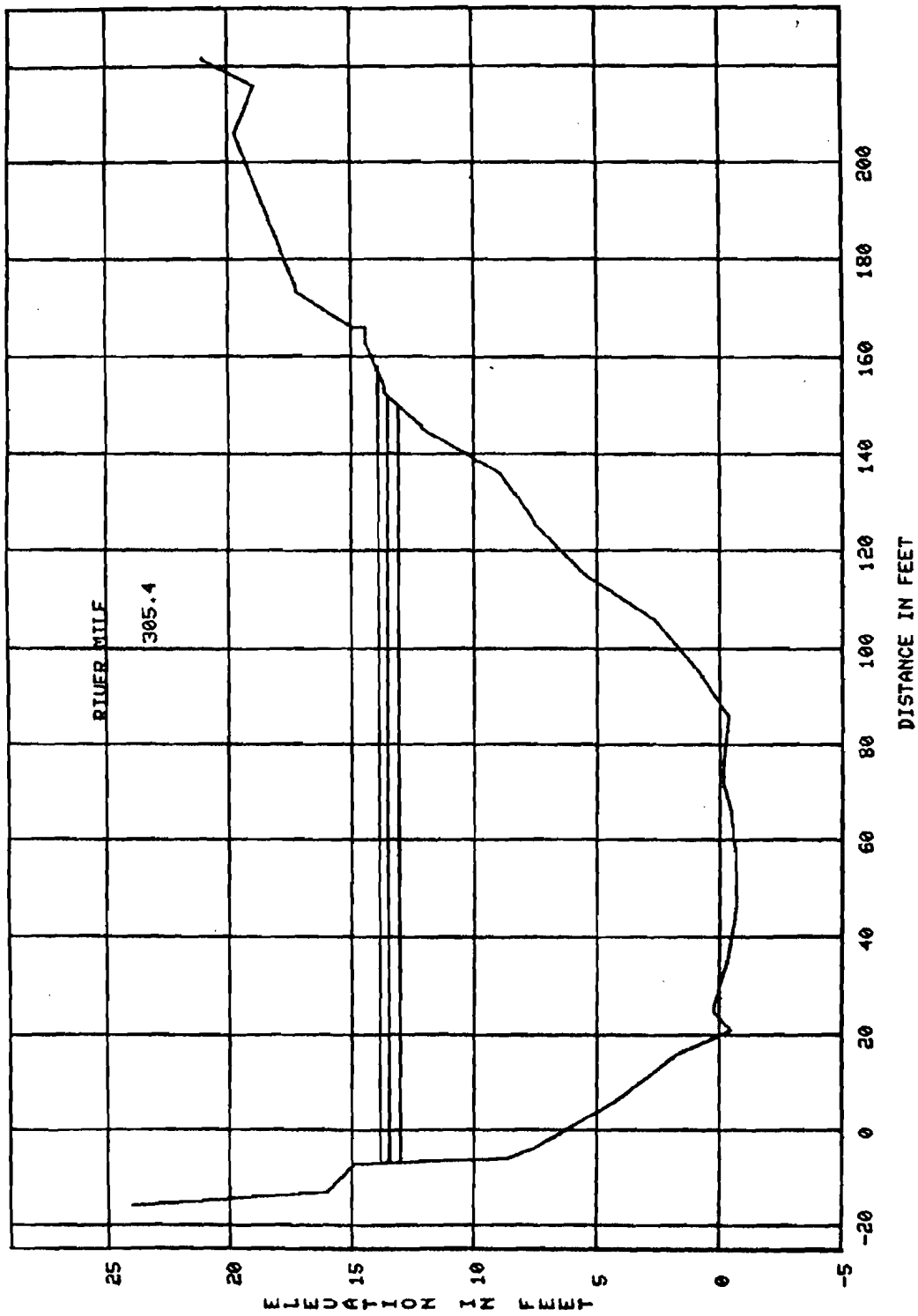
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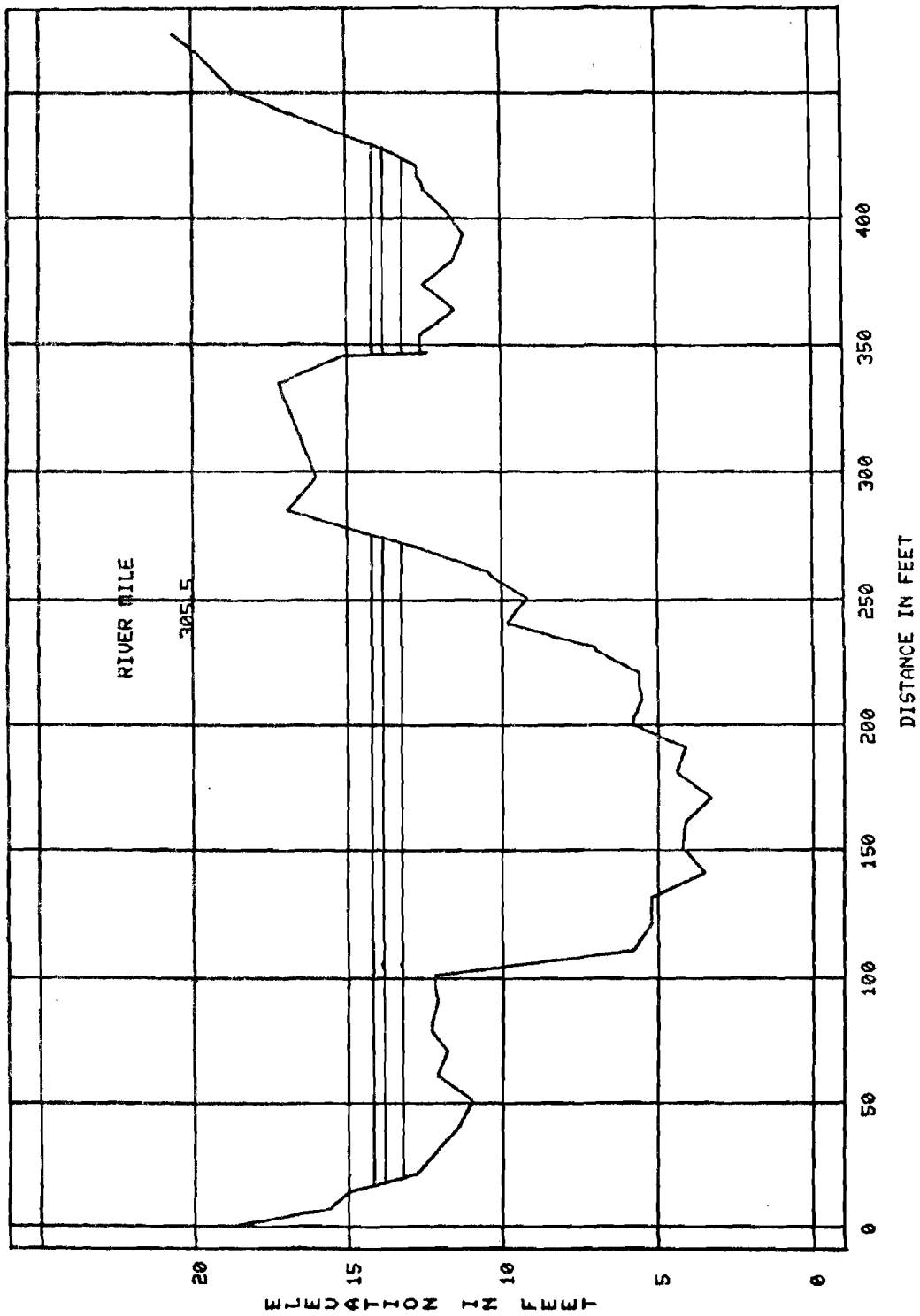
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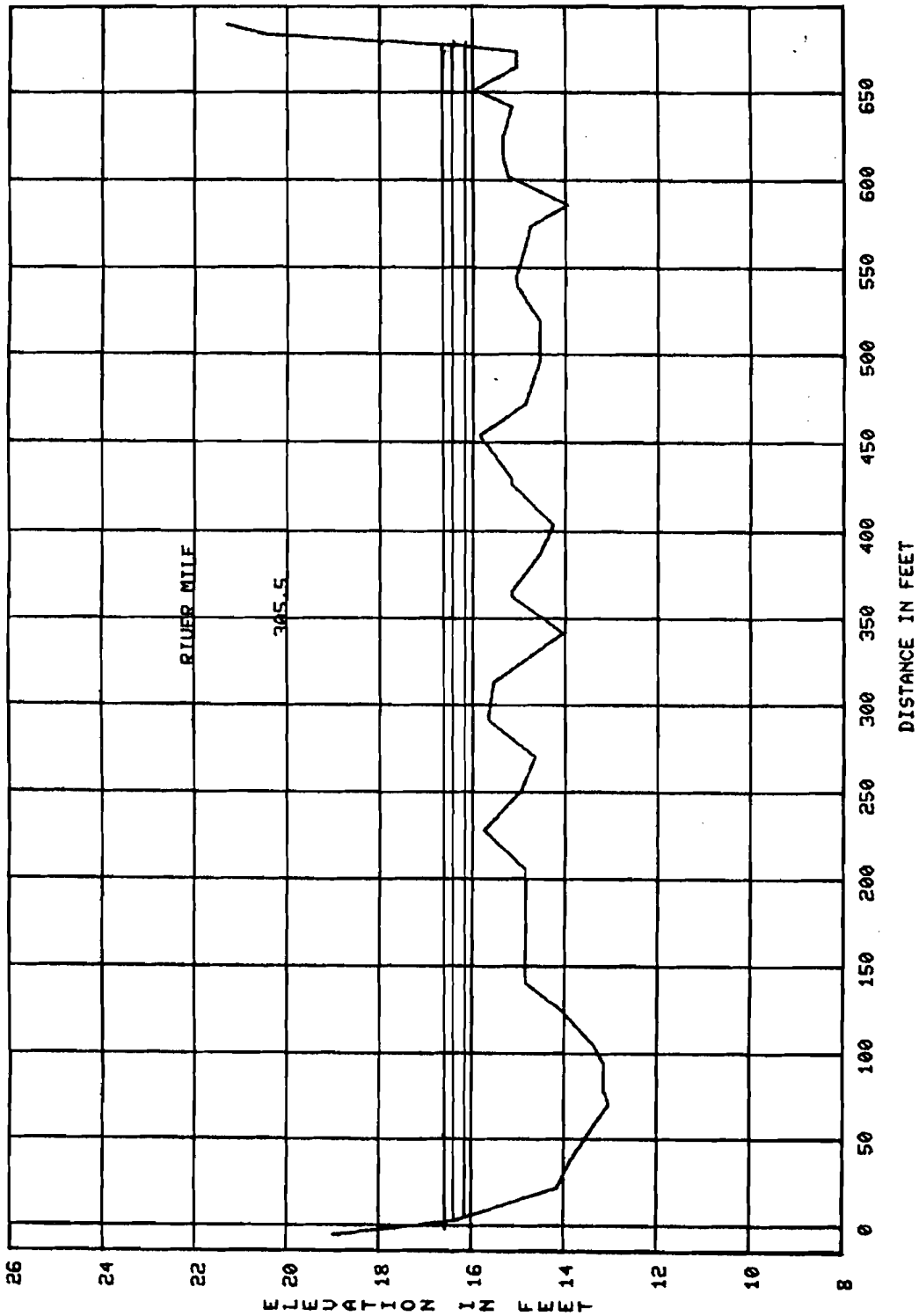
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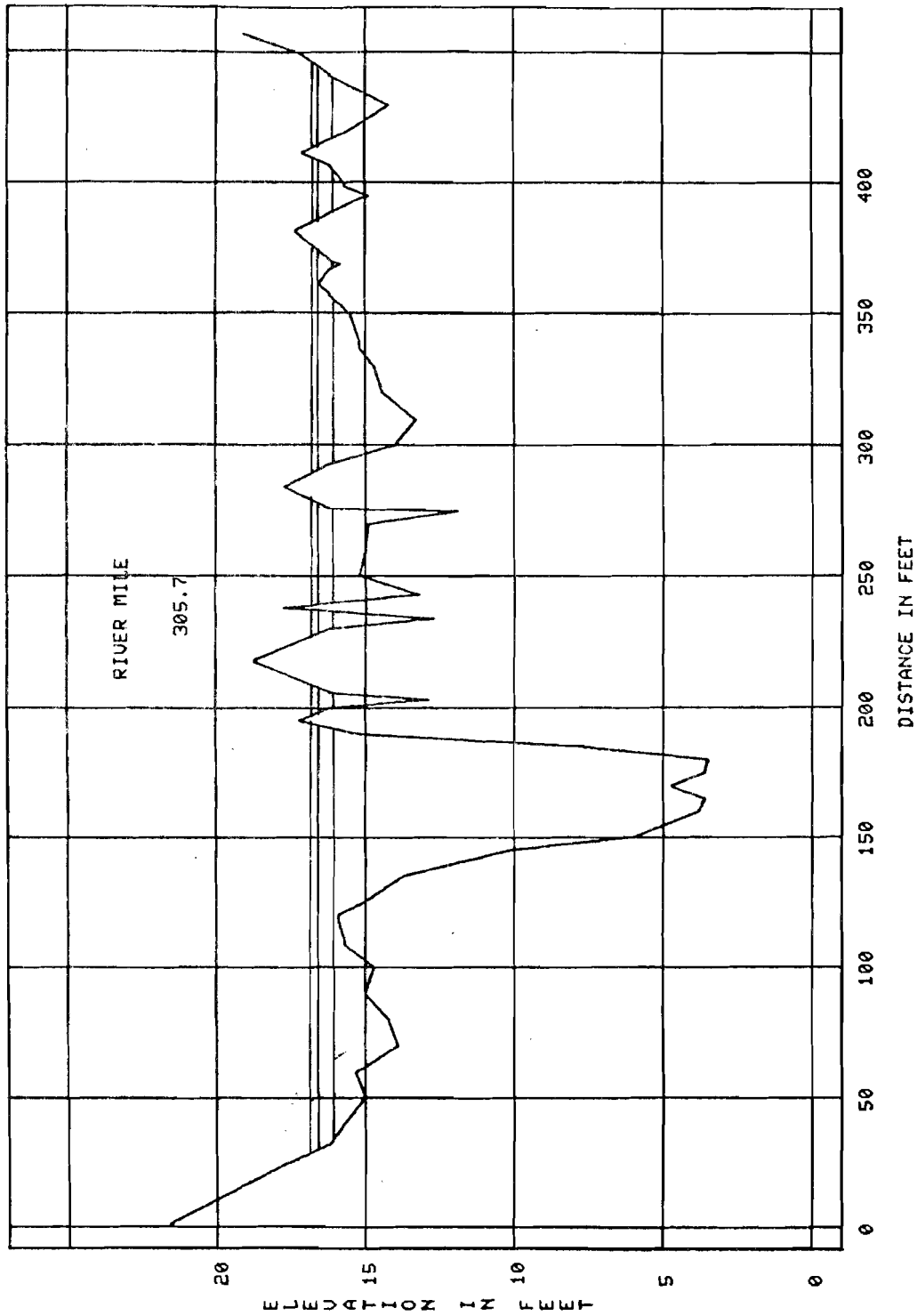
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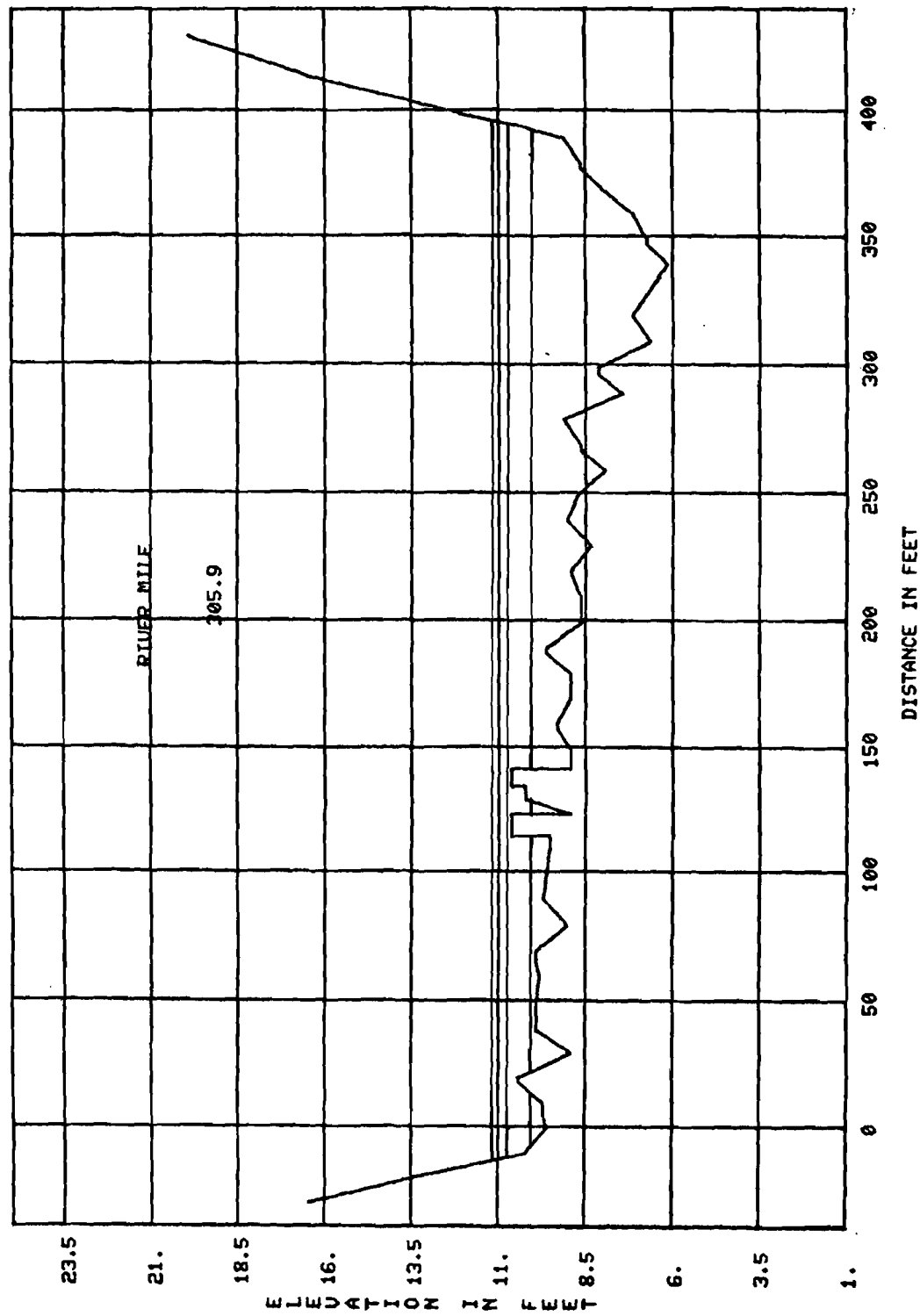
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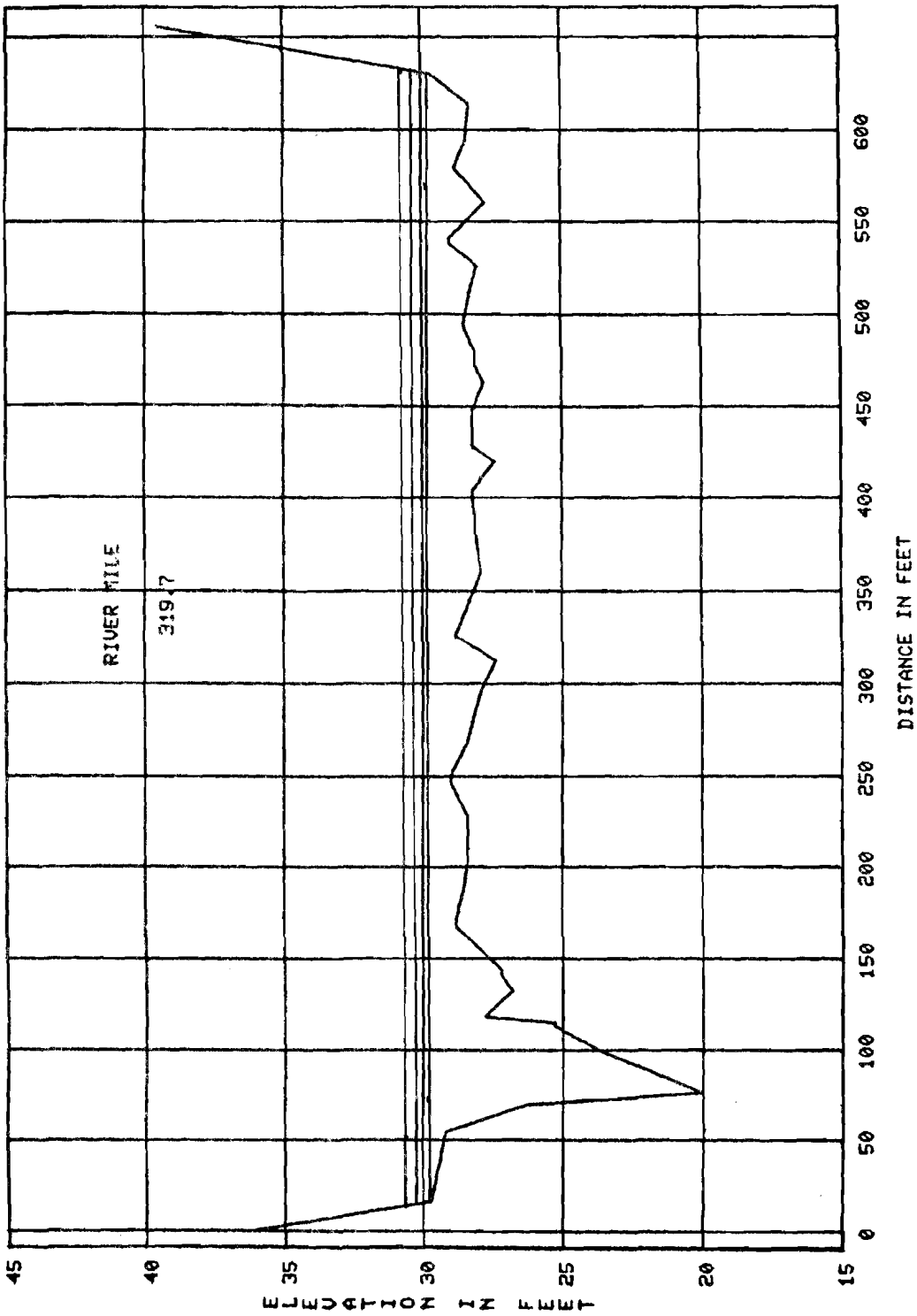
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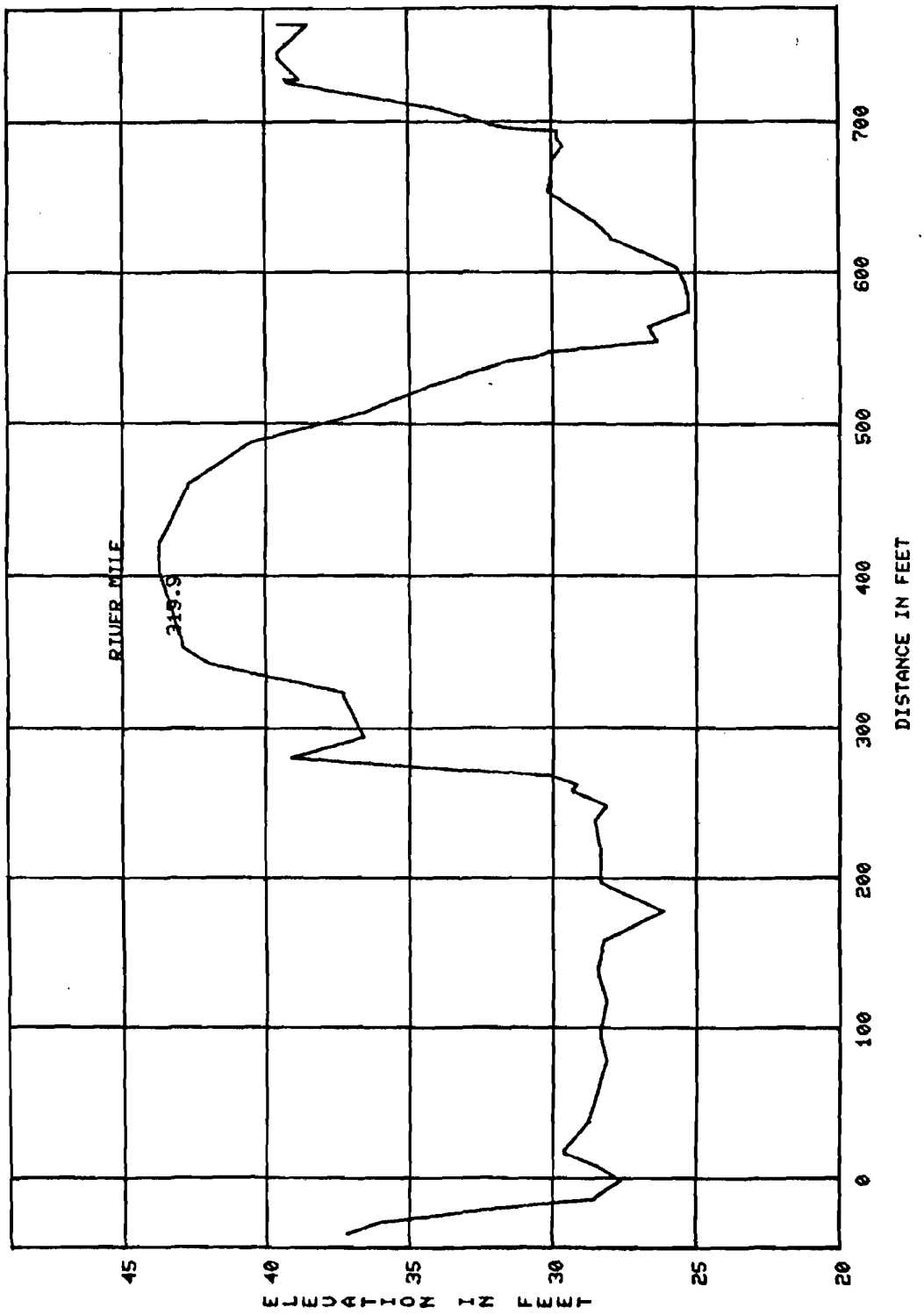
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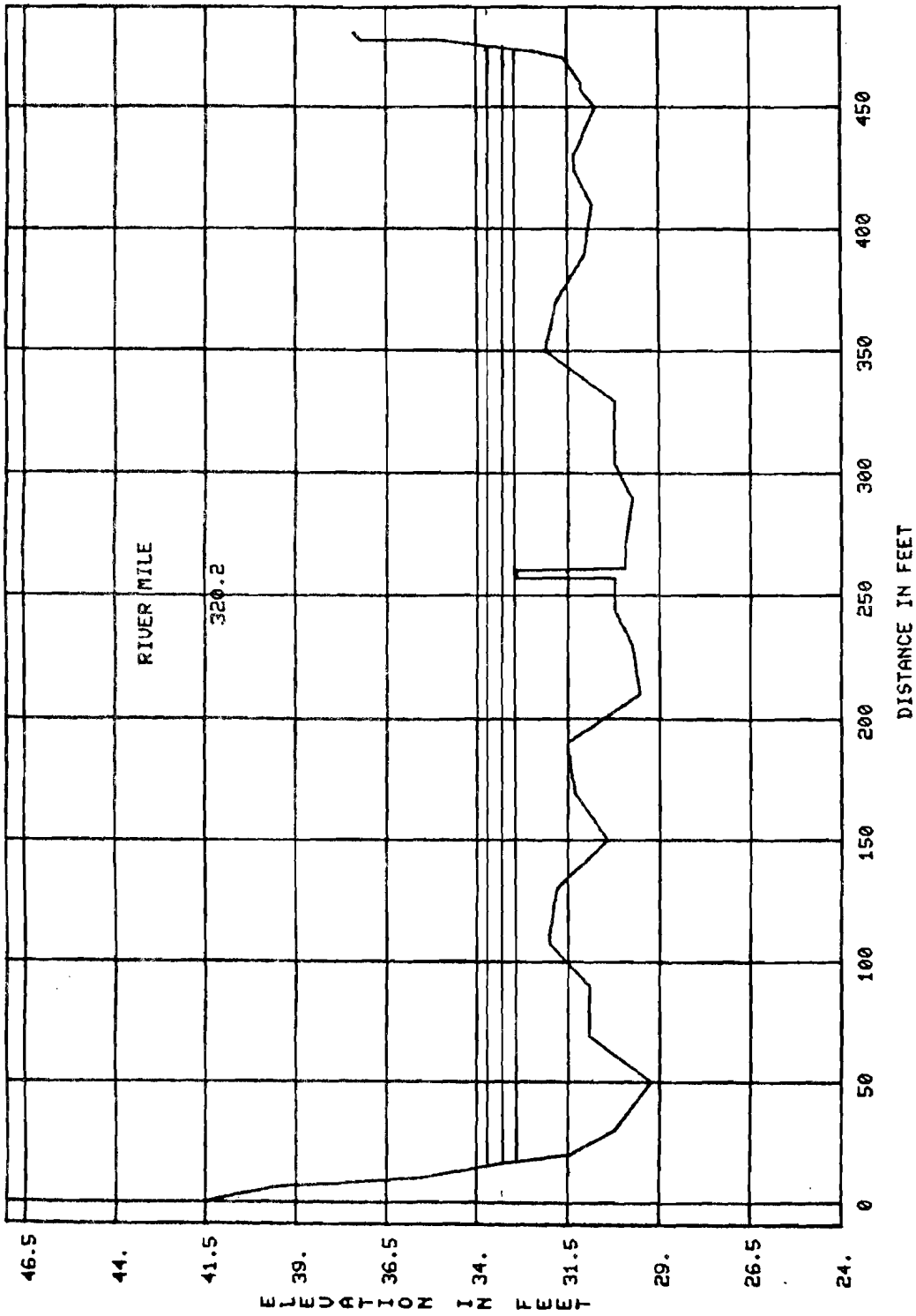
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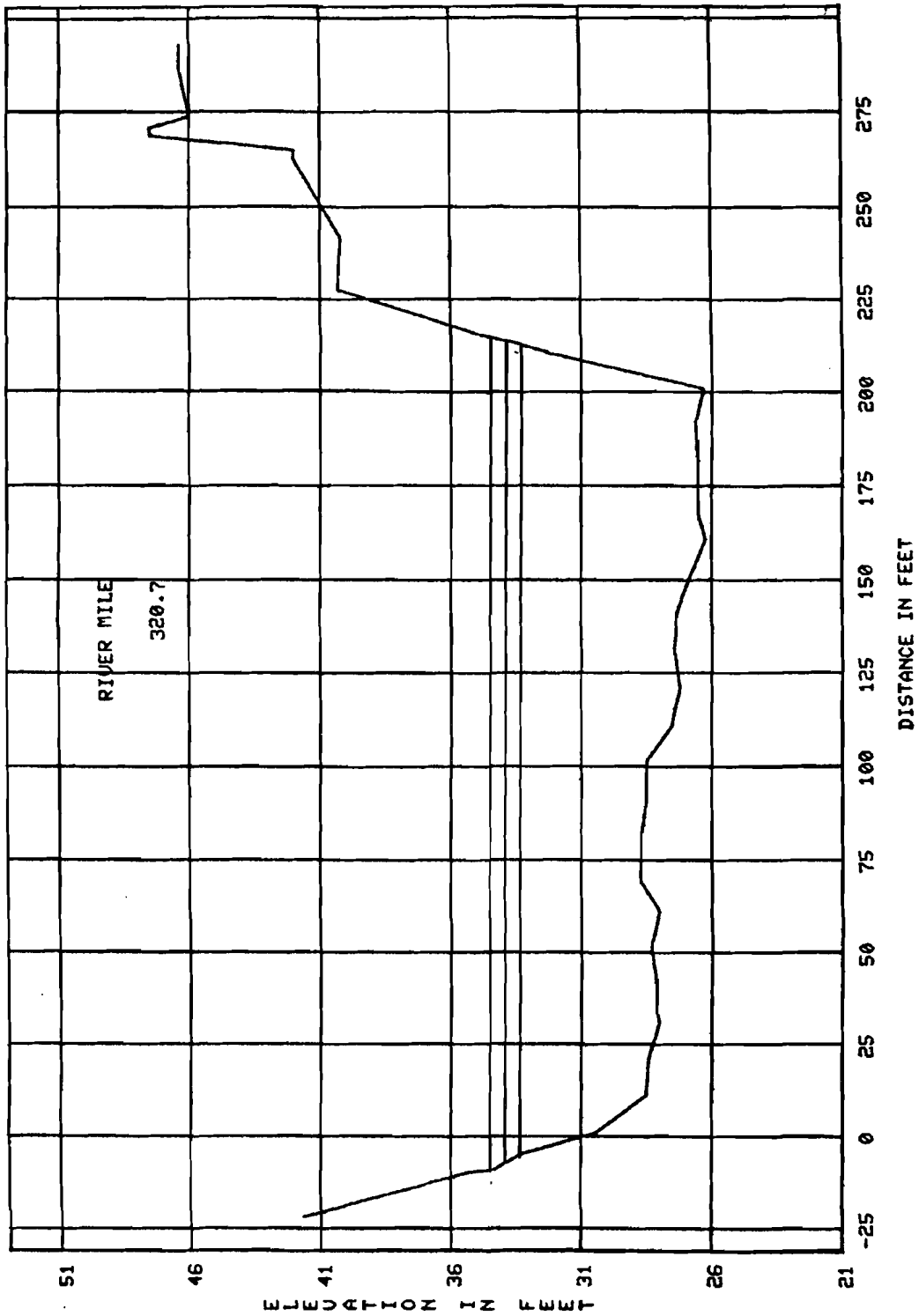
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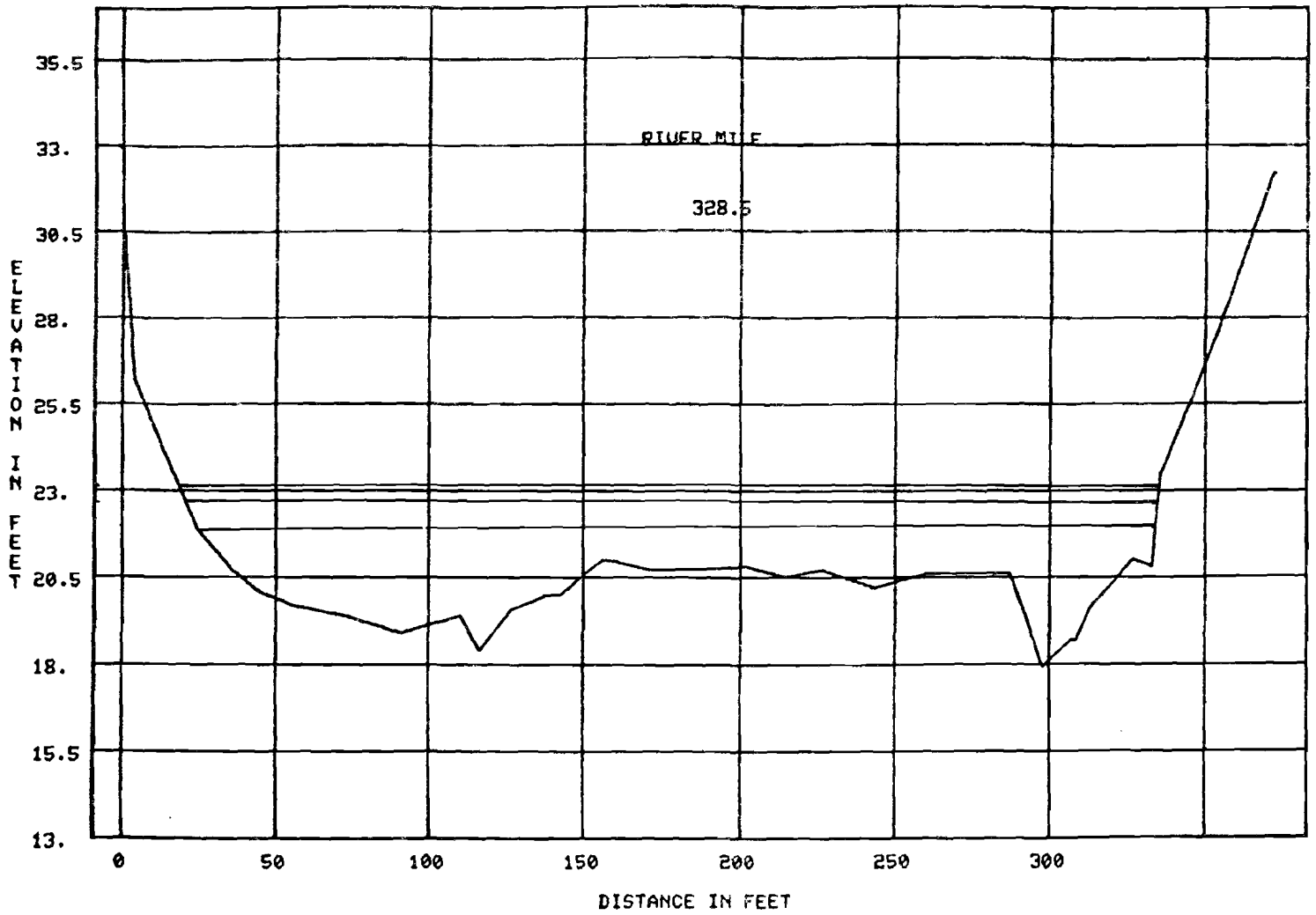
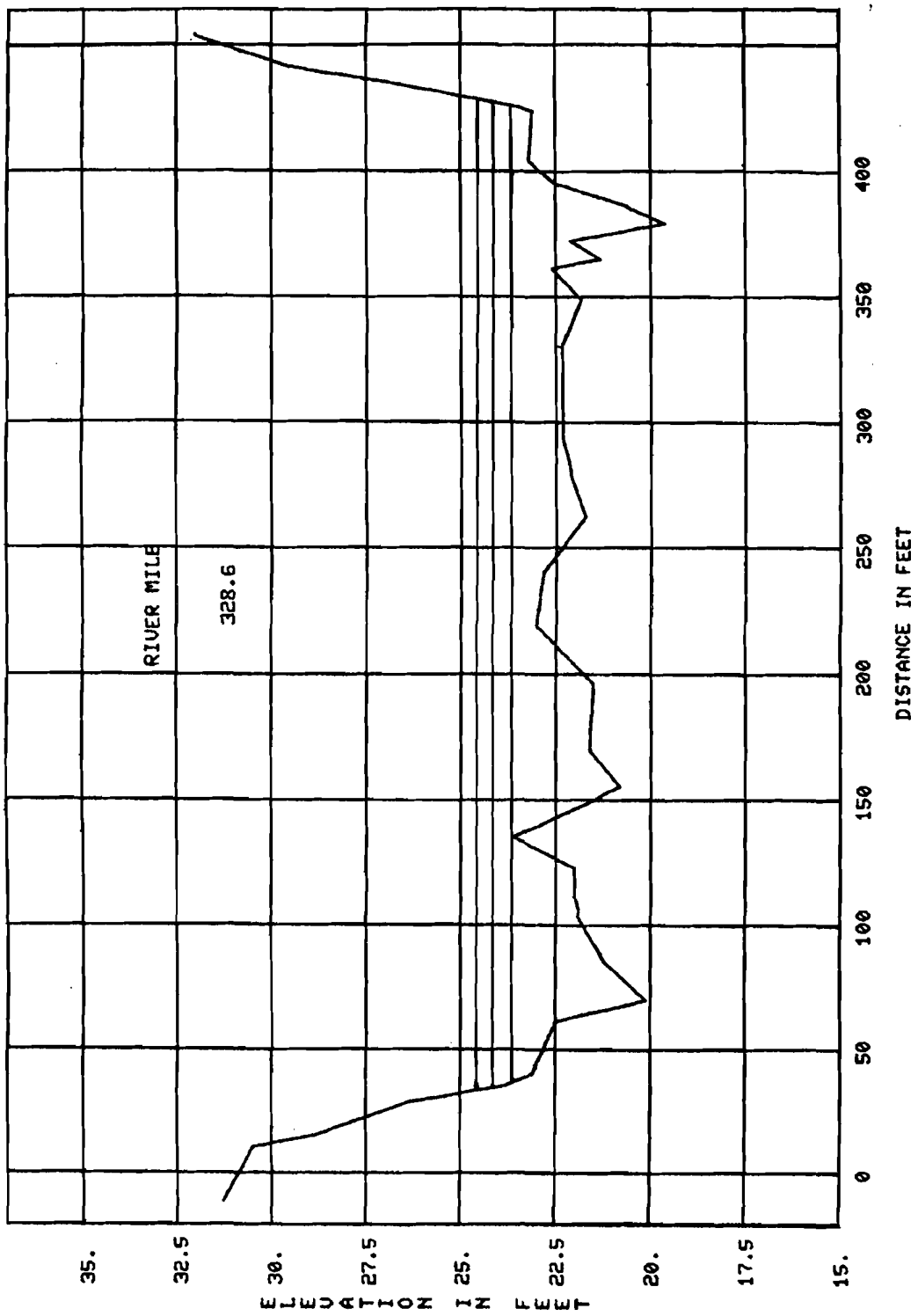
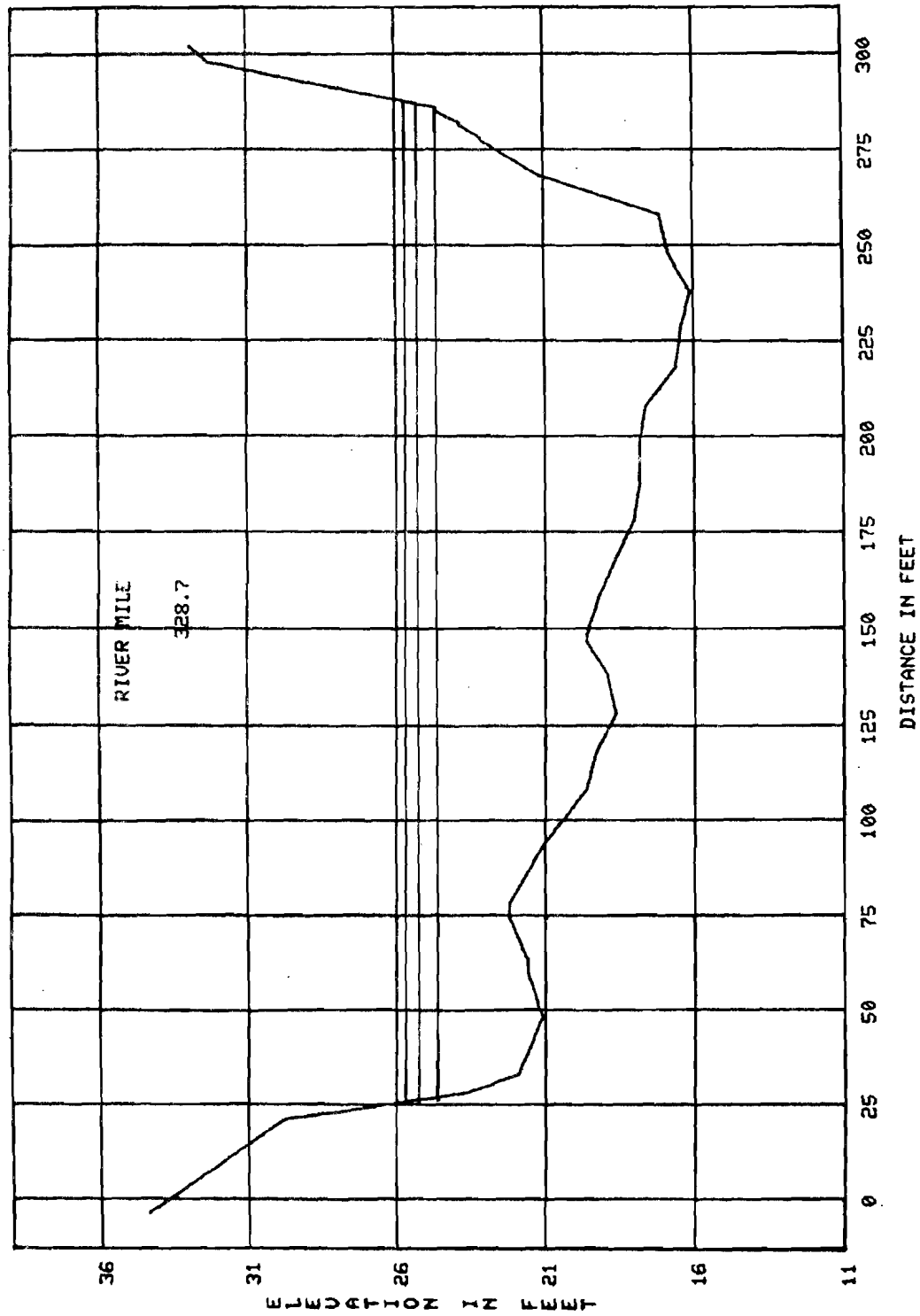
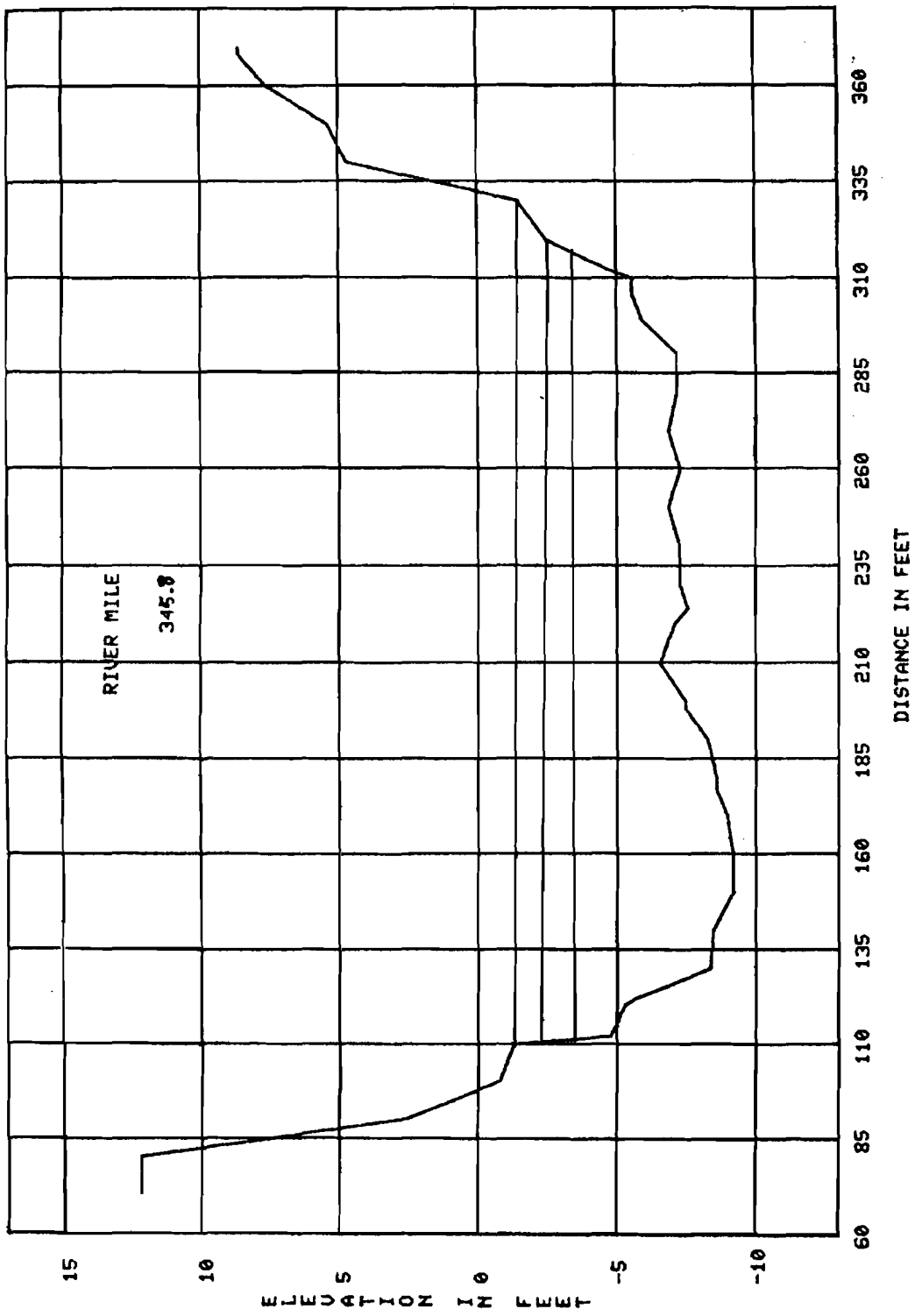
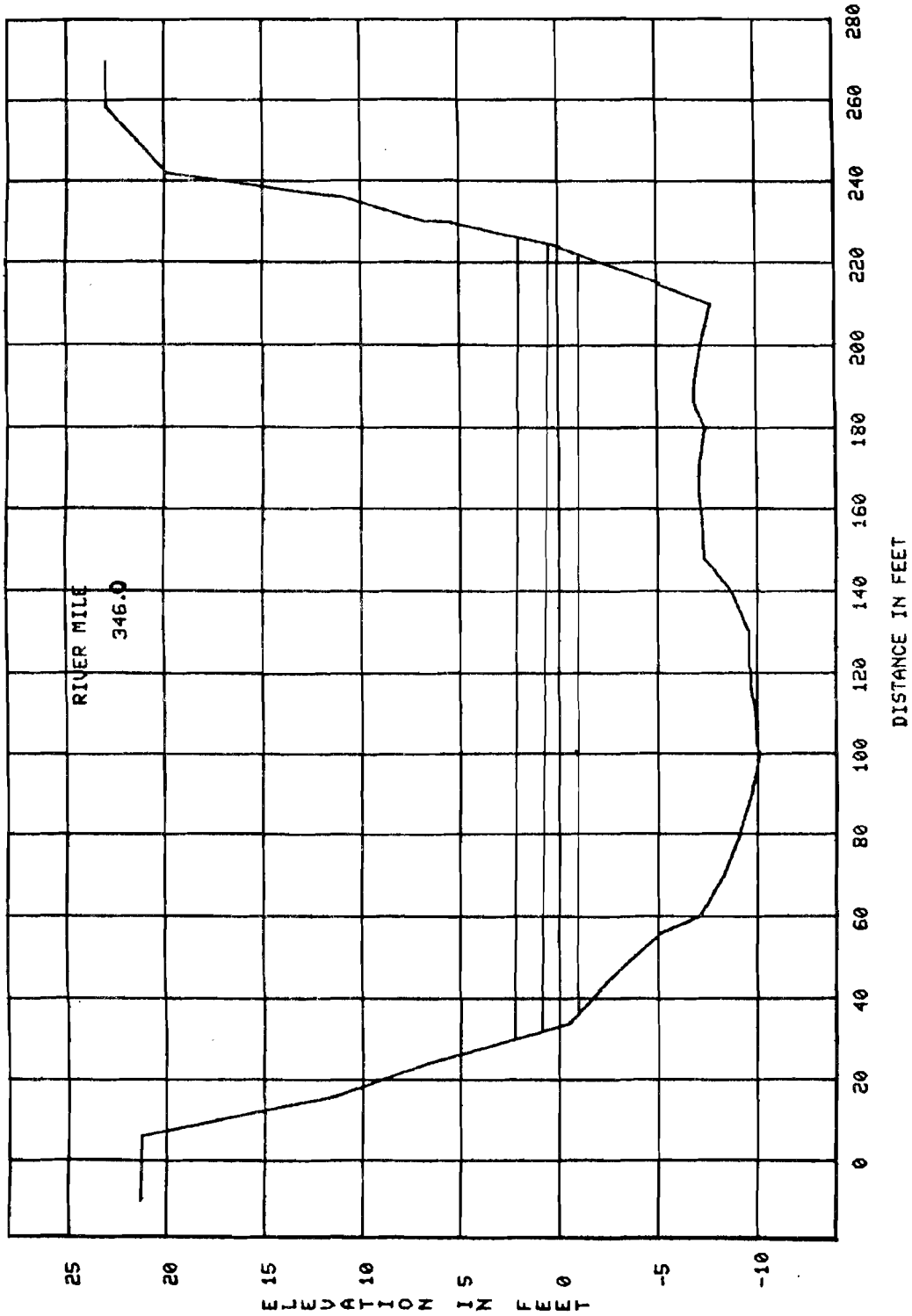
50
75
100
125
150
175
200
225
250
275
DISTANCE IN FEET

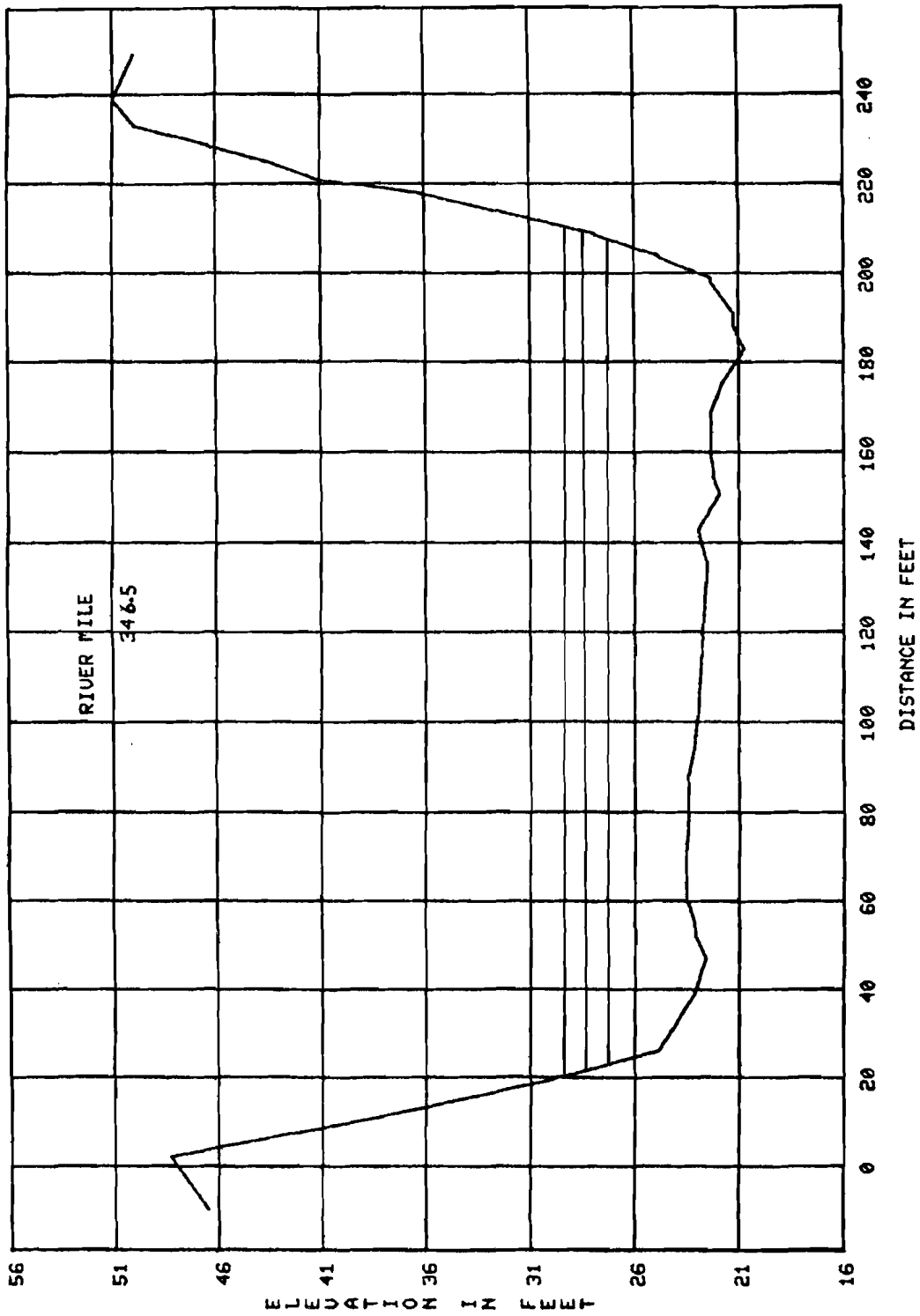

RIVER MILE
328.5
ELEVATION IN FEET
35.5
33.
30.5
28.
25.5
23.
20.5
18.
15.5
13.
0
50
100
150
200
250
300
DISTANCE IN FEET

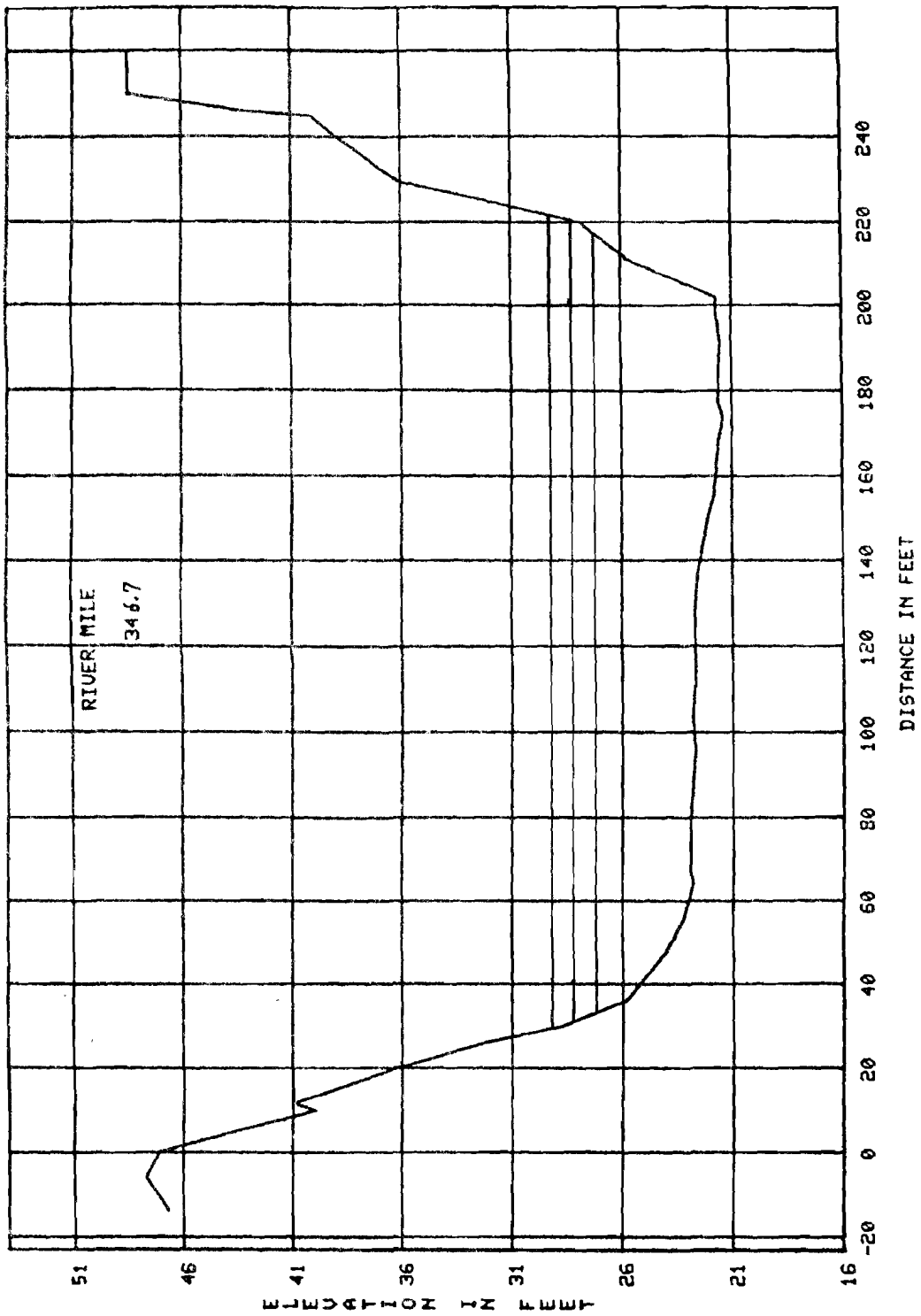

RIVER MILE
328.6
35.
32.5
30.
27.5
25.
22.5
20.
17.5
15.
ELEVATION IN FEET
0
50
100
150
200
250
300
350
400
DISTANCE IN FEET


RIVER MILE
328.7
36
31
26
21
16
11
ELEVATION IN FEET
0
25
50
75
100
125
150
175
200
225
250
275
300
DISTANCE IN FEET


RIVER MILE
345.8
15
10
5
0
-5
-10
ELEVATION IN FEET
60
85
110
135
160
185
210
235
260
285
310
335
360
DISTANCE IN FEET


RIVER MILE
346.0
ELEVATION IN FEET
25
20
15
10
5
0
-5
-10
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
DISTANCE IN FEET


RIVER MILE
346.5
56
51
46
41
36
31
26
21
16
ELEVATION IN FEET
0
20
40
60
80
100
120
140
160
180
200
220
240
DISTANCE IN FEET

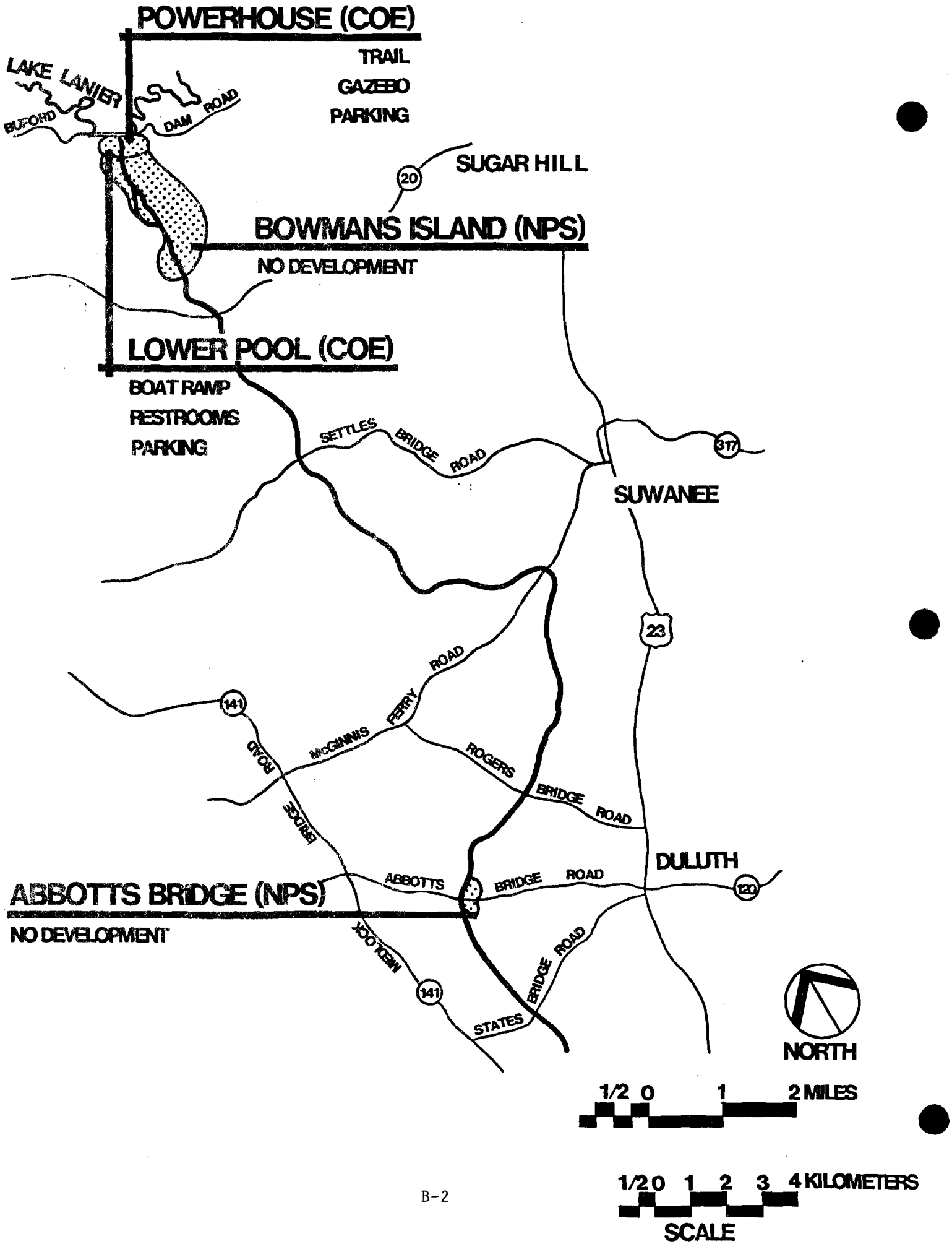

RIVER MILE
346.7
51
46
41
36
31
26
21
16
ELEVATION IN FEET
-20
0
20
40
60
80
100
120
140
160
180
200
220
240
DISTANCE IN FEET

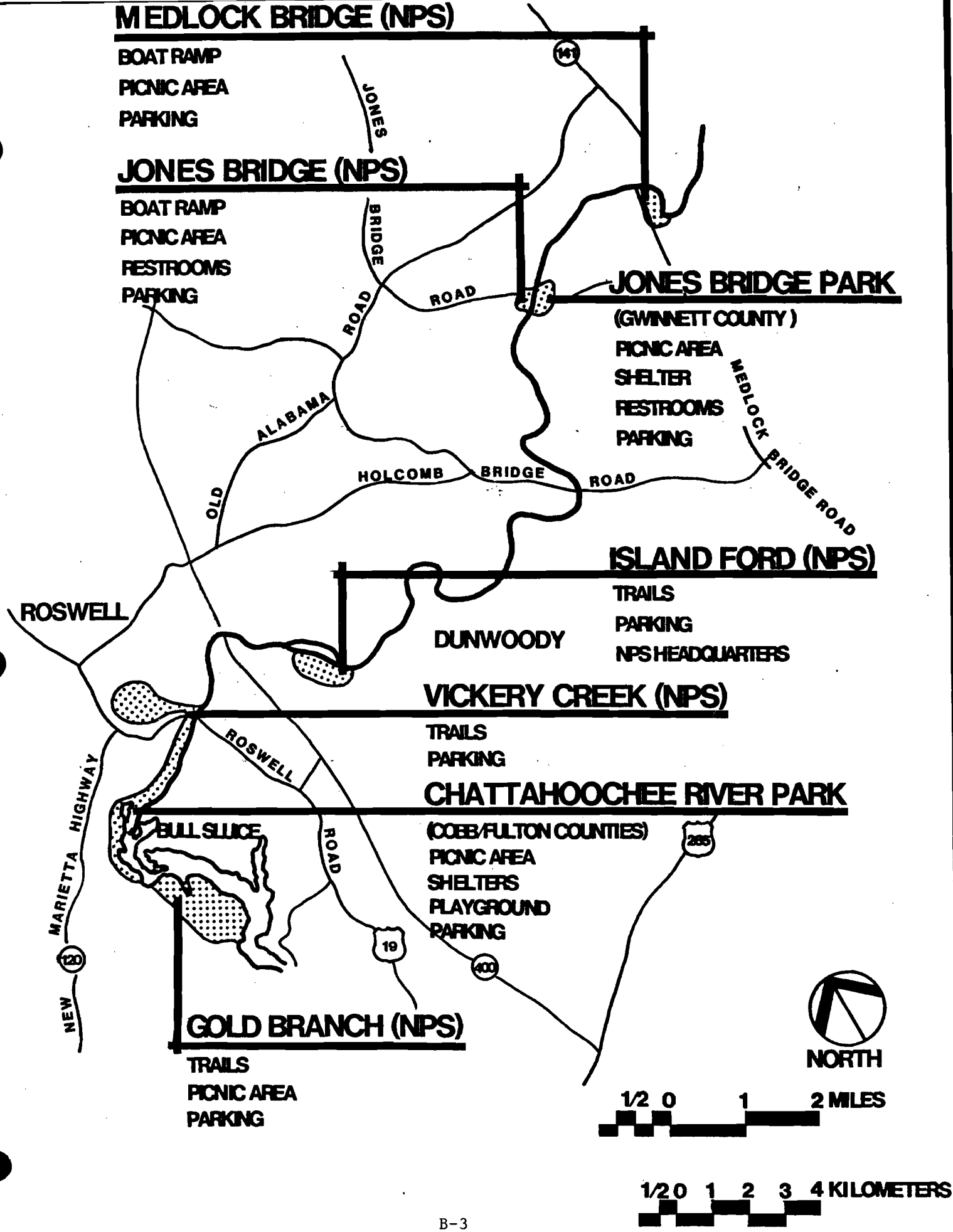
APPENDIX B

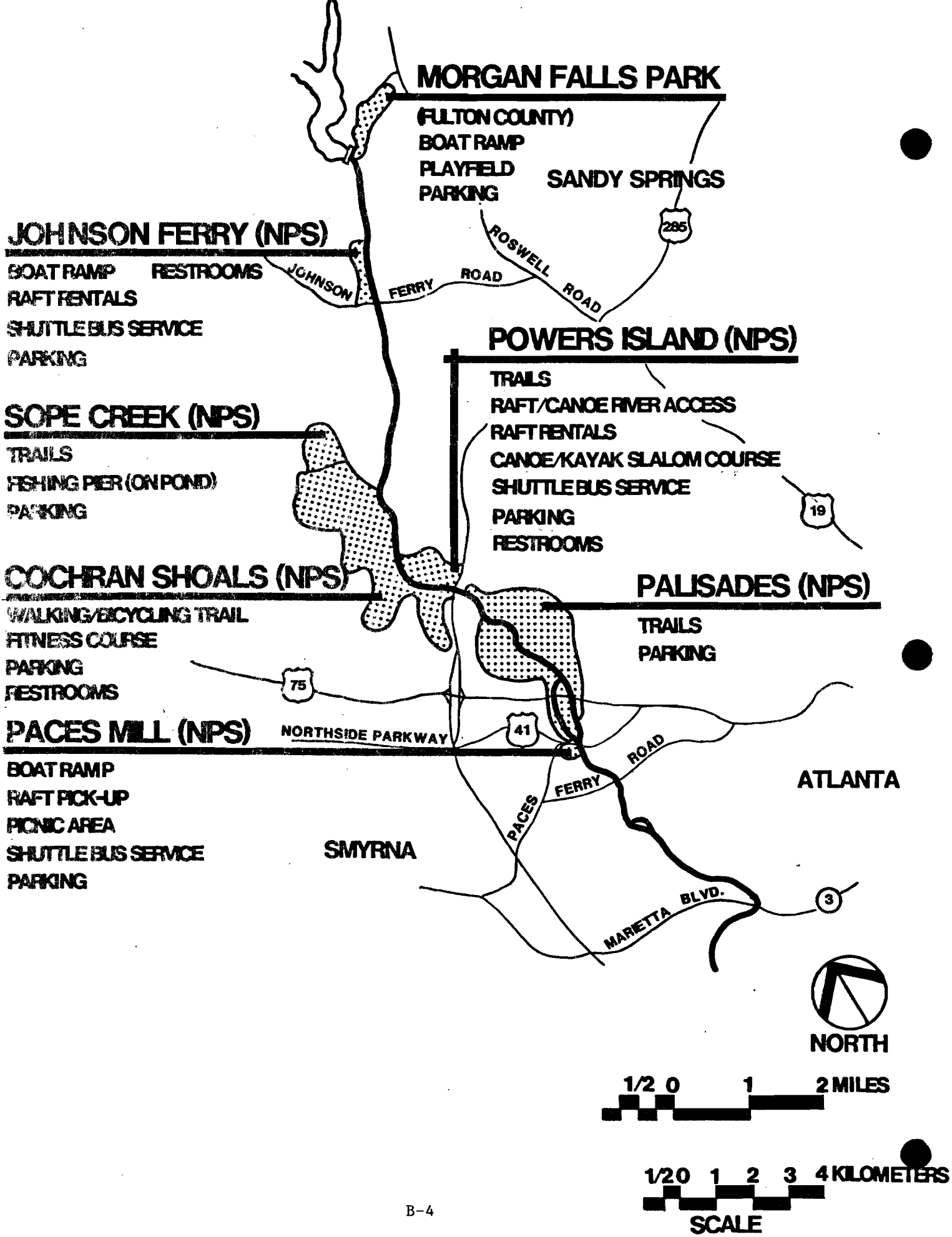
LOCATION MAPS

APPENDIX B

Location maps of the Chattahoochee River showing the major recreation areas in each of the major reaches. Modified from Hess (1980).


POWERHOUSE (COE)
TRAIL
GAZEBO
PARKING
LAKE LANIER
BUFORD
DAM ROAD
SUGAR HILL
20
BOWMANS ISLAND (NPS)
NO DEVELOPMENT
LOWER POOL (COE)
BOAT RAMP
RESTROOMS
PARKING
SETTLES BRIDGE ROAD
317
SUWANEE
23
141
McGINNIS FERRY ROAD
ROGERS BRIDGE ROAD
MEADOW BRIDGE ROAD
DULUTH
ABBOTTS BRIDGE ROAD
120
ABBOTTS BRIDGE (NPS)
NO DEVELOPMENT
STATES BRIDGE ROAD
141
NORTH
1/2 0 1 2 MILES
1/2 0 1 2 3 4 KILOMETERS
SCALE


MEDLOCK BRIDGE (NPS)
BOAT RAMP
PICNIC AREA
PARKING
JONES BRIDGE (NPS)
BOAT RAMP
PICNIC AREA
RESTROOMS
PARKING
JONES BRIDGE PARK
(GWINNETT COUNTY)
PICNIC AREA
SHELTER
RESTROOMS
PARKING
ISLAND FORD (NPS)
TRAILS
PARKING
NPS HEADQUARTERS
VICKERY CREEK (NPS)
TRAILS
PARKING
CHATTAHOOCHEE RIVER PARK
(COBB/FULTON COUNTIES)
PICNIC AREA
SHELTERS
PLAYGROUND
PARKING
GOLD BRANCH (NPS)
TRAILS
PICNIC AREA
PARKING
ROSWELL
DUNWOODY
BULL SLUICE
JONES BRIDGE ROAD
ALABAMA ROAD
OLD ALABAMA ROAD
HOLCOMB BRIDGE ROAD
MEDLOCK BRIDGE ROAD
ROSWELL ROAD
MARIETTA HIGHWAY
NEW
141
120
19
400
285
NORTH
1/2 0 1 2 MILES
1/2 0 1 2 3 4 KILOMETERS


MORGAN FALLS PARK
(FULTON COUNTY)
BOAT RAMP
PLAYFIELD
PARKING
SANDY SPRINGS
285
ROSWELL ROAD
JOHNSON FERRY (NPS)
BOAT RAMP
RESTROOMS
RAFT RENTALS
SHUTTLE BUS SERVICE
PARKING
JOHNSON FERRY ROAD
POWERS ISLAND (NPS)
TRAILS
RAFT/CANOE RIVER ACCESS
RAFT RENTALS
CANOE/KAYAK SLALOM COURSE
SHUTTLE BUS SERVICE
PARKING
RESTROOMS
19
SOPE CREEK (NPS)
TRAILS
FISHING PIER (ON POND)
PARKING
COCHRAN SHOALS (NPS)
WALKING/BICYCLING TRAIL
FITNESS COURSE
PARKING
RESTROOMS
PALISADES (NPS)
TRAILS
PARKING
75
PACES MILL (NPS)
NORTHSIDE PARKWAY
41
BOAT RAMP
RAFT PICK-UP
PICNIC AREA
SHUTTLE BUS SERVICE
PARKING
PACES FERRY ROAD
ATLANTA
SMYRNA
MARIETTA BLVD.
3
NORTH
1/2 0 1 2 MILES
1/2 0 1 2 3 4 KILOMETERS
SCALE

APPENDIX C

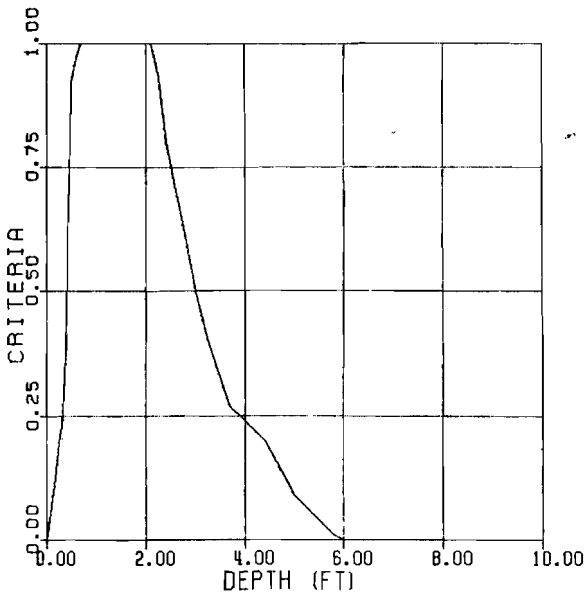
SUITABILITY CURVES
FOR
TROUT SPECIES

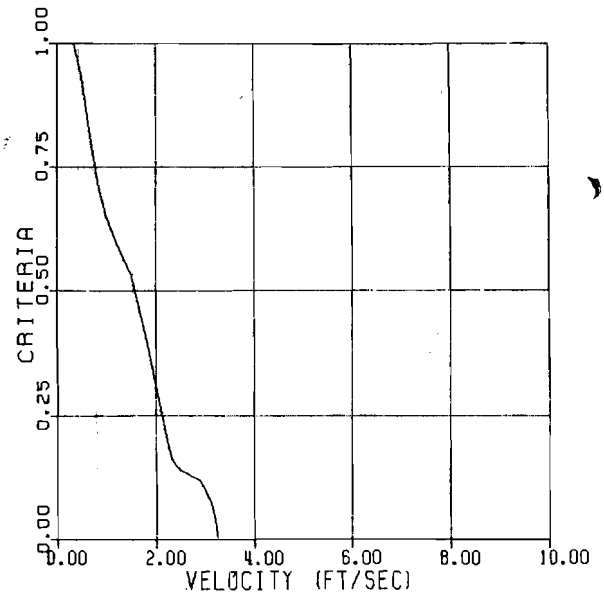
APPENDIX C

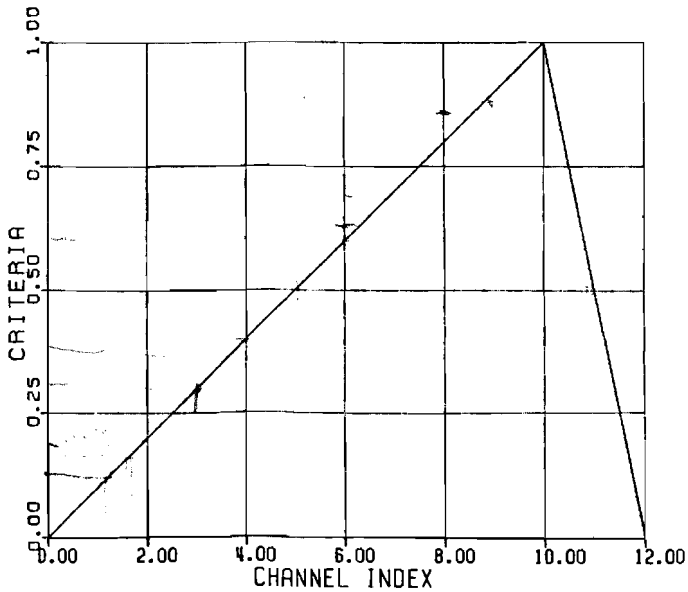
Suitability curves for trout species studied in this report. Curves are included for adult brook trout, adult rainbow trout, adult brown trout and juvenile brown trout.

BRØWN TRØUT--JUVENILE

11501 29-AUG-84

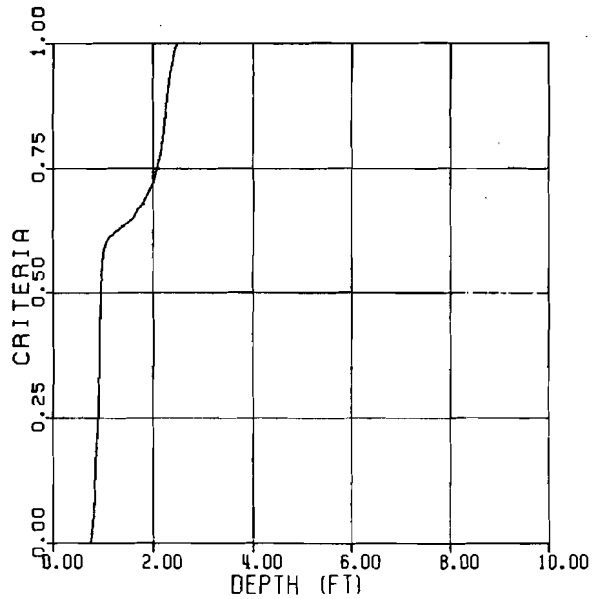


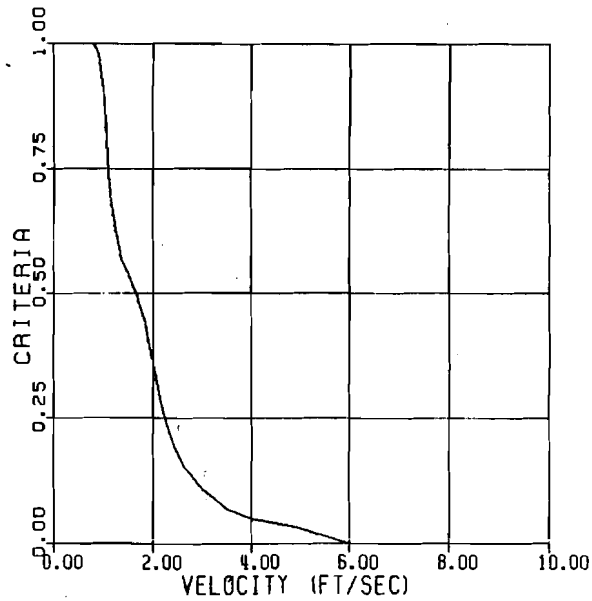


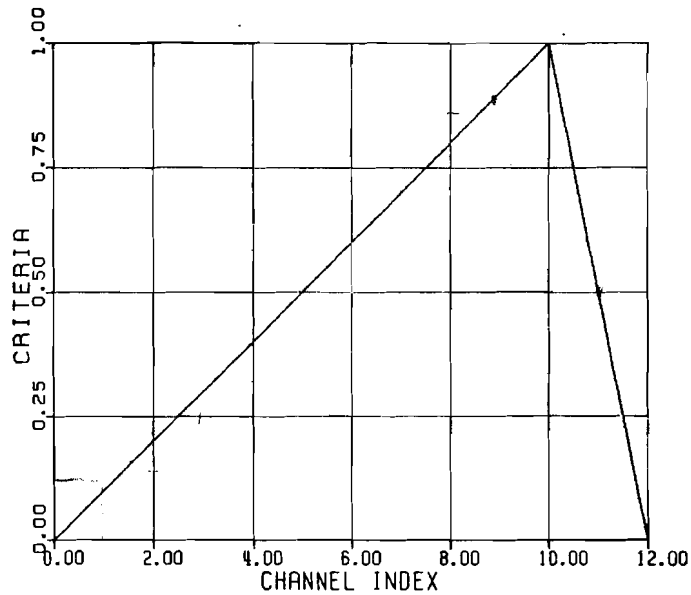


BRØWN TRØUT--ADULT

11302 29-AUG-84

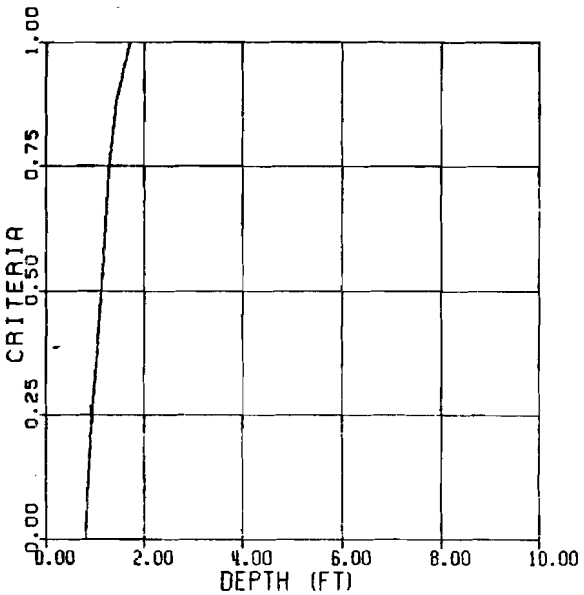


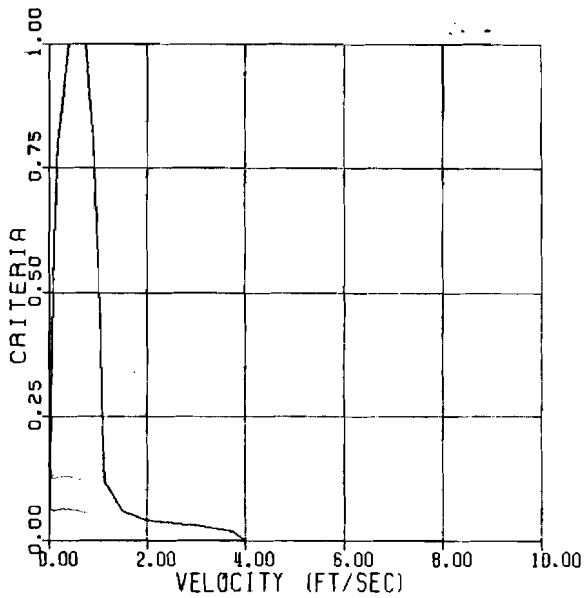


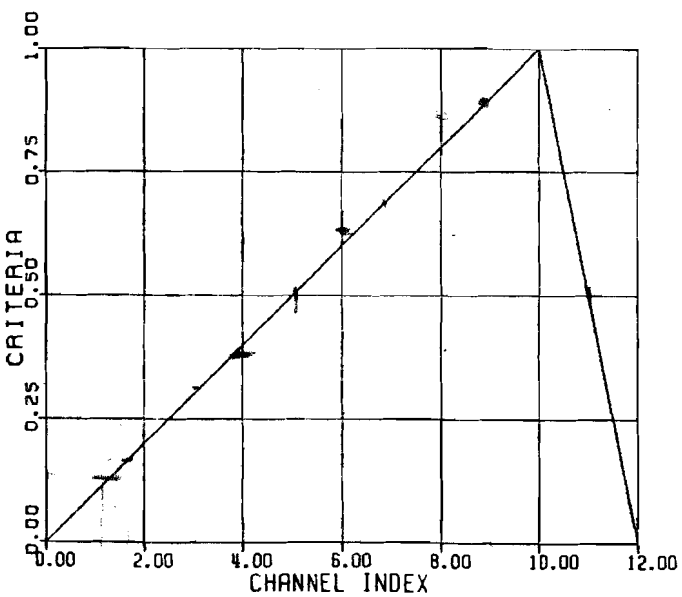


BROOK TROUT--OPEN RIVER

11111 29-AUG-84

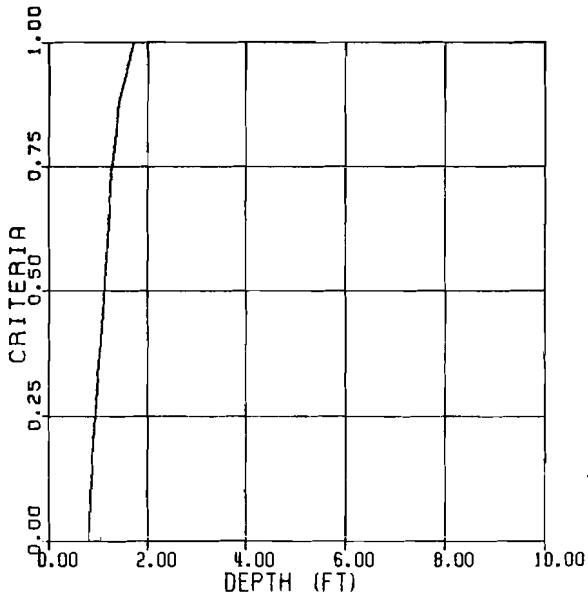


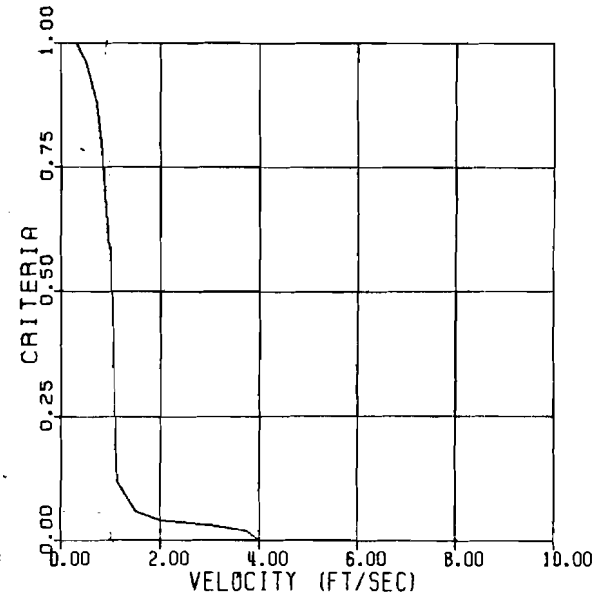


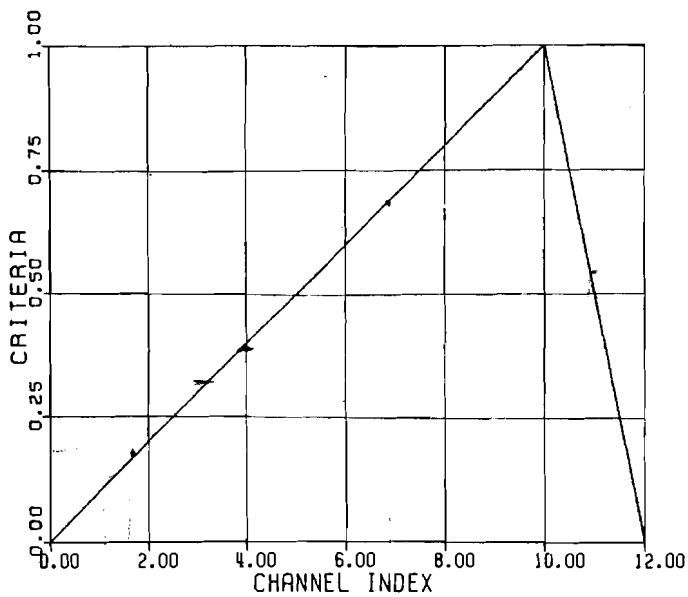


BROOK TROUT (SHOAL)--ADULT

11402 29-AUG-84

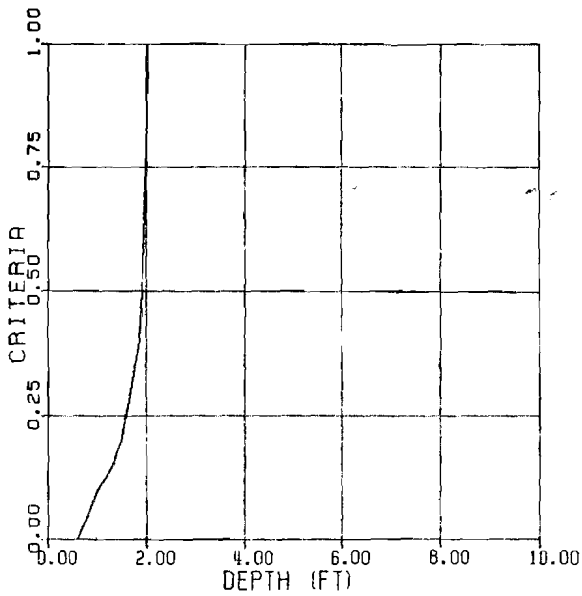


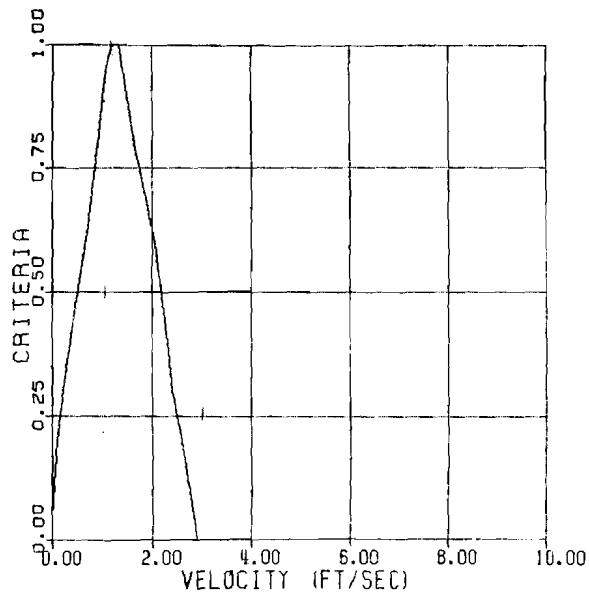


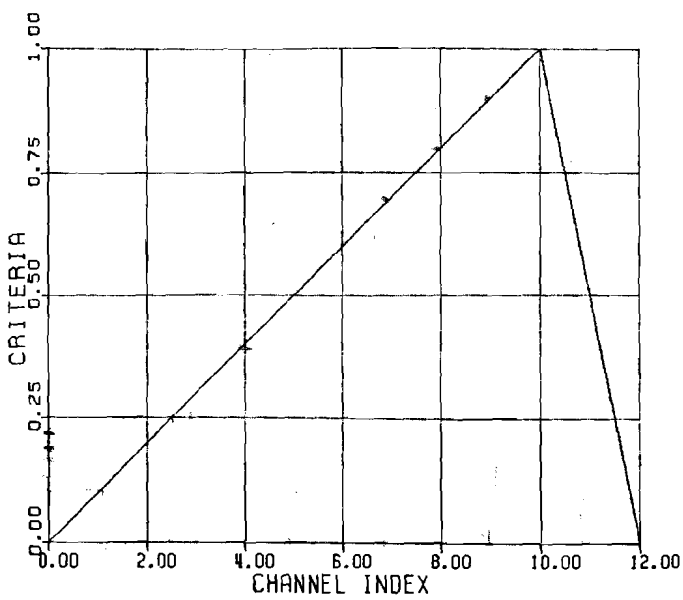


RAINBOW TROUT--ADULT

11102 29-AUG-84







APPENDIX D

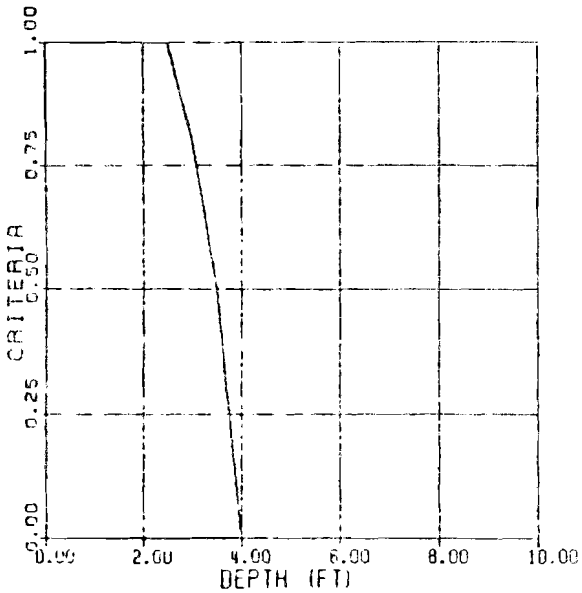
SUITABILITY CURVES FOR RECREATIONAL FISHING

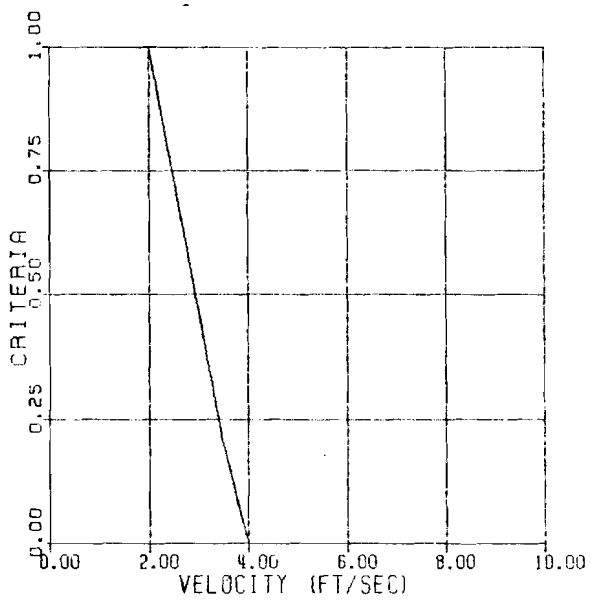
APPENDIX D

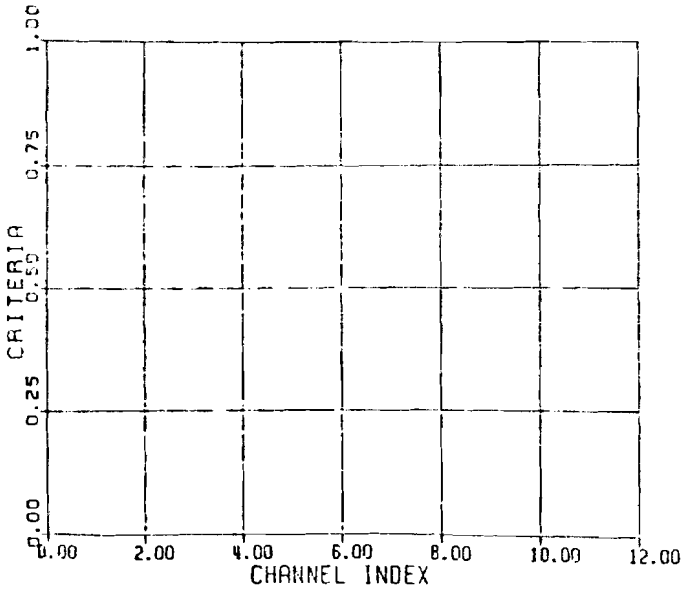
Suitability curves for recreational fishing activities investigated in this report. Curves are included for wade- and tube-fishing and for nonpower and low-power boat fishing.

SUITABILITY OF USE CRITERIA- FISHING/WAD

70000 20-AUG-84

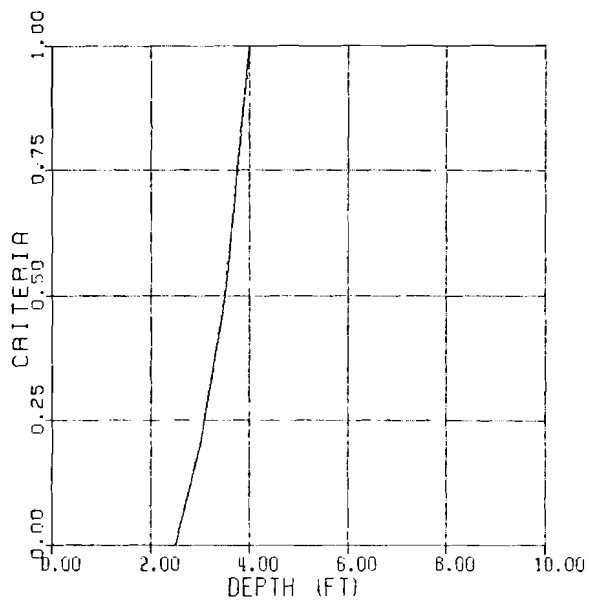


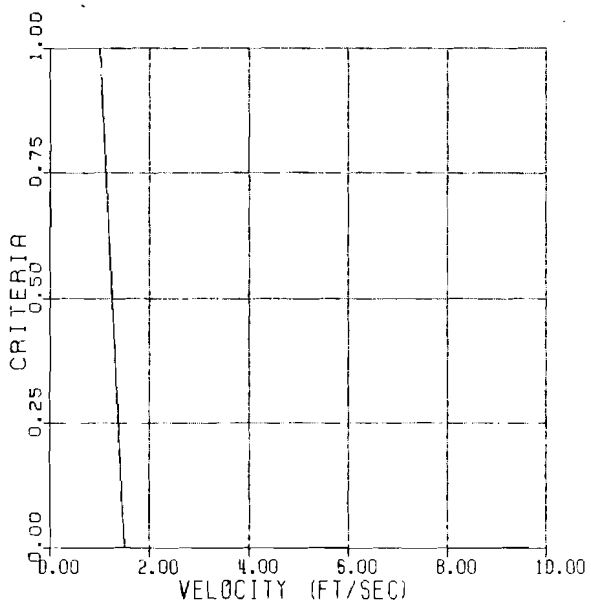


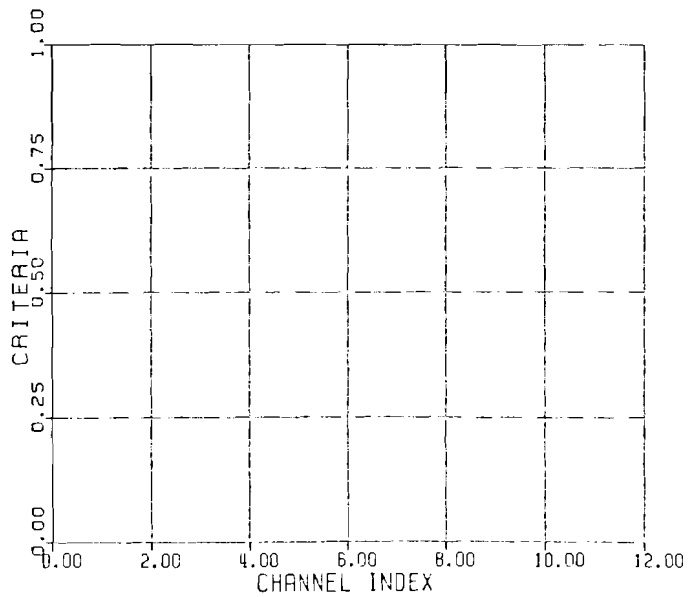


SUITABILITY OF USE CRITERIA-FISHING/TUBI

70010 20-AUG-84

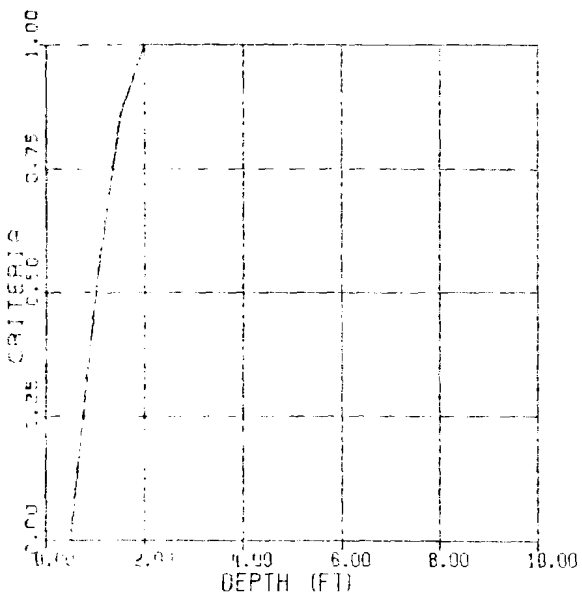


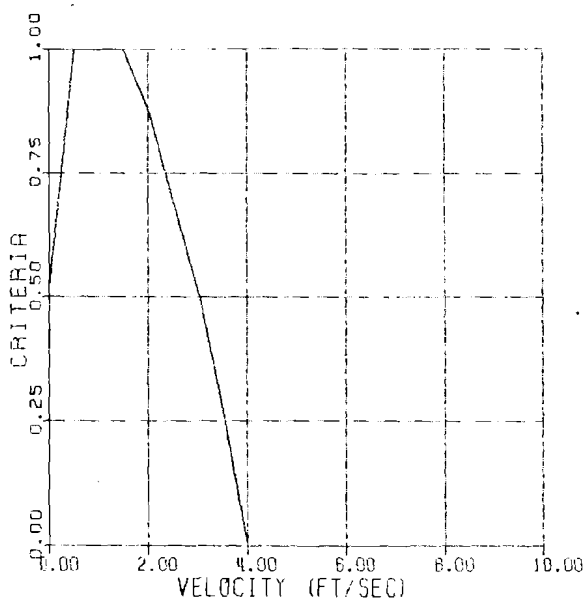


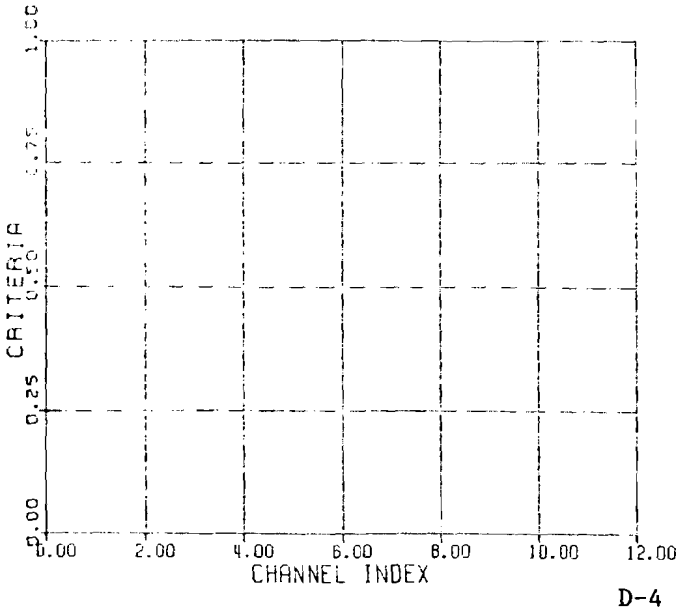


FISHING (FRØM INFØ PAPER NØ. 6)/BØAT-NPR

70020 20-AUG-84

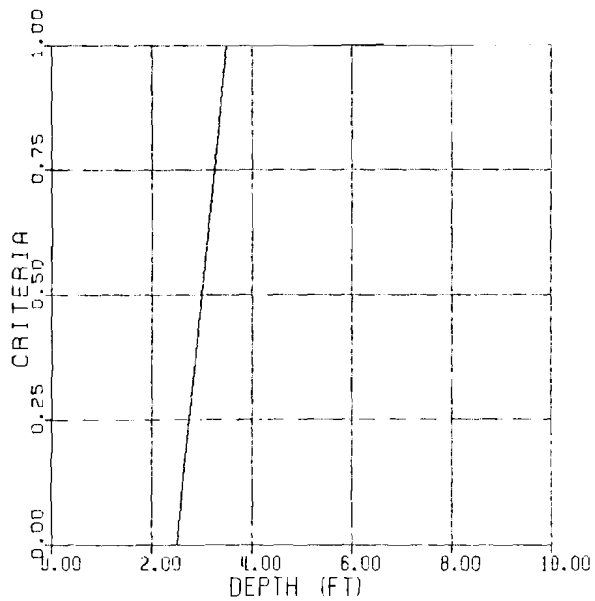


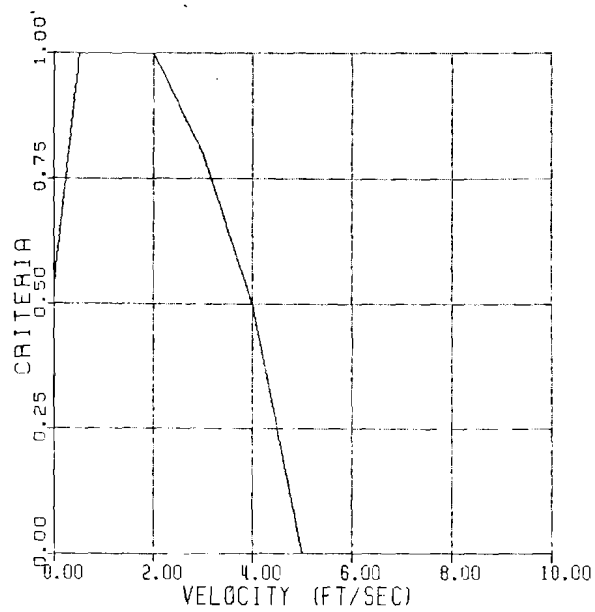


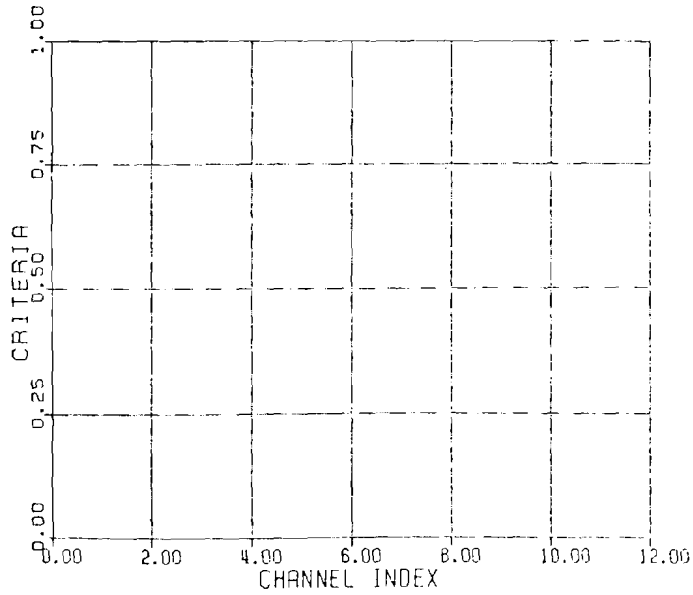


FISHING (FRØM INFØ PAPER NØ.6)/BØAT-PWR

70030 20-AUG-84







APPENDIX E

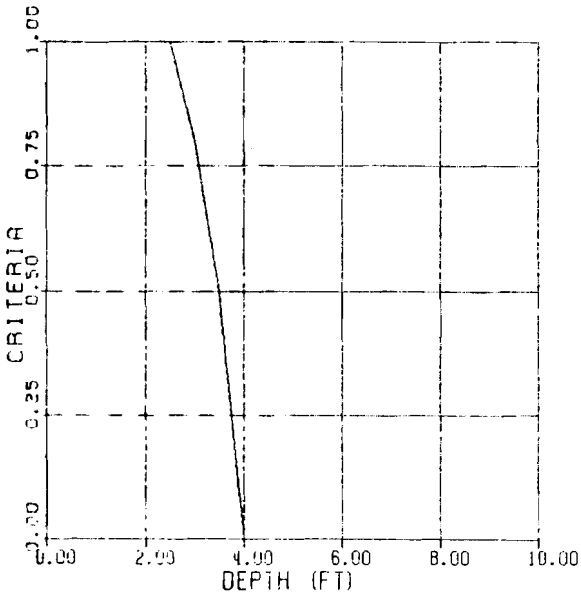
SUITABILITY CURVES FOR RECREATIONAL ACTIVITIES

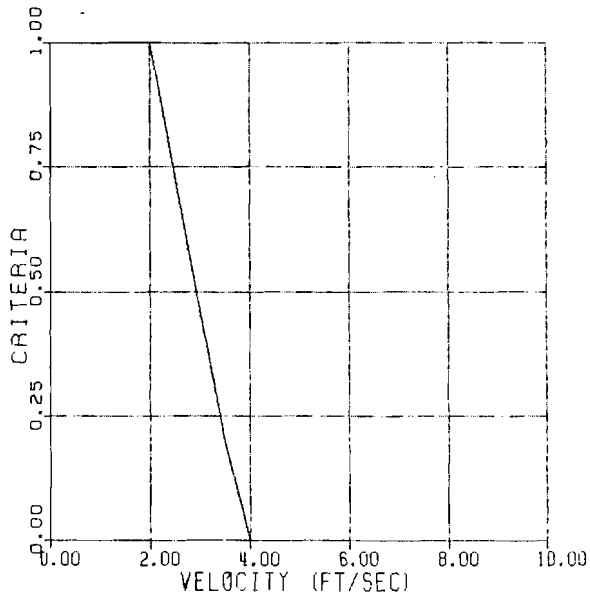
APPENDIX E

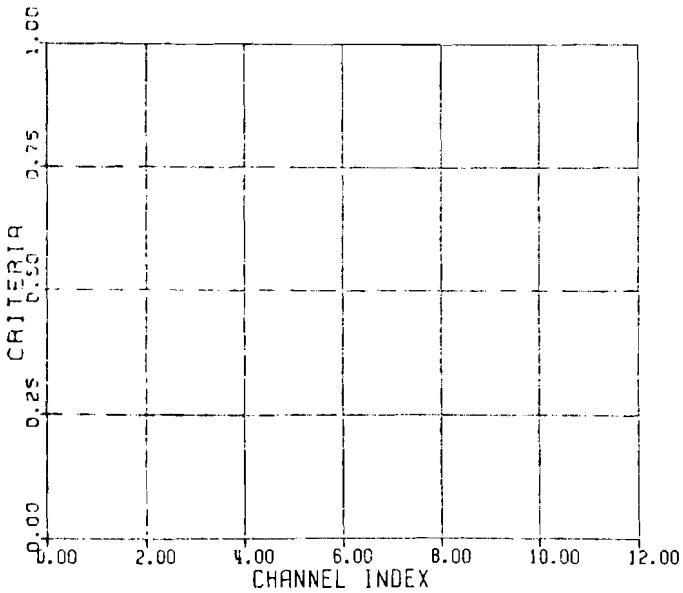
Suitability curves for recreational activities studied in this report. Curves are included for novice canoeing, midlevel canoeing, raft landing, novice rafting (includes safety considerations), preferred novice rafting, and midlevel rafting.

SUITABILITY OF USE CRITERIA-WC/WADING

71010 20-AUG-84

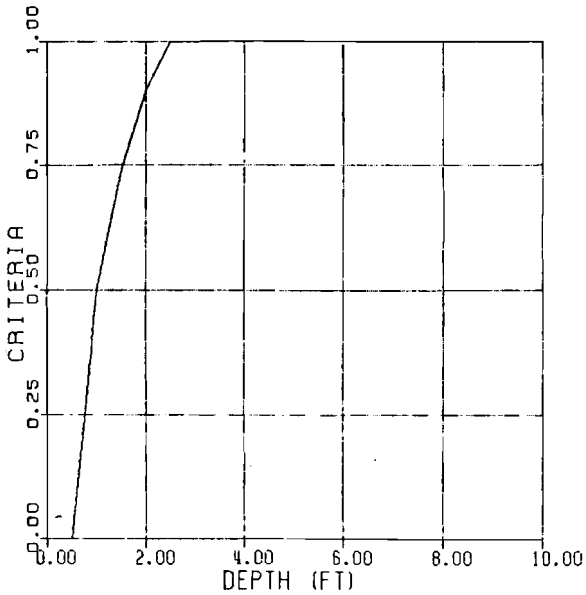


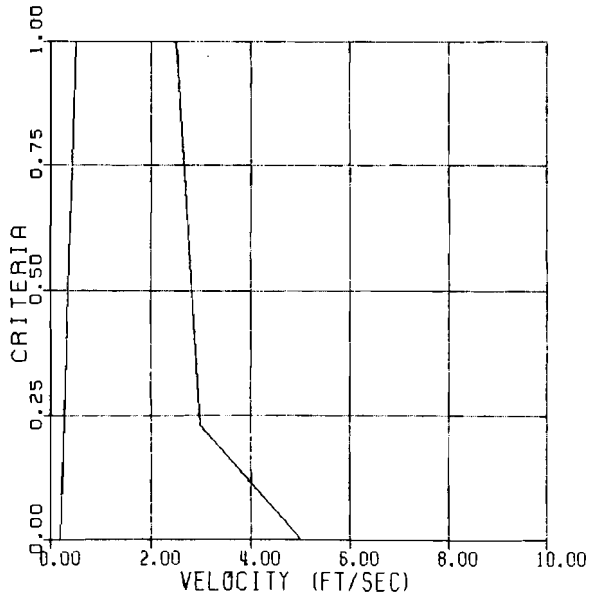


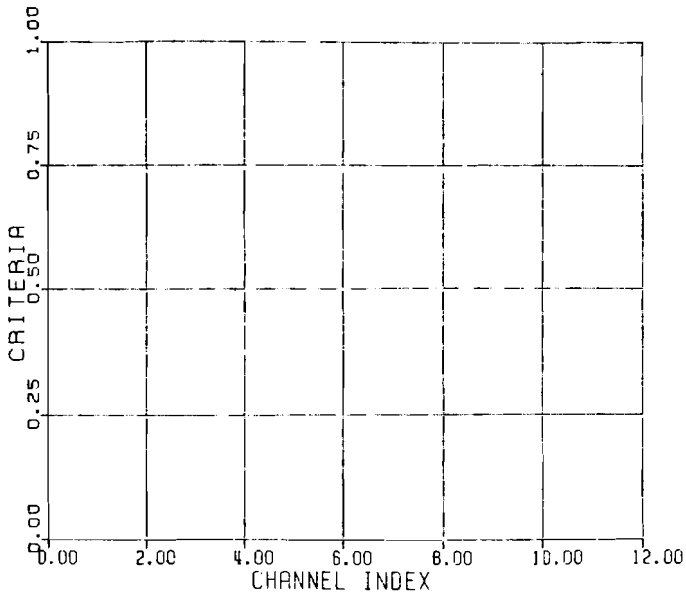


SUITABILITY ØF USE CRITERIA=CANØE (RIVER)

720302 20-AUG-84

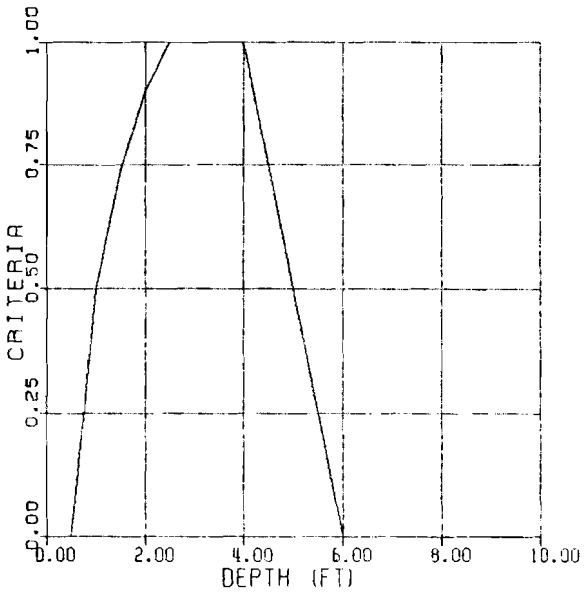


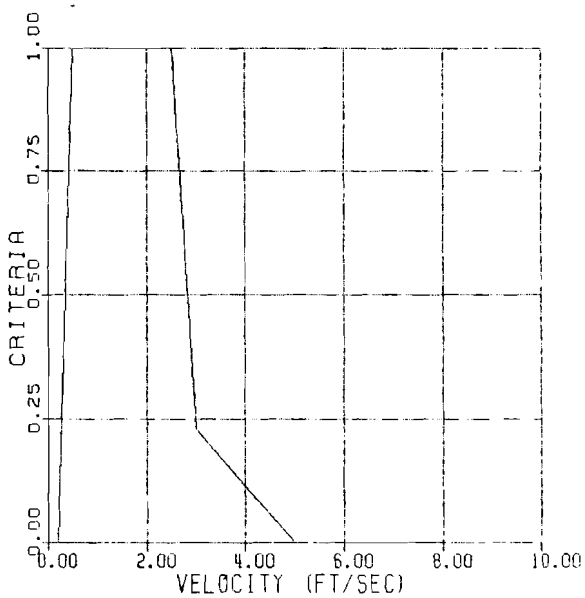


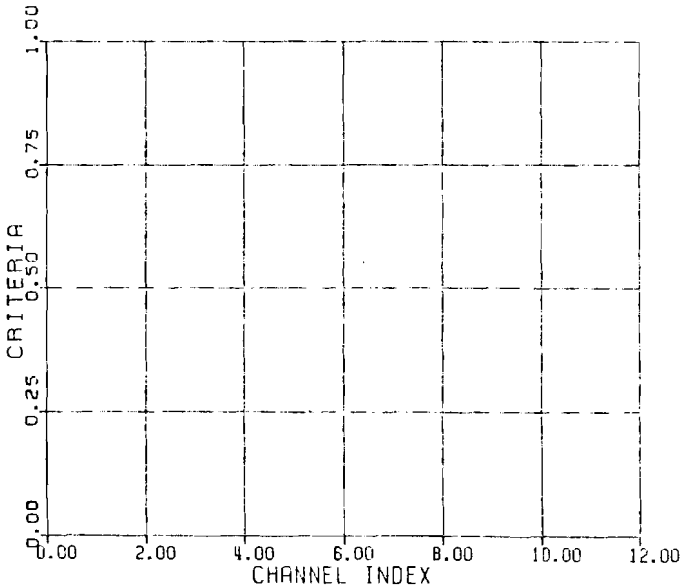


SUITABILITY OF USE CRITERIA-CANOE (SHOAL)

720301 20-AUG-84







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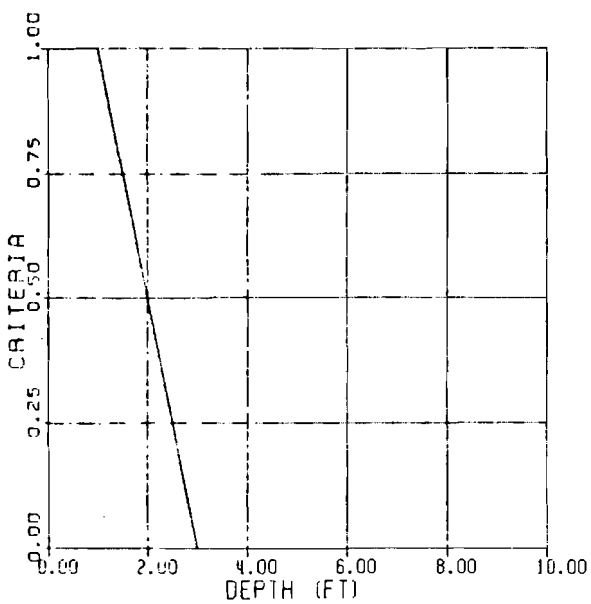
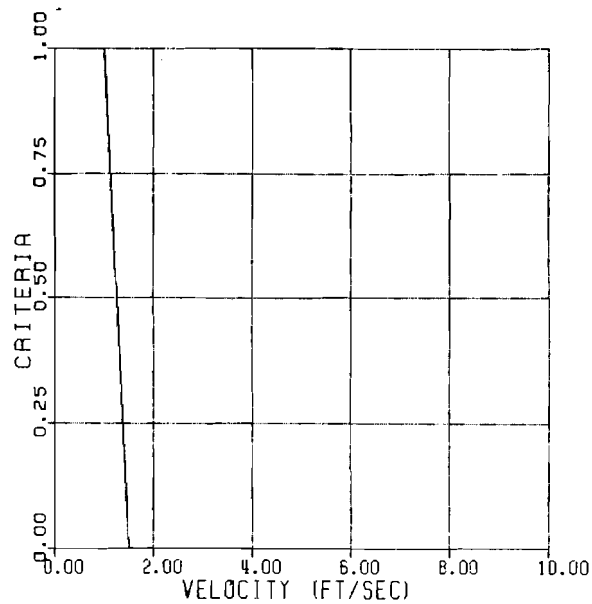
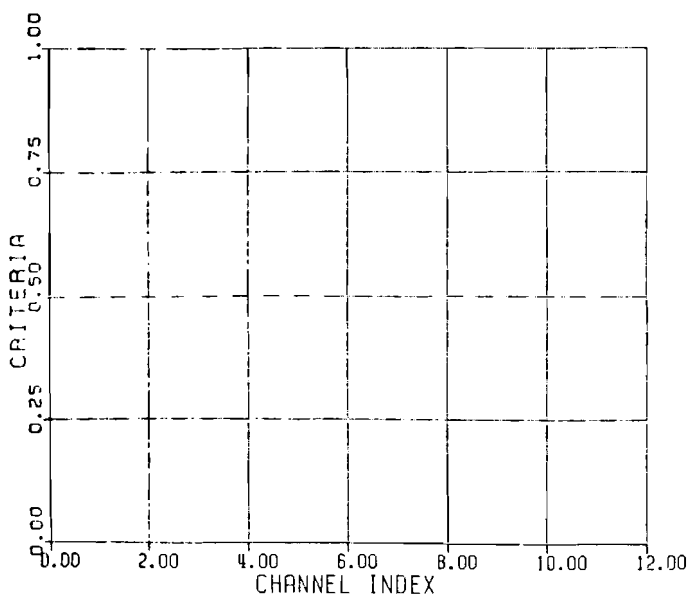
720400 20-AUG-84







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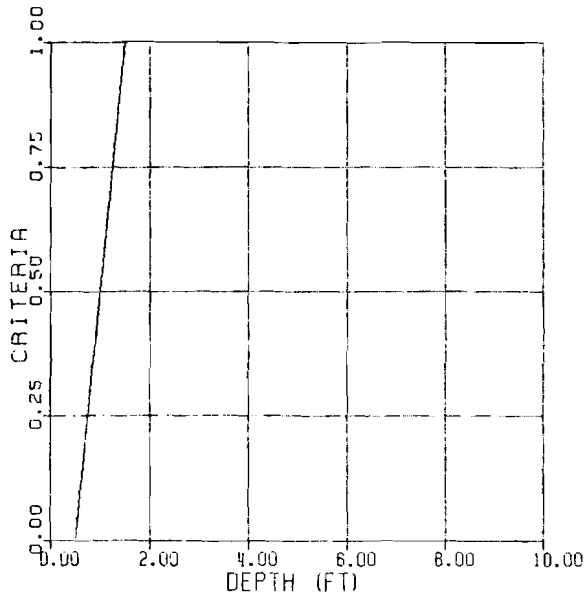

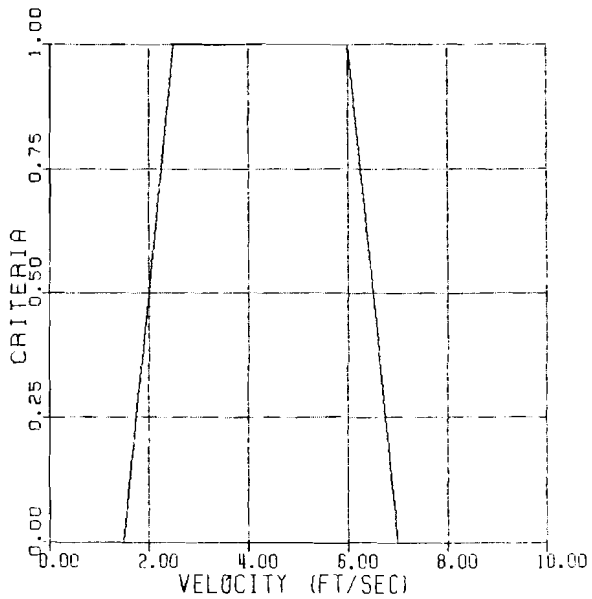

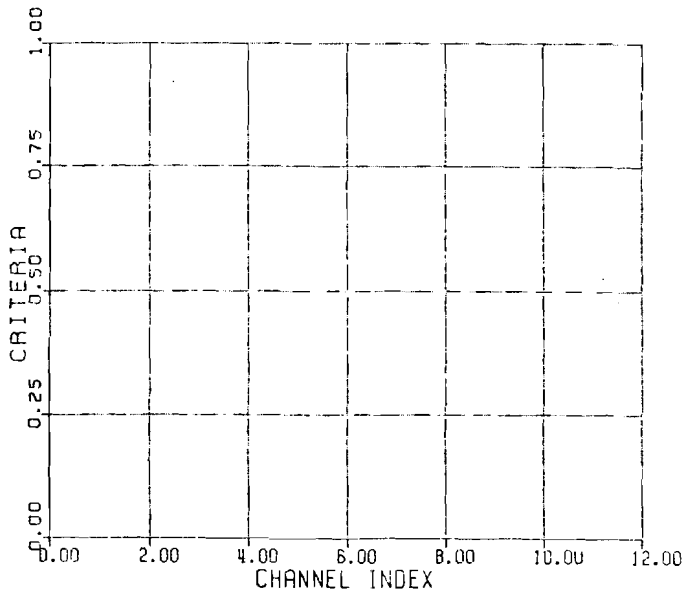

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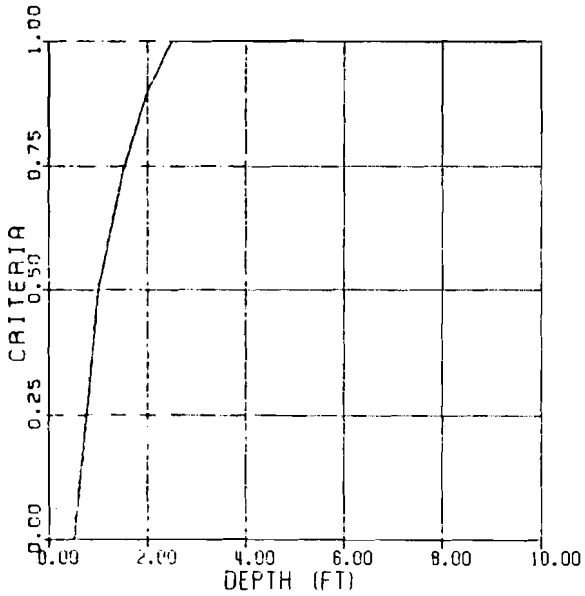

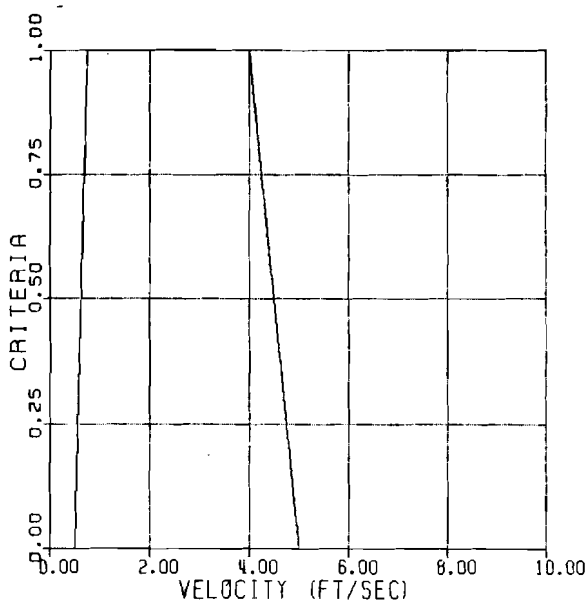

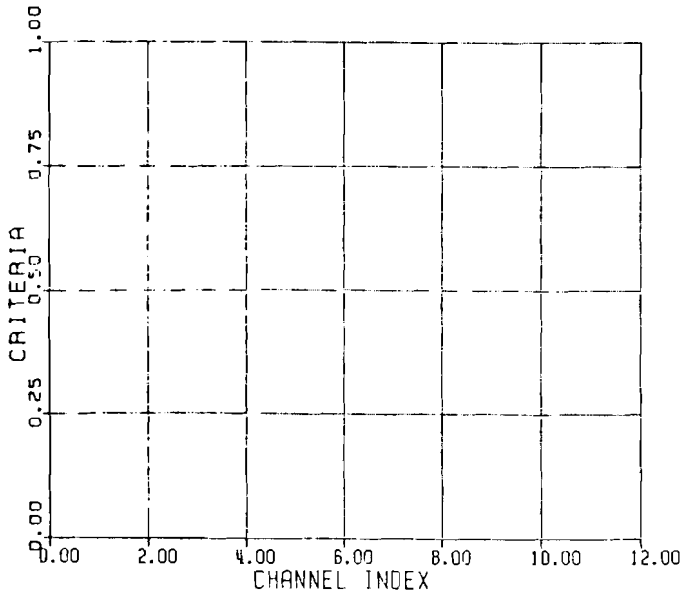

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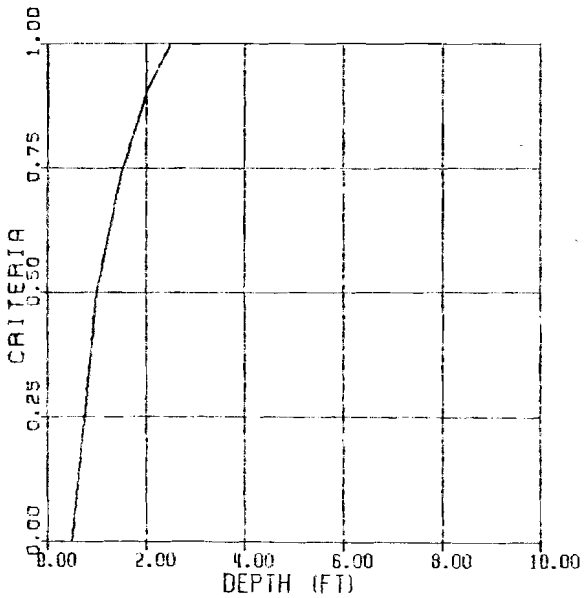

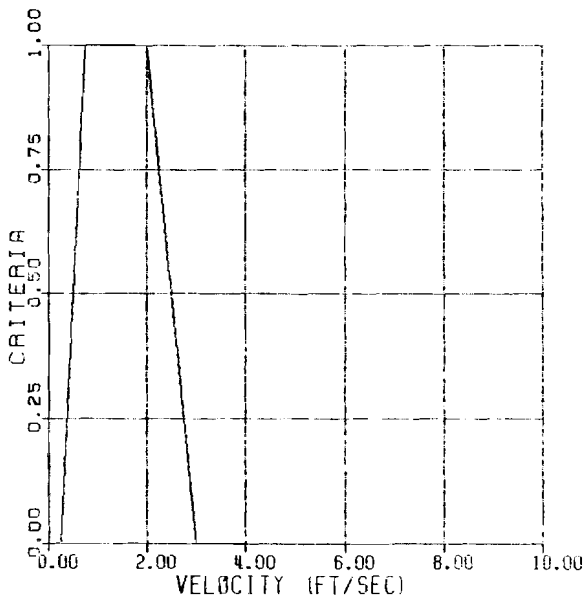

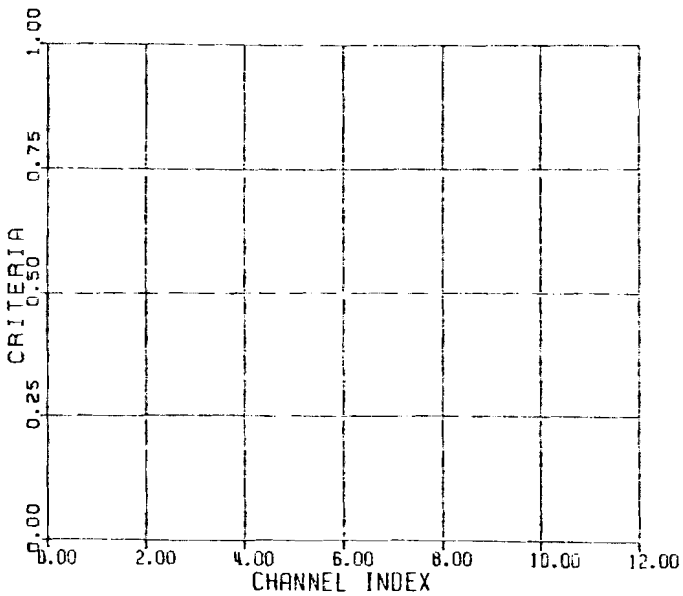

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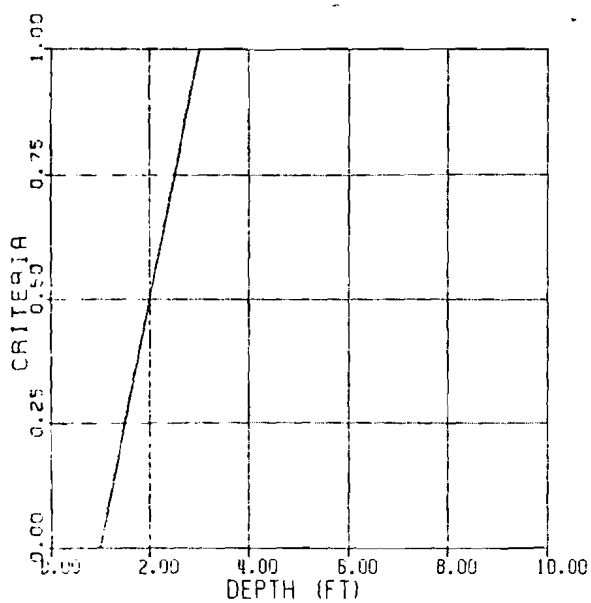
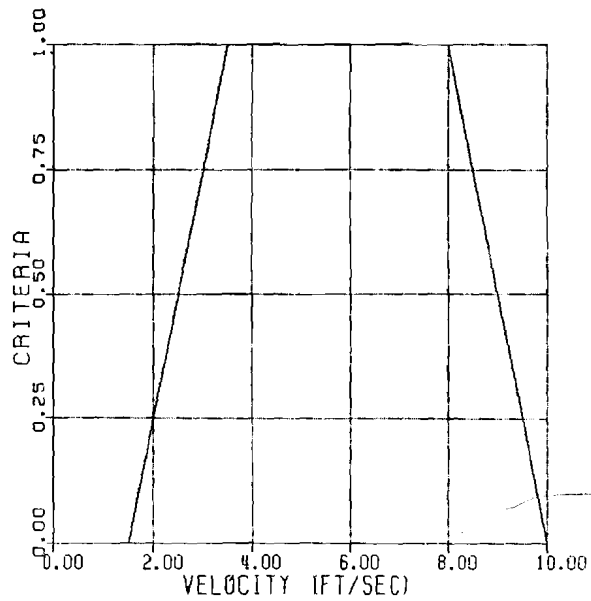
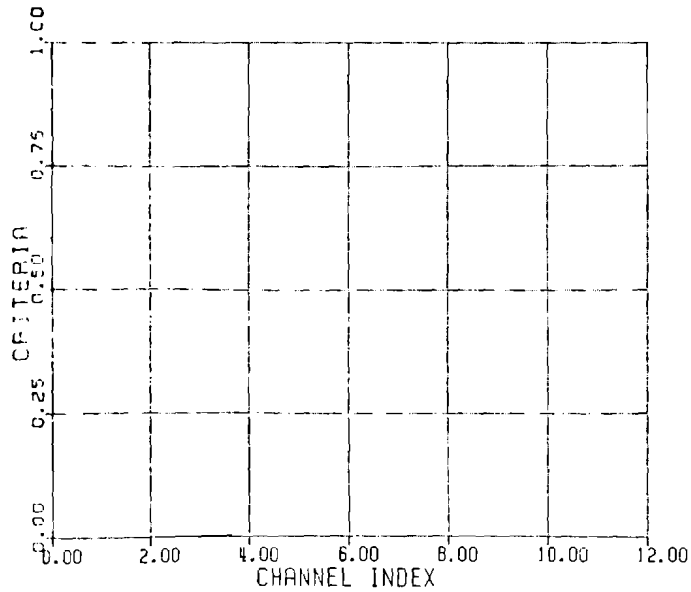






APPENDIX F

LETTER REPORT

PHABSIM ANALYSIS WITH ATTACHMENT A
(STREAMFLOW RELATIONSHIPS)

APPENDIX F

Letter report of the reconnaisance PHABSIM analysis performed on the Chattahoochee River by the Instream Flow Group of the U. S. Fish and Wildlife Service. The results of this study are preliminary in nature and do not represent the final conclusions of this study.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

DIVISION OF BIOLOGICAL SERVICES
Western Energy & Land Use Team
Creekside One Building
2627 Redwing Road
Fort Collins, Colorado 80526-2899

Instream Flow and Aquatic Systems Group

January 26, 1984 IFG: 577

Memorandum

To: Field Supervisor, ES, Panama City, FL

From: Group Leader, Western Energy and Land Use Team, IF&ASG

Subject: Chattahoochee River, Georgia Reconnaissance Study

This memorandum reports the results of studies and analysis made in accordance with order for reimbursable services number WESRF 83-313 dated May 17, 1983. The following information for the Chattahoochee River downstream from the site of a proposed re-regulation dam near Atlanta, Georgia is provided:

A. An assessment of the potential for channel change based on existing data;

B. Design of a sampling program adequate to describe potential changes in the fish habitat and recreation potential; and

C. Use summaries of USGS measurements to perform a reconnaissance-level PHABSIM analysis of the physical habitat for fisheries and the river space for recreation.

RECONNAISSANCE LEVEL PHABSIM

The results of the reconnaissance level PHABSIM study are given in Attachment A. These analysis were made using existing data. The river reaches used in analysis were from River Mile 330.77 to 348.10 (Georgia Highway 14 to Buford Dam, River Mile 319.57 to 324.68 (c/s set 2), and river mile 306.98 to 309.44 (c/s set 1). The later two sets are for river reaches below Morgan Falls Dam.

The results must be considered of reconnaissance grade only with the data for RM 330.77 to 348.10 being the most reliable. The use of Corps of Engineers data instead of USGS data for two of the reaches was made because the Corps data is better for the study purposes than the available USGS data.

The results the PHABSIM reconnaissance study all tell essentially the same story - namely that the physical habitat for Brook Trout and Brown Trout decrease continually in the range of 500 to at least 6000 cfs, that the habitat for rainbow trout increase from 500 cfs to 1000 cfs and then decreased with further increase in flow. The river space for recreation depends on the recreational activity. The predominate activity on the Chattahoochee is a composite of boating and wading such that the best flows are probably between 1000 and 2000 cfs.

The reconnaissance study did not include any substrate/cover factors and the suitability functions for trout were based on data from small to medium size streams. Substrate/cover must be included in more detailed studies and the suitability criteria must also be reviewed. My judgment is that the results

of a more detailed analysis will differ in specifics from the reconnissance study but, for trout, have the same general form. Additional data will have to be collected in order to simulate the river recreational space for the critical recreation areas (shoals and near the shoals); consequently, the results of the more detailed study could be significantly different from reconnaissance results in Attachment A.

POTENTIAL FOR CHANNEL CHANGE

The suspended sediment load data for the Chattahoochee River at Atlanta and for Big Creek near Alpharetta were analyzed. The relationship between suspended load and streamflow is given in Attachment B. The equations for each stream are

Big Creek near Alpharetta, Georgia

Total load = 0.0124 *(DISHCARGE)** 1.57
Standard Error of Estimate = 0.11
Correlation Coefficient (R) = 0.89

Sand load = 0.00014*(DISCHARGE)** 2.02
Standard Error of Estimate = 0.21
Correlation Coefficient (R) = 0.88

Chattahoochee River at Atlanta

Total load = $0.11*10^{-5}$ *(DISHCARGE)** 2.44
Standard Error of Estimate = 0.17
Correlation Coefficient (R) = 0.86

Sand load = $0.14*10^{-13}$(DISCHARGE)**4.36
Standard Error of Estimate = 1.93
Correlation Coefficient (R) = 0.66

In U.S. Geological Survey Professional Paper 1107, the statement is made, "The relative stability of channel dimensions was assessed by noting the occurrence of bank sloughing and channel debris and the abundance and type of bank vegetation. These assessments indicate that relatively severe bank erosion has occurred..., along the Chattahoochee River downstream of Buford Dam."

The authors of PP 1107 derived equations for the sediment transport at each of the two stations differently - their equations for total load are

Big Creek near Alpharetta

Rising Limb:

Total load = $39.1*10^{-6}*(DISHCARGE)**2.61$
Correlation Coefficient = 0.99

Steady and Falling Limb:

Total load = $15.1*10^{-3}*(DISHCARGE)**1.46$
Correlation Coefficient = 0.84

Chattahoochee River at Atlanta

Cases where most of the flow is reservoir release:

Total load = $0.820*10^{-3}(DISHCARGE)**1.27$
Correlation Coefficient = 0.81

Cases where most of the flow is from land between Buford Dam and the Atlanta Gage

Total load = $2.97*10^{-6}(DISHCARGE)**2.49$
Correlation Coefficient = 0.93

The authors of Professional Paper 1107 considers the load due to reservoir releases to be channel erosion between Buford Dam and the Atlanta Gage; a distance of about 30 miles. The total equations for both the load sediment inflow and reservoir release cases are given in Attachment B.

Tables 22 and 25 of Protessional Paper page 1107 suggests the following total sediment load is being transported in the Chattahoochee. (Using table 23, the ratio of bed load to unmeasured sediment load is assumed to be 0.18.)

Measured suspended load	108,000 tons/year
Unmeasured suspended load	31,270
Bed load	5,630
Total	144,900 tons/year

The source of the measured suspended load is

Channel erosion	62,300 tons/year
Watershed loss	45,700 tons/year
Total	108,000 tons/year

If the same proportion holds for the total load, the source is

Channel erosion	83,600 tons/year
Watershed loss	61,300 tons/year
Total	144,900 tons/year

If the banks of the Chattahooche River average 15 feet high with a unit weight of sediment of 120 lb/ft^3; the average erosion rate would be 0.30 feet per year on each side of the river.

There is an alternative approach to calculate the erosion rate between Buford Dam and the Atlanta Gage. This alternative is given below.

The draiange areas are

Chattahooche River at Buford Dam	1040 mi^2
Chattahoochee River at Atlanta	1450 mi^2
Between Buford Dam and Atlanta	410 mi^2

The sediment load of Big Creek has been measured; the total load is:

Measured suspended load	24,000
Unmeasured suspended load	1630
Bed load	160
Total	25,600

The drainage area of Big Creek at the gage is 72.0 sq. mi. Assuming the yield per square mile from the area between Buford Dam and the Atlanta Gage is 80 percent of the yield from Big Creek, the yield (SY) for the area is

$$SY = (0.8)\ \frac{25,600}{72} = 284 \text{ tons/mi}^2\text{/yr.}$$

The total sediment load (Q_S) to the Chattahoochee River between Buford Dam and the Atlanta gage is

$$Q_s = (284)(410) = 116,622 \text{ tons/year}$$

On this basis, the channel erosion is 73,600 tons per year (see Attachment C). The erosion rate would then be 0.26 feet per year. Given the uncertainty in all of the estimates, these calculations suggest the estimate based on pp 1107 is probably correct.

Field observations suggest there is more debris from trees falling into the river than in unregulated southeastern rivers. There could be two explanations for this.

Explanation 1: The diurnal variation in streamflow due to power generation causes an increase in bank erosion with an increase in the number tree falling into the river.

Explanation 2: The reduction of peak flows resulting from flood control operation of Buford Dam reduces the rate at which trees that fall into the river are removed from the river. Consequently, the number of trees in the river has increased over the "natural" cause.

The daily streamflow duration curve, given in Attachment D, indicates there has been a reduction in peak flows but an increase in more moderate flows. The net result of the analysis above and observations along the river, is that, on the reconnaissance level, there does appear to be a channel change problem. Consequently, channel change must be addressed further.

CONSIDERATIONS RELATED TO INSTREAM FLOWS AND RECREATION

All instream flow considerations in the Chattahooche River between Buford Dam and Atlanta are related to fisheries and recreational use. Fishery concerns are important because one of the principle recreational pursuits is fishing.

On the basis of the reconnissance level investigation the river between Buford Dam and Atlanta (Peachtree Creek) can be divided into sub-sections. These are:

1. Buford Dam to Fish Weir Shoals (RM 345.8 to 345.8)
2. Fish Weir Schools to Jones Bridge Shoals (RM 328.7 to 345.8)
3. Jones Bridge to Headwaters of Bull Sluice Lake (RM 317 to 328.7)

4. Bull Sluice Lake and Morgan Falls Dam (RM 312.5 to 317)
5. Morgan Falls to Peachtree Creek (RM 300.4 to 312.5)

The river miles given are approximate.

The river between Buford Dam and Fish Weir Shoal is used mostly for bank fishing but could be used for floating. From Fish Weir Shoals to Jones Bridge Shoals the river is gentle and little used for recreational pursuits except for bank fishing at bridge crossings. In the reach between Jones Bridge and Bull Sluice Lake it appears most of the river recreation is concentrated at the two major shoal areas - Jones Bridge and Island Ford and this use is for fishing from boats, by wading, and from the banks. The fishing in the reach between Bull Sluice Lake and Buford Dam is maintained by stocking adult trout. The most important fishing area in the whole 30 miles between the lake and dam is at Island Ford Shoals. Bull Sluice Lake apparently is little used for recreation - this assumption must be checked in future work. The reach downstream of Morgan Falls Dam is the most important reach because of two important recreational uses, one of those is fishing for Brown Trout and the other is river floating. River floating is especially important in the seven miles between Johnson Ferry and Paces Mill.

Using data in a 1980 Georgia Game and Fish Division report, the use of the river for recreation was compiled in Attachment E. Based on the information in Attachment E and conversation with others it appears the two most important areas for recreation are:

1. Island Ford Shoals
2. Cochran Shoals to Paces Mill

The major value of the Island Ford Shaols is the presence of "hanging out" space for both fish and people. Hanging out space for fish is found among the rocks making up the shoal areas. Hangout space for people is the relatively smooth top of rock shoals exposed at low water but surrounded by water (see Attchment F). These places are used for socializing in the sun near water much like a beach on the ocean.

Another aspect of recreational use on the Chattahoochee River is that skill level of floaters is not particularly high; as a result, landing of rafts can be a problem. The data available at this time does not allow a detailed analysis, but by using the suitability of use criteria for wading and assuming, between 20 and 40 percent of the available surface area must be suitable for wading in order for the floating experience to be satisfactory, an estimate of the maximum flow allowable for floating can be determined. This was done for one reach with the results in Attachment G. The analysis suggest the maximum flow is between 1800 and 3800 cfs, above the maximum flow the river cannot be safely used for rafting by most rafters.

Design of Future Studies

As a result of field reconnaisssance the study group designed the following program.

1. Collect data for the reach of river near the trout hatchery. The purpose of this data is to evaluate the worth of the reach for mitigtion purposes. Four cross sections would be used.

2. Analysing the reach between Highway 20 bridge (just upsstream of Fish Weir Shoals) and Jones Bridge using existing USGS data with some field work to describe the cover along the streamside.

3. Describe the relationship of flow and fish habitat and below flow and recreation at Island Ford. Four cross sections would be used.

4. Develop a fish habitat versus streamflow relationship for Cochran Shoals using eight cross sections.

5. Describe the impact on recreation of various levelss of flows at Devils Race Course Shoals, Thornton Shoals, Long Island Shoals, and Jones Bridge Shoals. All of these, except Jones Bridge Shoals, are in the Morgan Falls to Peachtree Creek reach of the river.

After review of the proposed plan for study sites by others, the plan was revised to include only six cross sections at Cochran Shoals and a study at Jones Bridge Shoals with three cross sections.

The weak point in the proposed program is the data for the description fish habitat between Morgan Falls Dam and Peachtree Creek. Consequently, existing Corps of Engineers data would be used to develop a habitat versus streamflow relationship for this reach.

An important element of the future work is the review and modification of species criteria curves and recreational suitability curves.

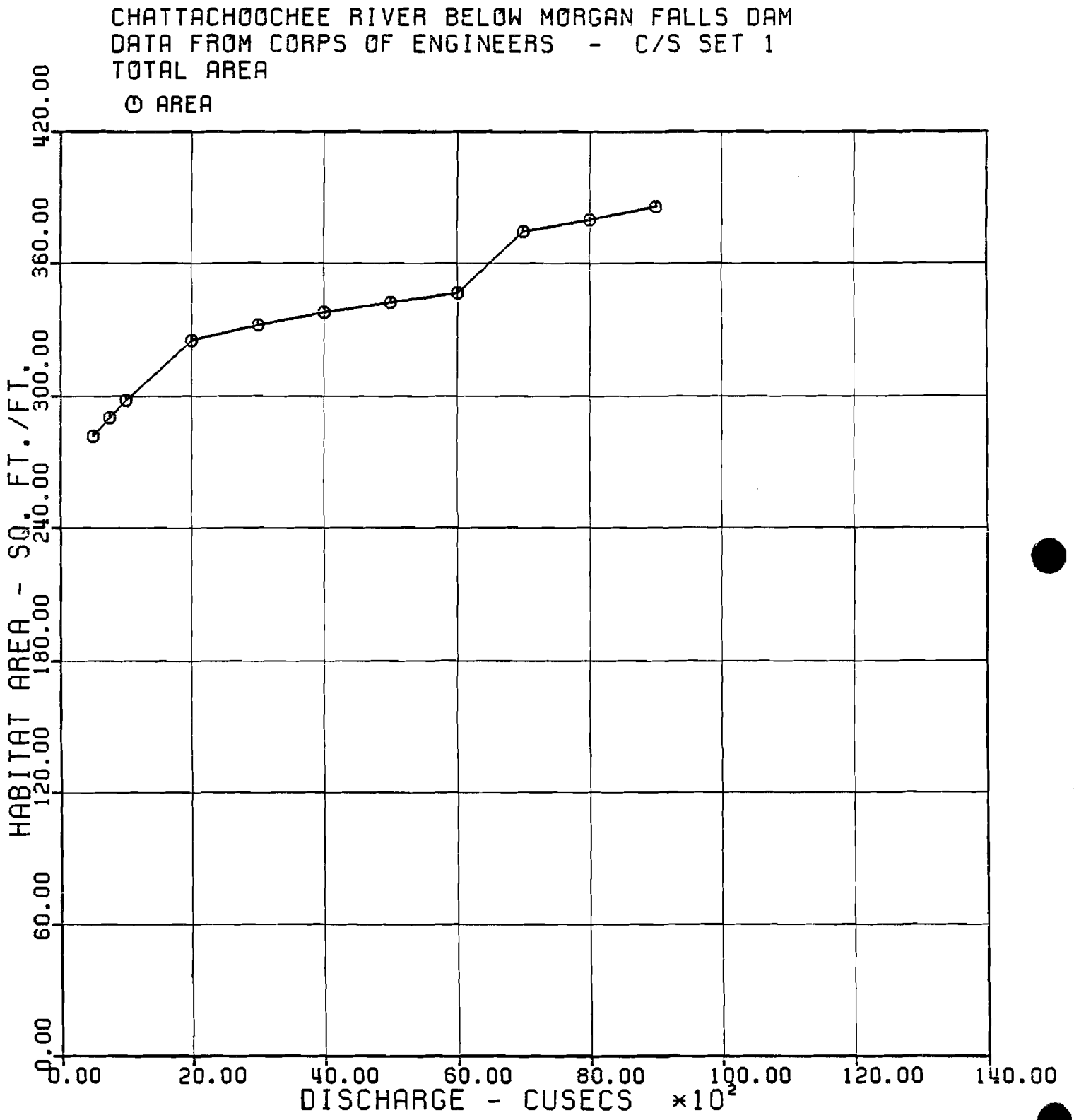
In simulating the whole river, unsteady flow models may have to be used in obtaining the habitat/recreation space relationship for the whole river as a function of water release criteria for Buford Dam and any size of reregulation dam. Future work will be required to select an unsteady program to be utilized on the Chattahoochee River.

As stated previously, the channel change possibly will have to be analyzed further.

This memorandum presents information on which further work can be based and is of reconnaissance grade only.

ATTACHMENT A

HABITAT VERSUS STREAMFLOW RELATIONSHIPS -
CHATTAHOOCHE RIVER, GEORGIA


CHATTACHOOCHEE RIVER BELOW MORGAN FALLS DAM
DATA FROM CORPS OF ENGINEERS - C/S SET 1
TOTAL AREA
AREA
HABITAT AREA - SQ. FT./FT.
0.00
60.00
120.00
180.00
240.00
300.00
360.00
420.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
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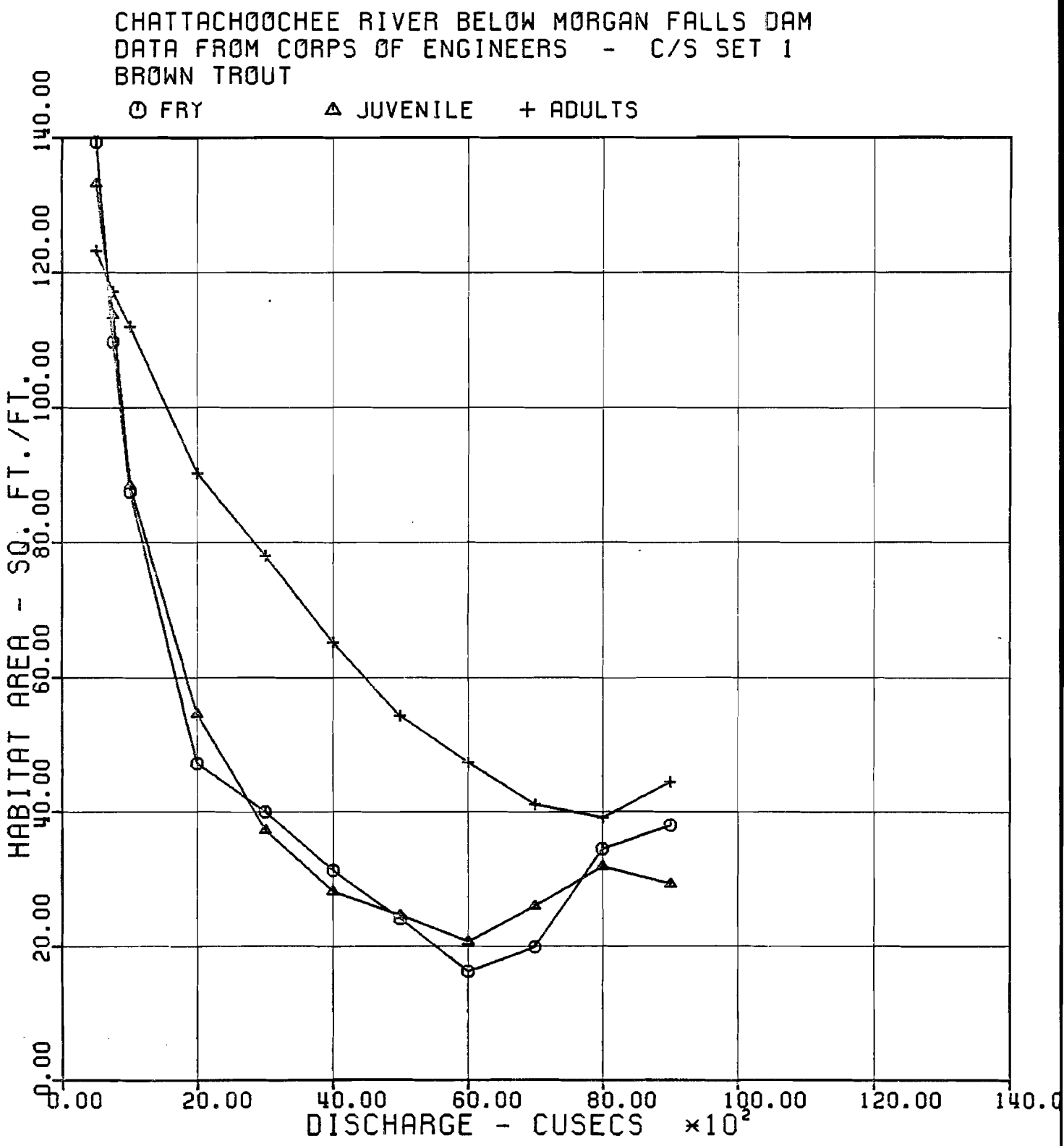
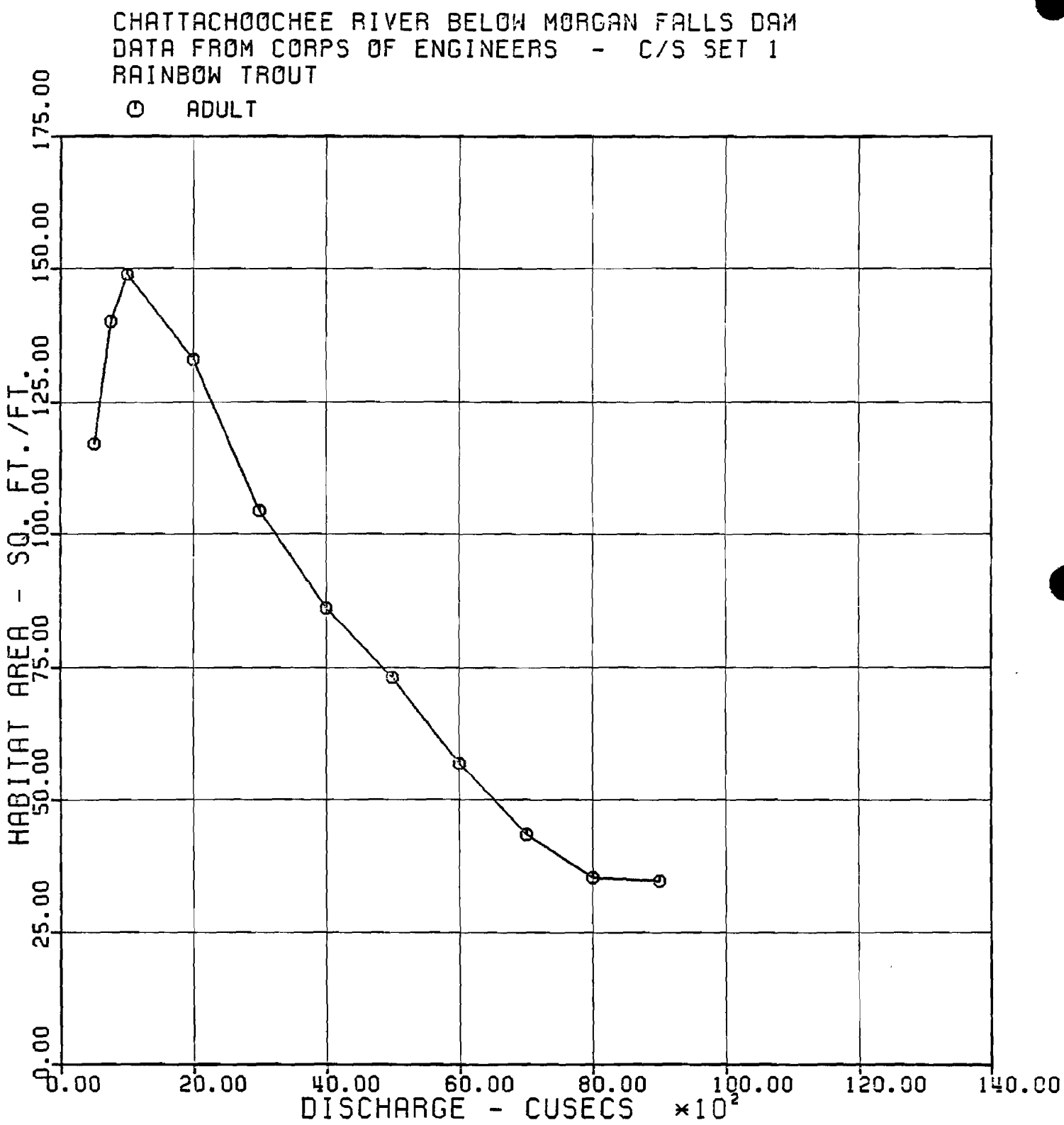
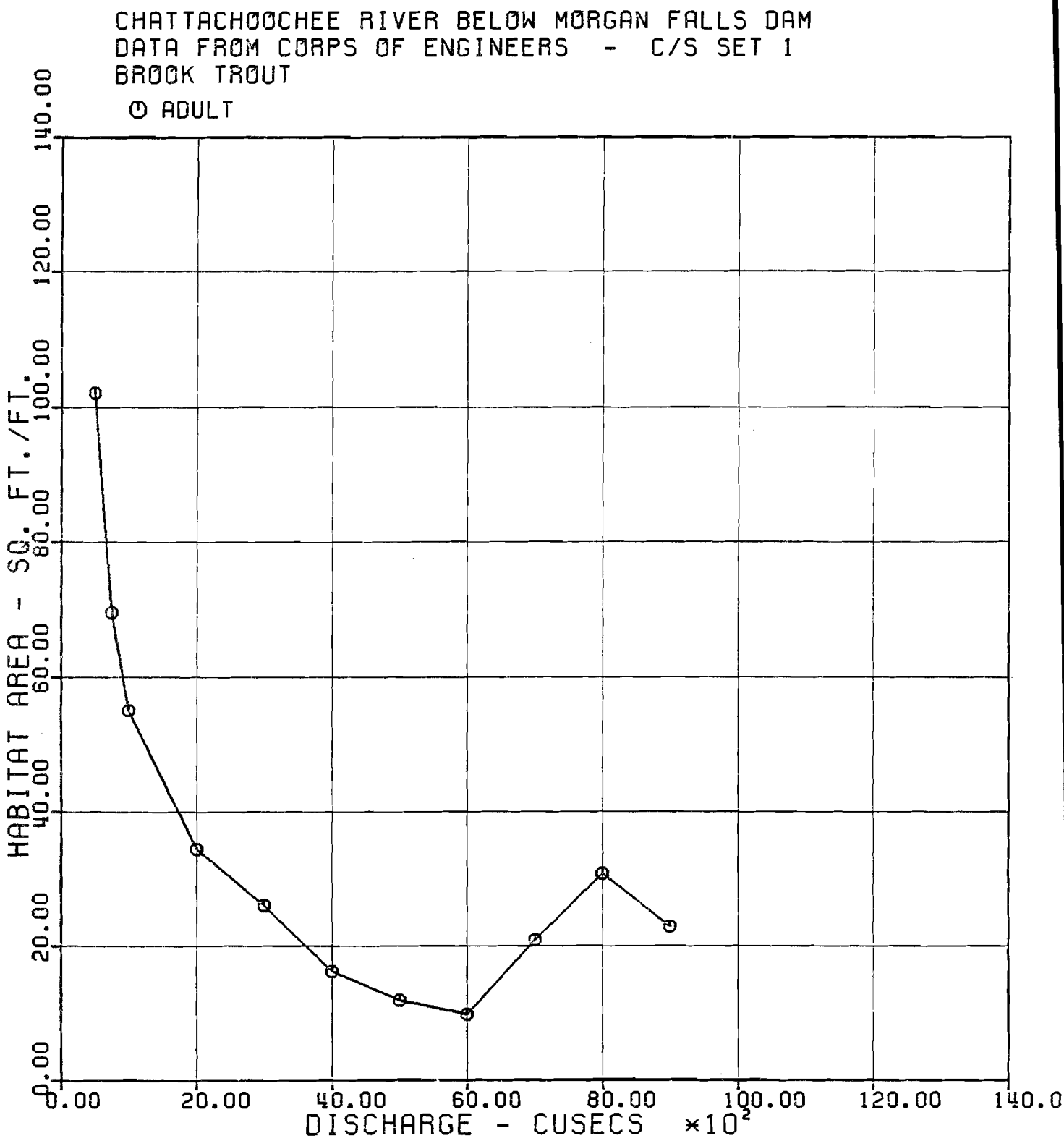
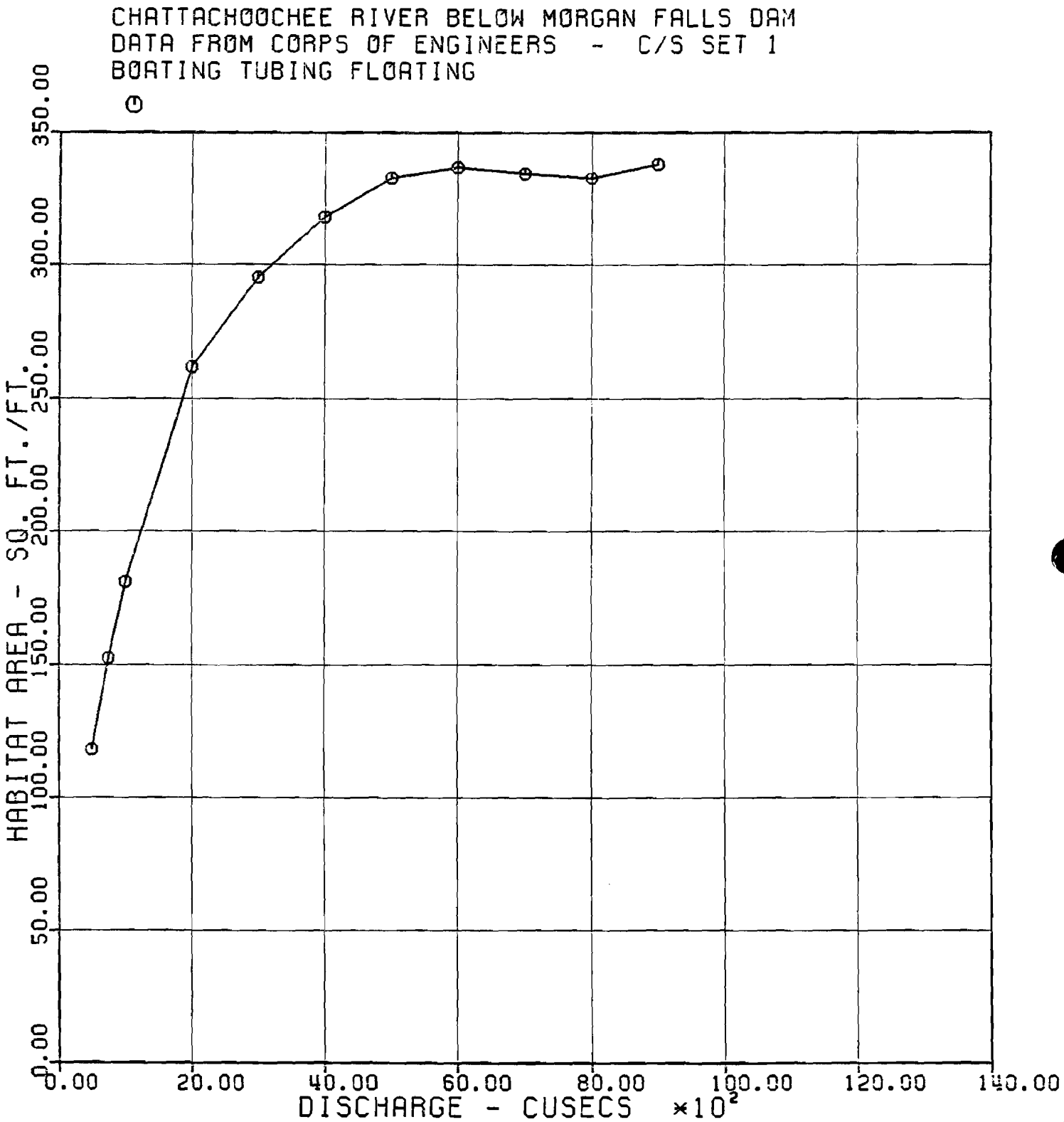
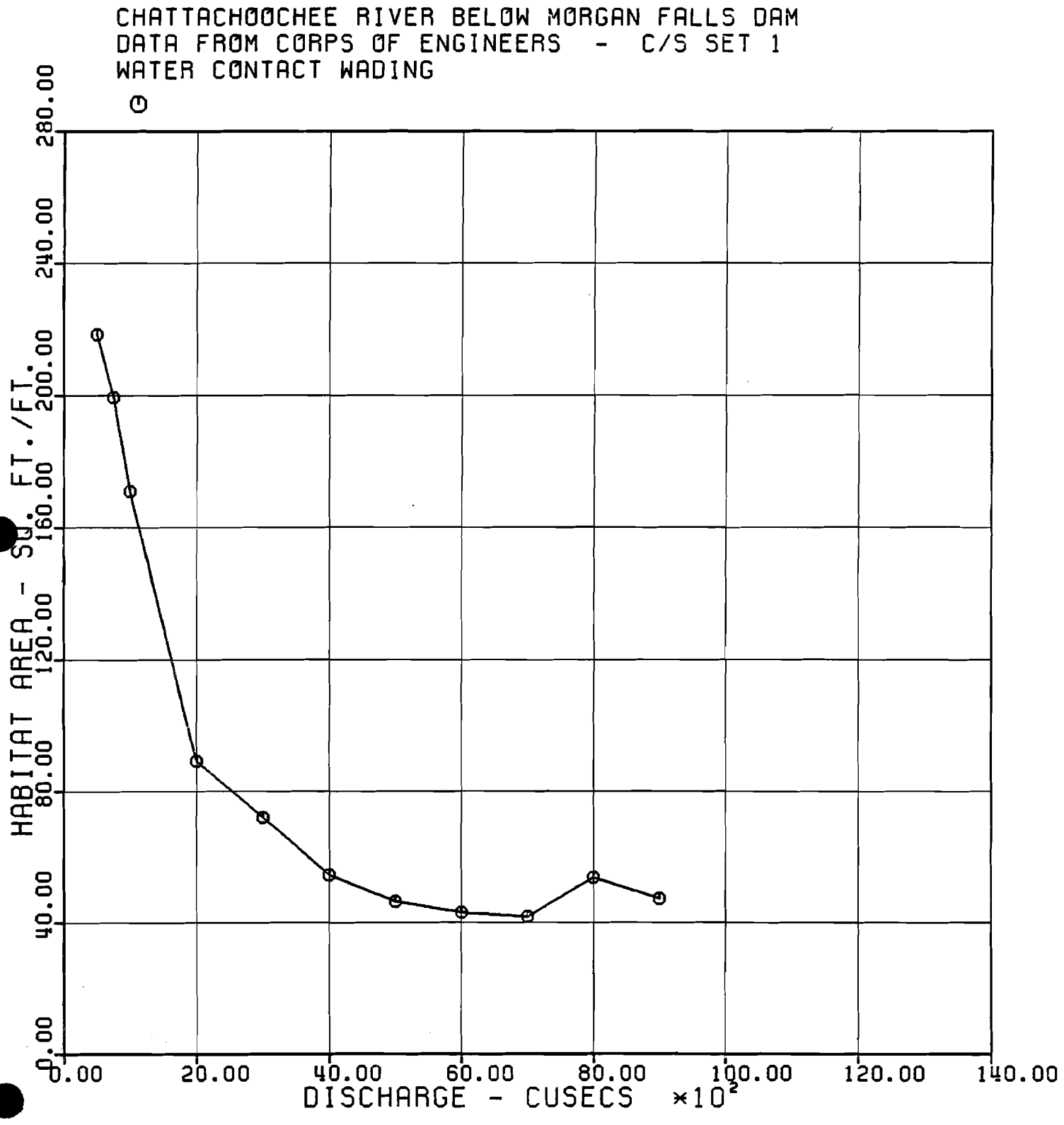
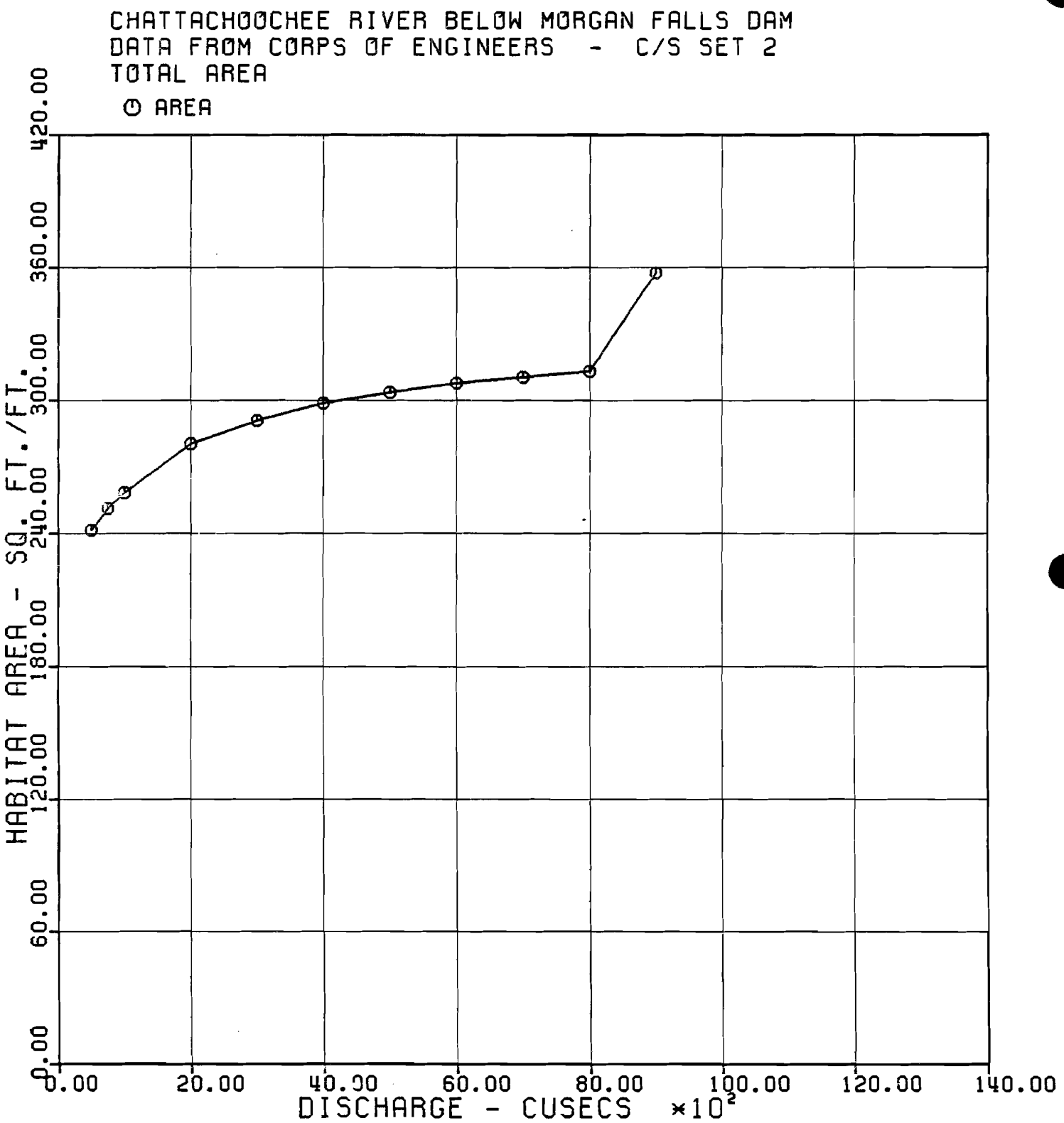

CHATTACHOOCHEE RIVER BELOW MORGAN FALLS DAM
DATA FROM CORPS OF ENGINEERS - C/S SET 1
BROWN TROUT
FRY
JUVENILE
ADULTS
HABITAT AREA - SQ. FT./FT.
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
DISCHARGE - CUSECS ×10²
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.0

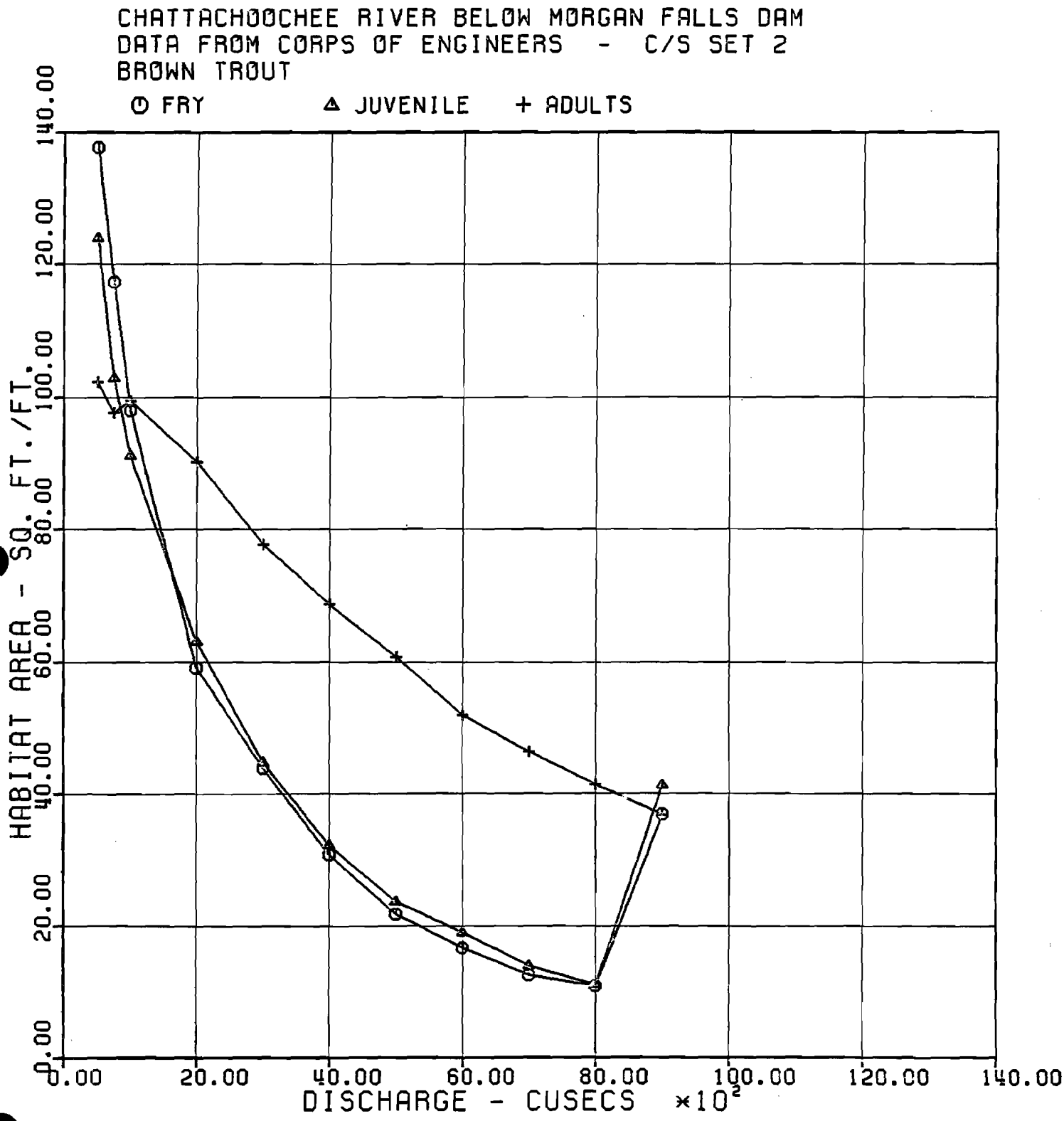

CHATTACHOOCHEE RIVER BELOW MORGAN FALLS DAM
DATA FROM CORPS OF ENGINEERS - C/S SET 1
RAINBOW TROUT
ADULT
HABITAT AREA - SQ. FT./FT.
0.00
25.00
50.00
75.00
100.00
125.00
150.00
175.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
DISCHARGE - CUSECS ×10²

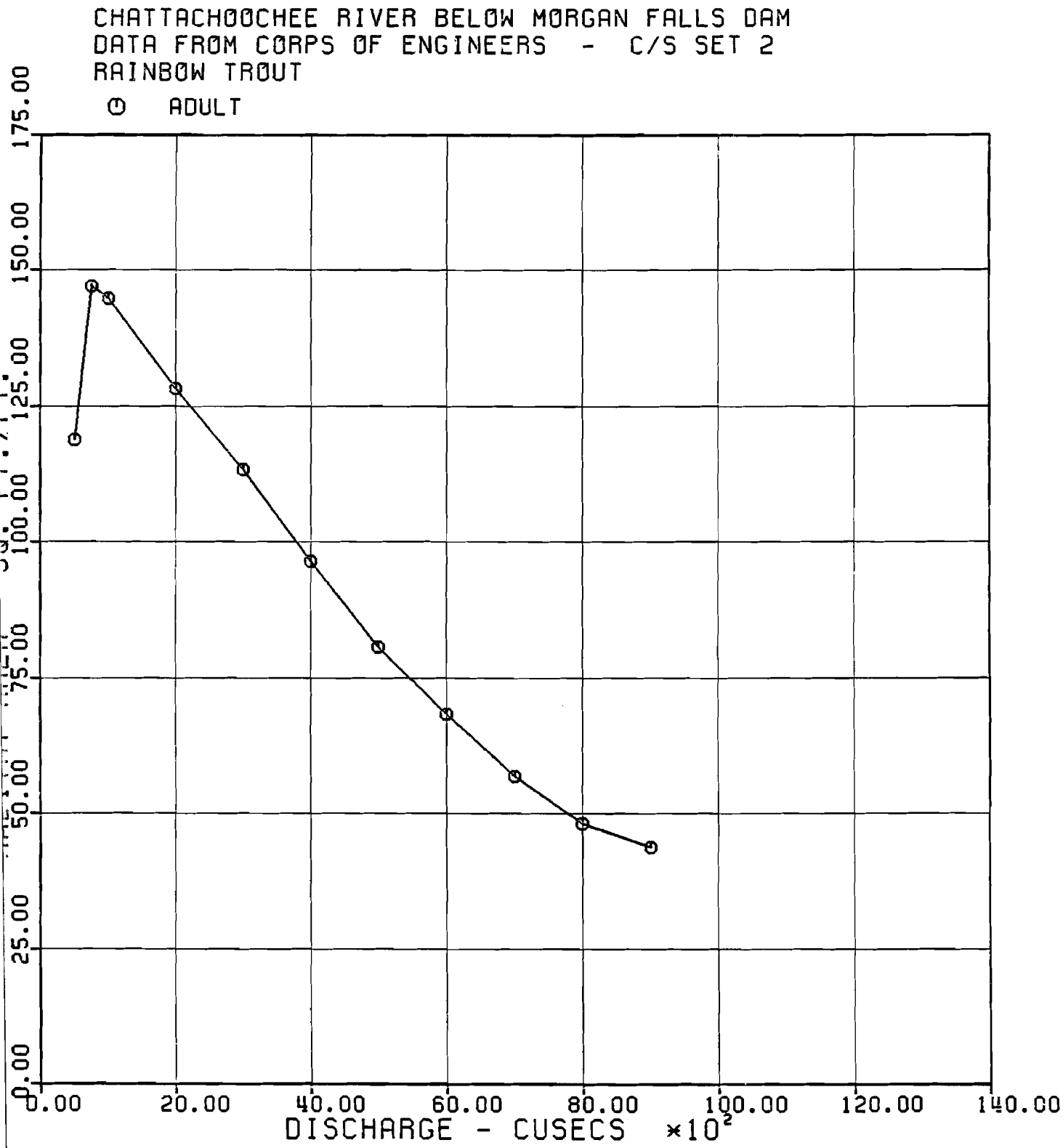

CHATTACHOOCHEE RIVER BELOW MORGAN FALLS DAM
DATA FROM CORPS OF ENGINEERS - C/S SET 1
BROOK TROUT
ADULT
HABITAT AREA - SQ. FT./FT.
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.0
DISCHARGE - CUSECS ×10²

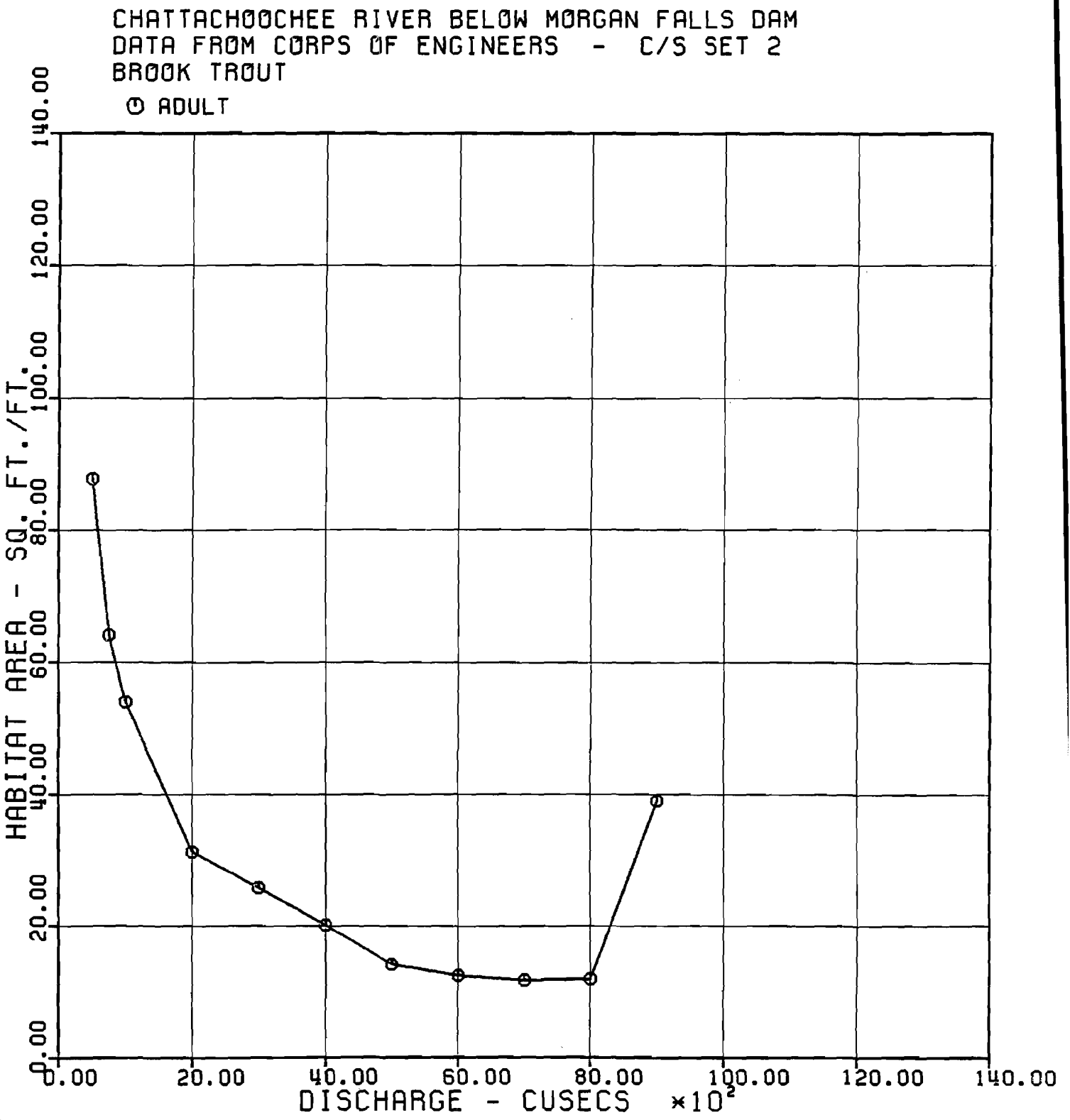

CHATTACHOOCHEE RIVER BELOW MORGAN FALLS DAM
DATA FROM CORPS OF ENGINEERS - C/S SET 1
BOATING TUBING FLOATING
HABITAT AREA - SQ. FT./FT.
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
DISCHARGE - CUSECS ×10²

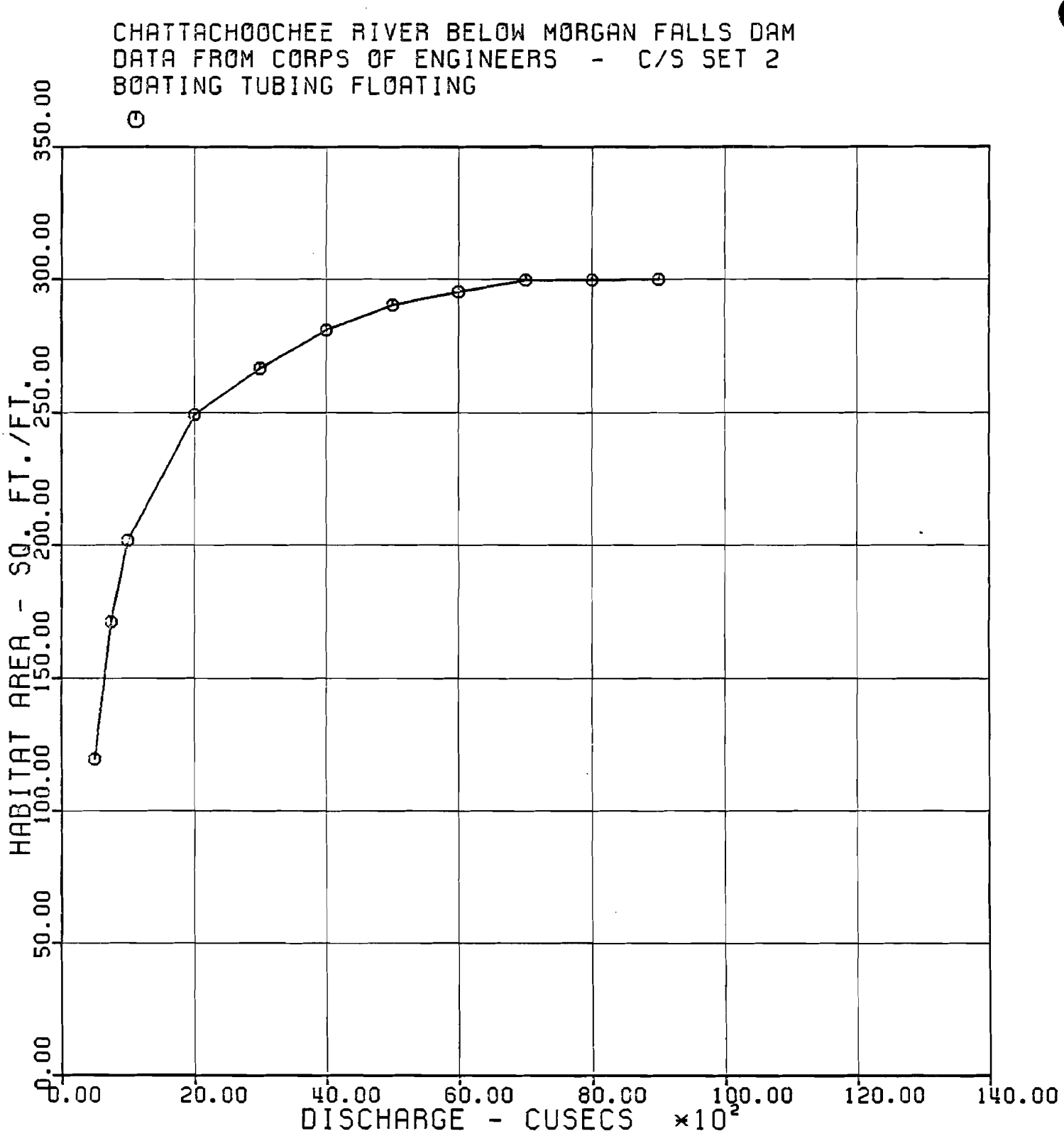

CHATTACHOOCHEE RIVER BELOW MORGAN FALLS DAM
DATA FROM CORPS OF ENGINEERS - C/S SET 1
WATER CONTACT WADING
HABITAT AREA - SQ. FT./FT.
0.00
40.00
80.00
120.00
160.00
200.00
240.00
280.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
DISCHARGE - CUSECS ×10²

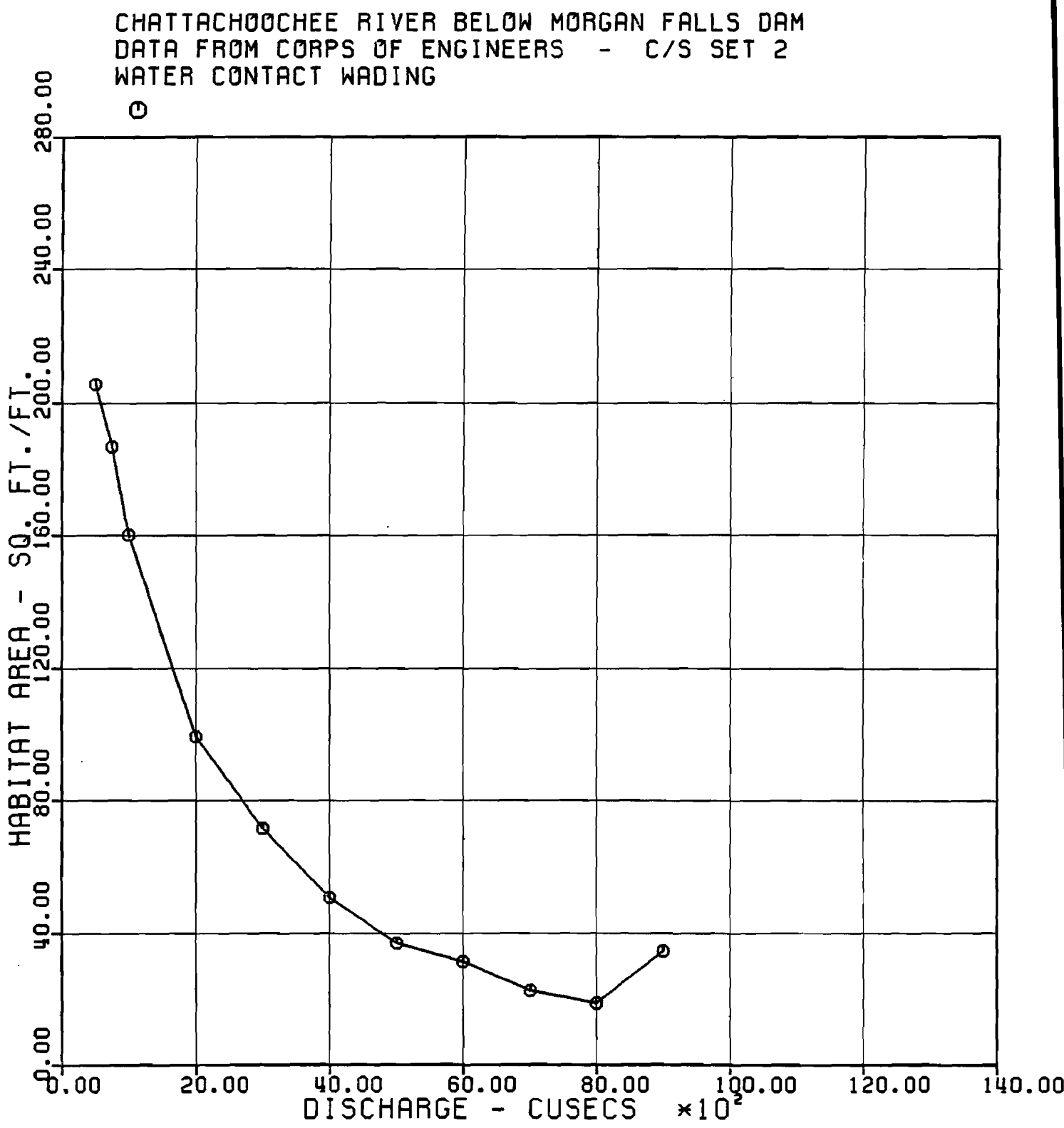

CHATTACHOOCHEE RIVER BELOW MORGAN FALLS DAM
DATA FROM CORPS OF ENGINEERS - C/S SET 2
TOTAL AREA
AREA
HABITAT AREA - SQ. FT./FT.
0.00
60.00
120.00
180.00
240.00
300.00
360.00
420.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
DISCHARGE - CUSECS ×10²

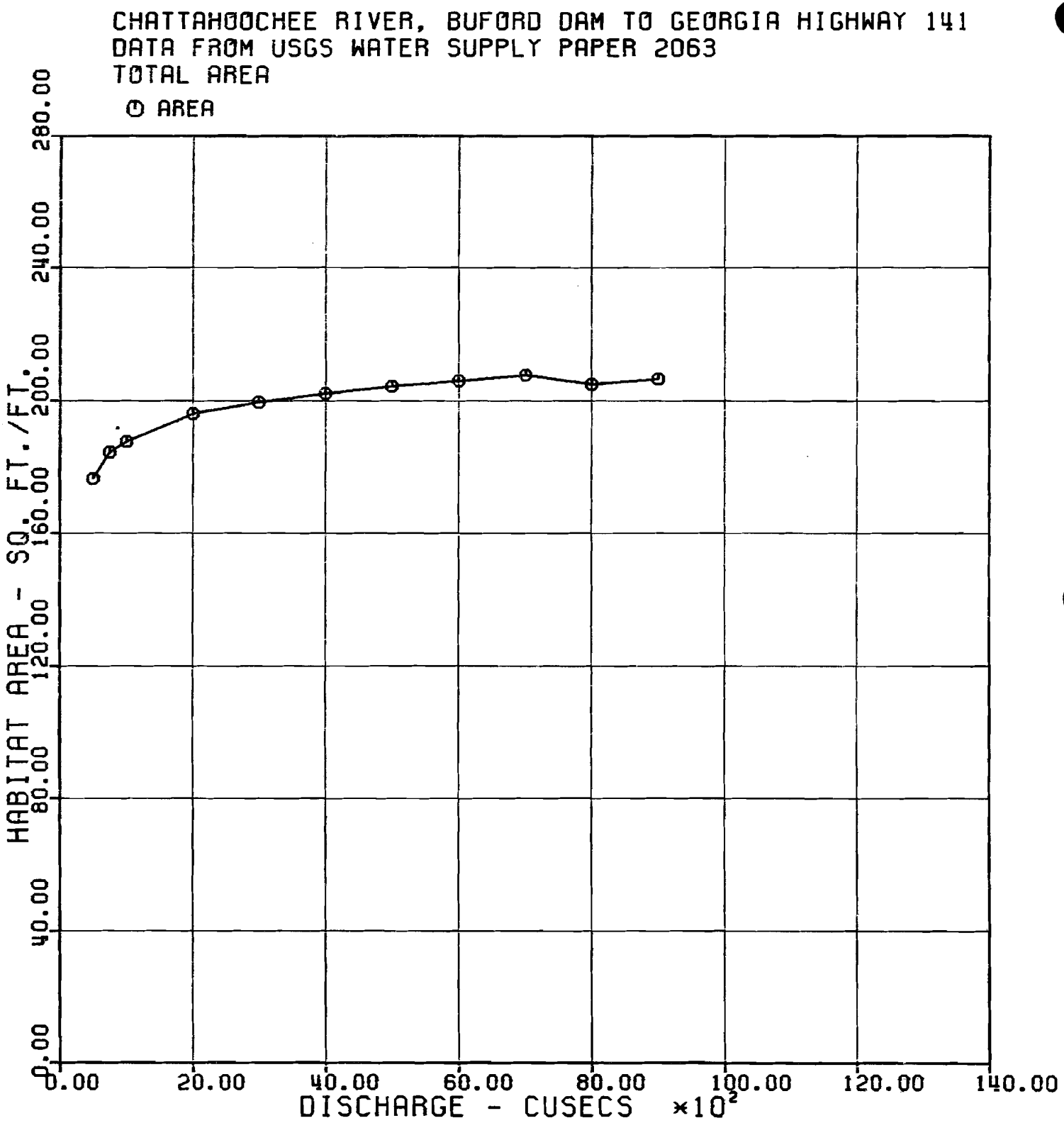

CHATTACHOOCHEE RIVER BELOW MORGAN FALLS DAM
DATA FROM CORPS OF ENGINEERS - C/S SET 2
BROWN TROUT
FRY
JUVENILE
ADULTS
HABITAT AREA - SQ. FT./FT.
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
DISCHARGE - CUSECS ×10²

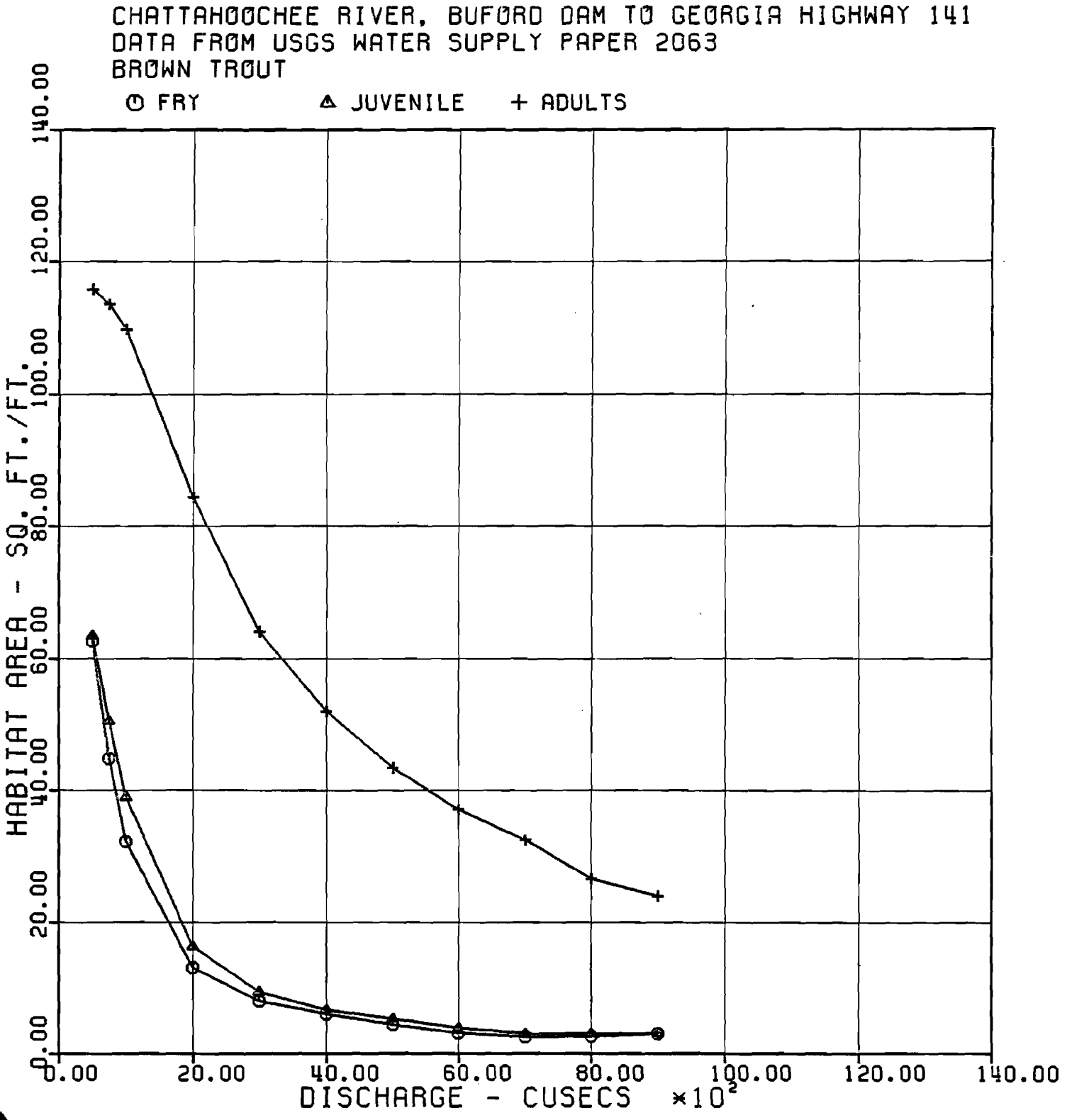

CHATTACHOOCHEE RIVER BELOW MORGAN FALLS DAM
DATA FROM CORPS OF ENGINEERS - C/S SET 2
RAINBOW TROUT
ADULT
175.00
150.00
125.00
100.00
75.00
50.00
25.00
0.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
DISCHARGE - CUSECS ×10²

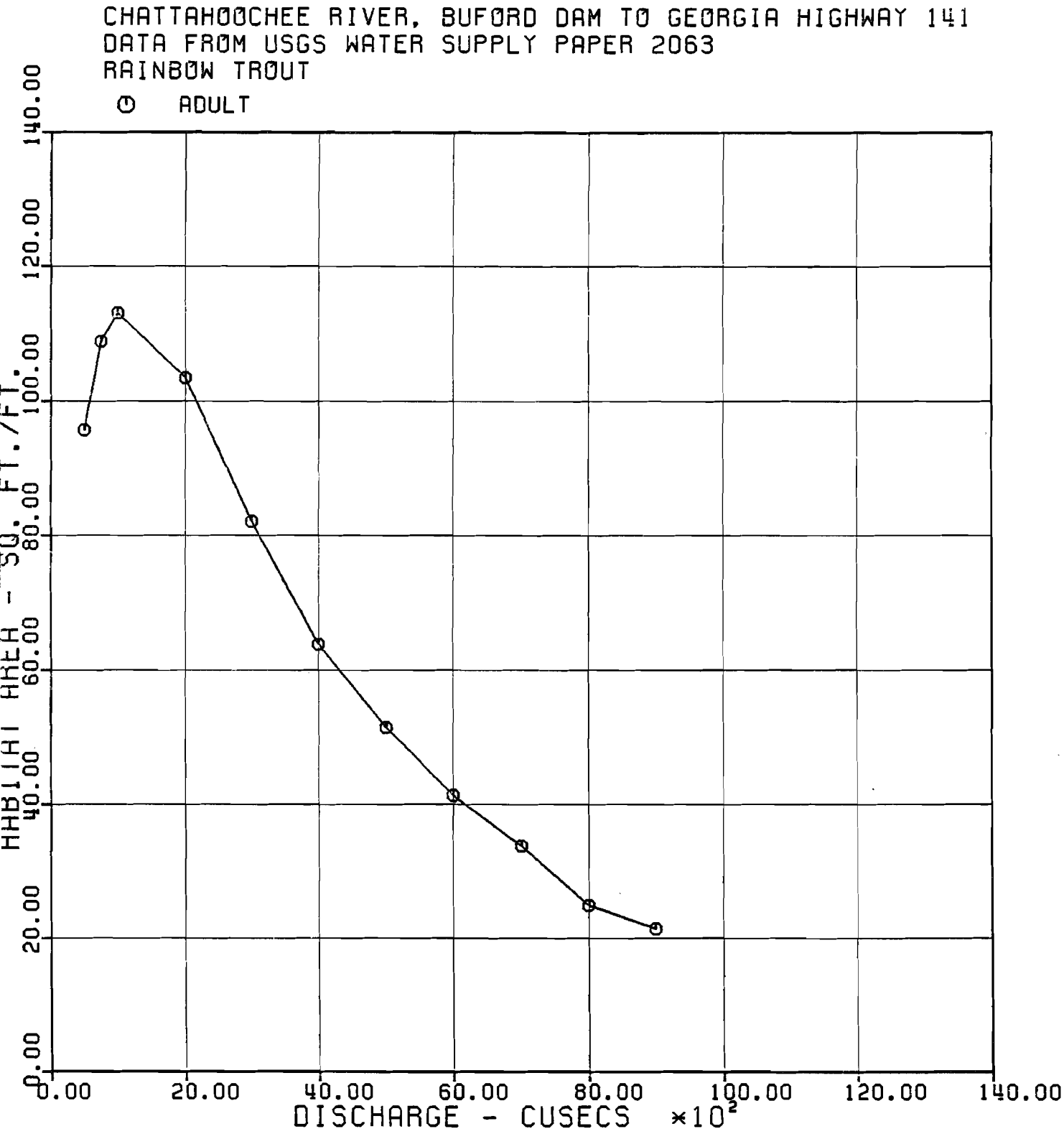

CHATTACHOOCHEE RIVER BELOW MORGAN FALLS DAM
DATA FROM CORPS OF ENGINEERS - C/S SET 2
BROOK TROUT
ADULT
HABITAT AREA - SQ. FT./FT.
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
DISCHARGE - CUSECS ×10²

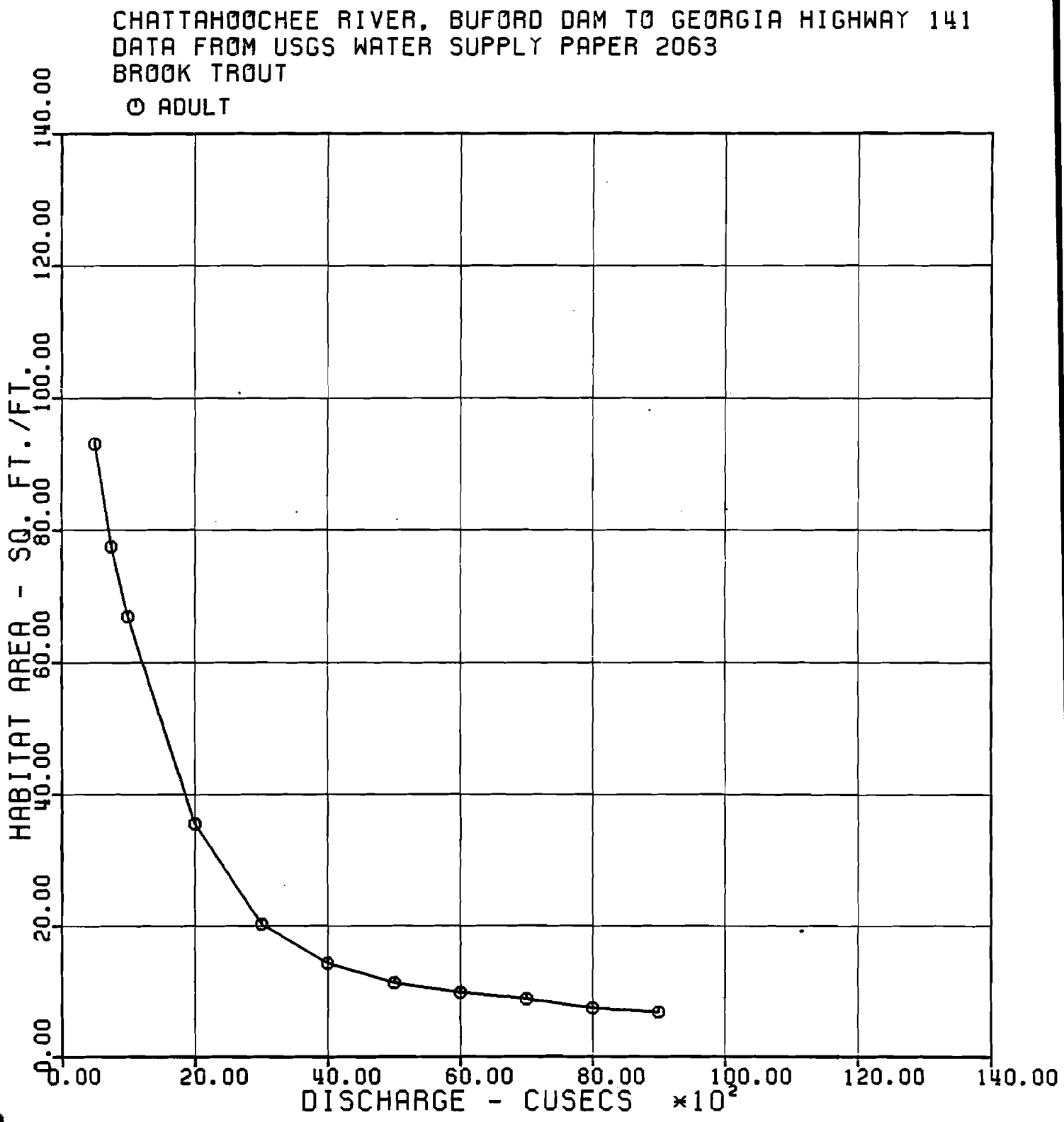

CHATTAHOOCHEE RIVER BELOW MORGAN FALLS DAM
DATA FROM CORPS OF ENGINEERS - C/S SET 2
BOATING TUBING FLOATING
HABITAT AREA - SQ. FT./FT.
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
DISCHARGE - CUSECS ×10²

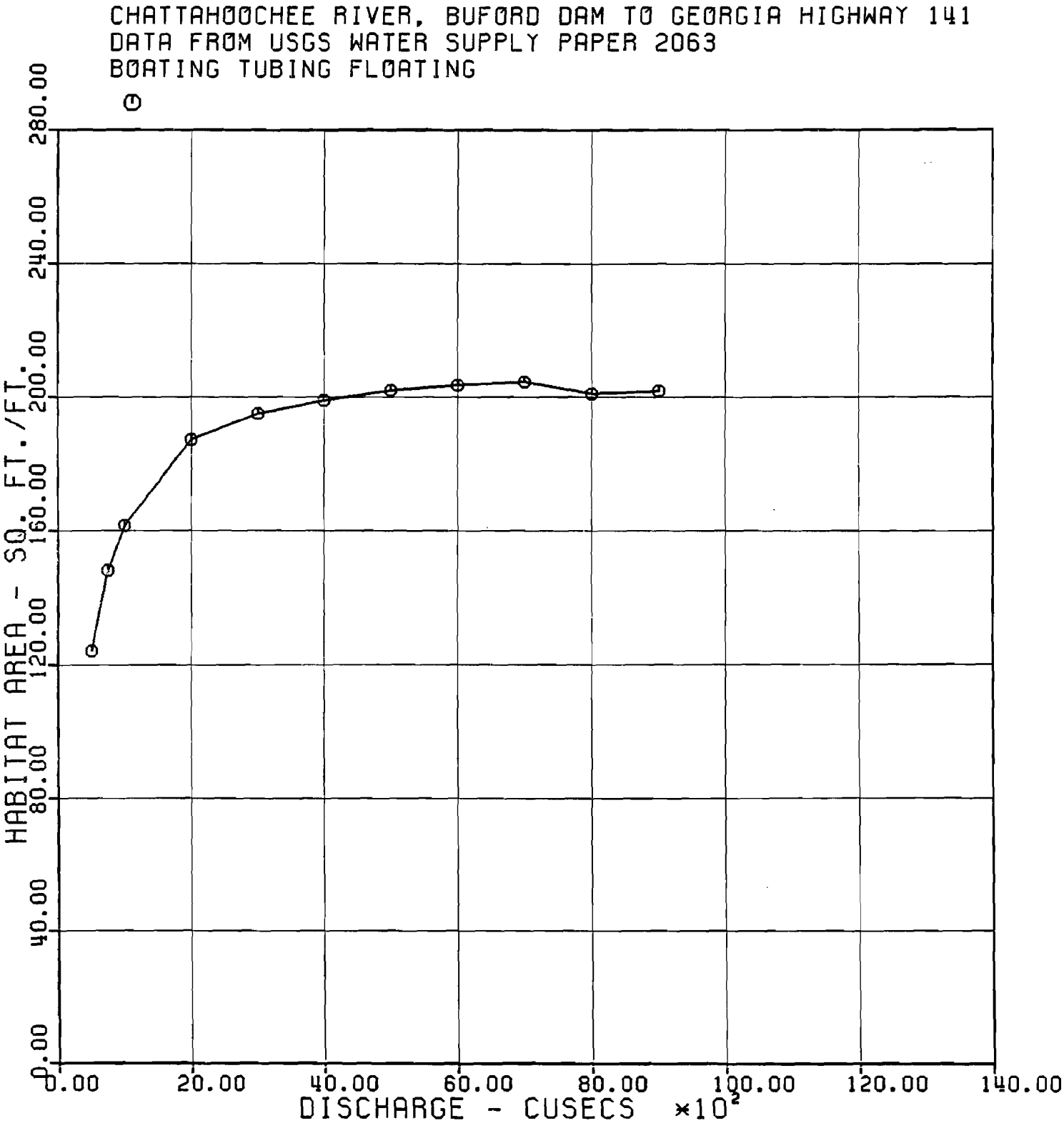

CHATTACHOOCHEE RIVER BELOW MORGAN FALLS DAM
DATA FROM CORPS OF ENGINEERS - C/S SET 2
WATER CONTACT WADING
HABITAT AREA - SQ. FT./FT.
0.00
40.00
80.00
120.00
160.00
200.00
240.00
280.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
DISCHARGE - CUSECS ×10²

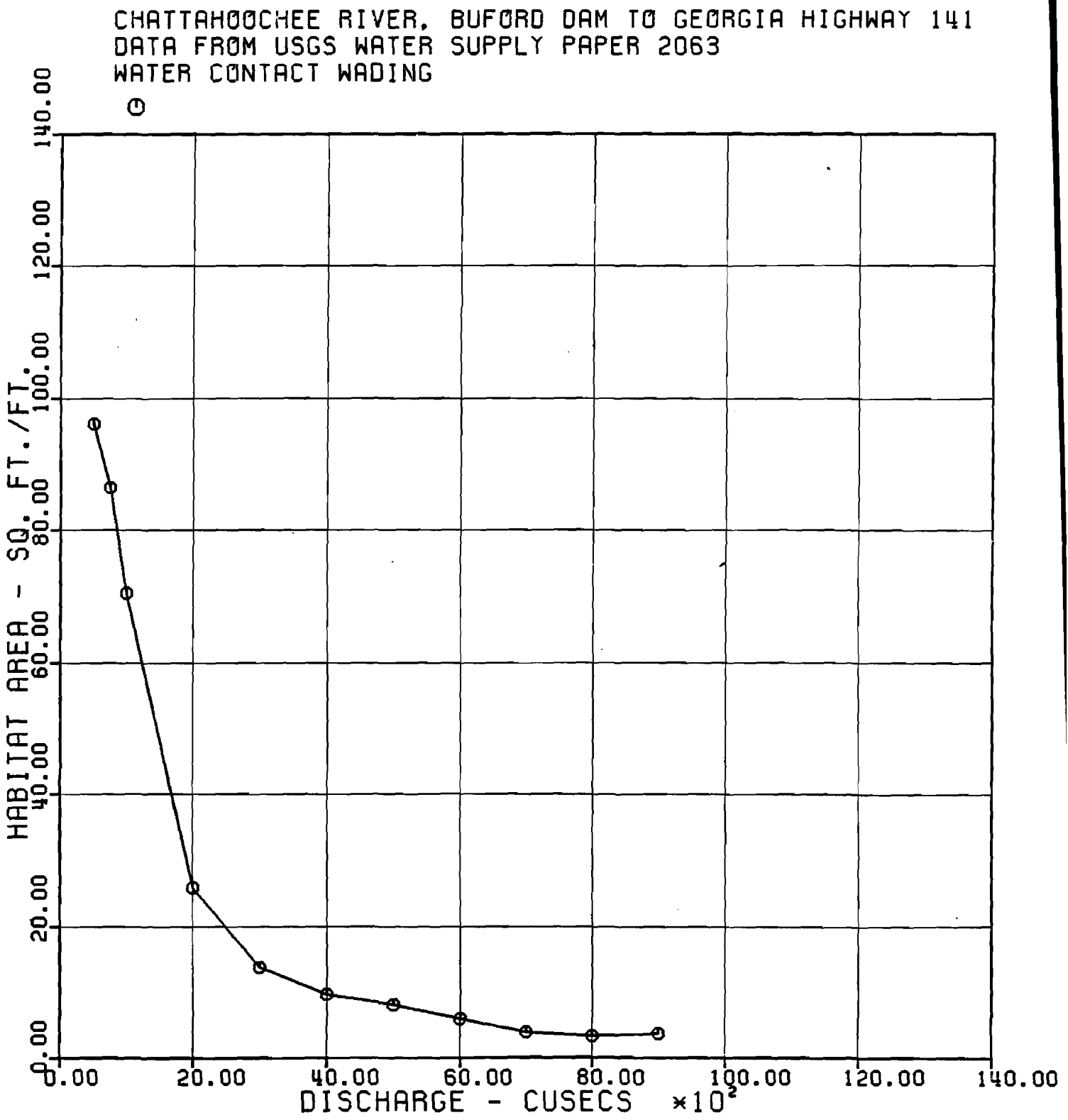

CHATTAHOOCHEE RIVER, BUFORD DAM TO GEORGIA HIGHWAY 141
DATA FROM USGS WATER SUPPLY PAPER 2063
TOTAL AREA
AREA
HABITAT AREA - SQ. FT./FT.
0.00
40.00
80.00
120.00
160.00
200.00
240.00
280.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
DISCHARGE - CUSECS ×10²


CHATTAHOOCHEE RIVER, BUFORD DAM TO GEORGIA HIGHWAY 141
DATA FROM USGS WATER SUPPLY PAPER 2063
BROWN TROUT
FRY
JUVENILE
ADULTS
HABITAT AREA - SQ. FT./FT.
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
DISCHARGE - CUSECS ×10²

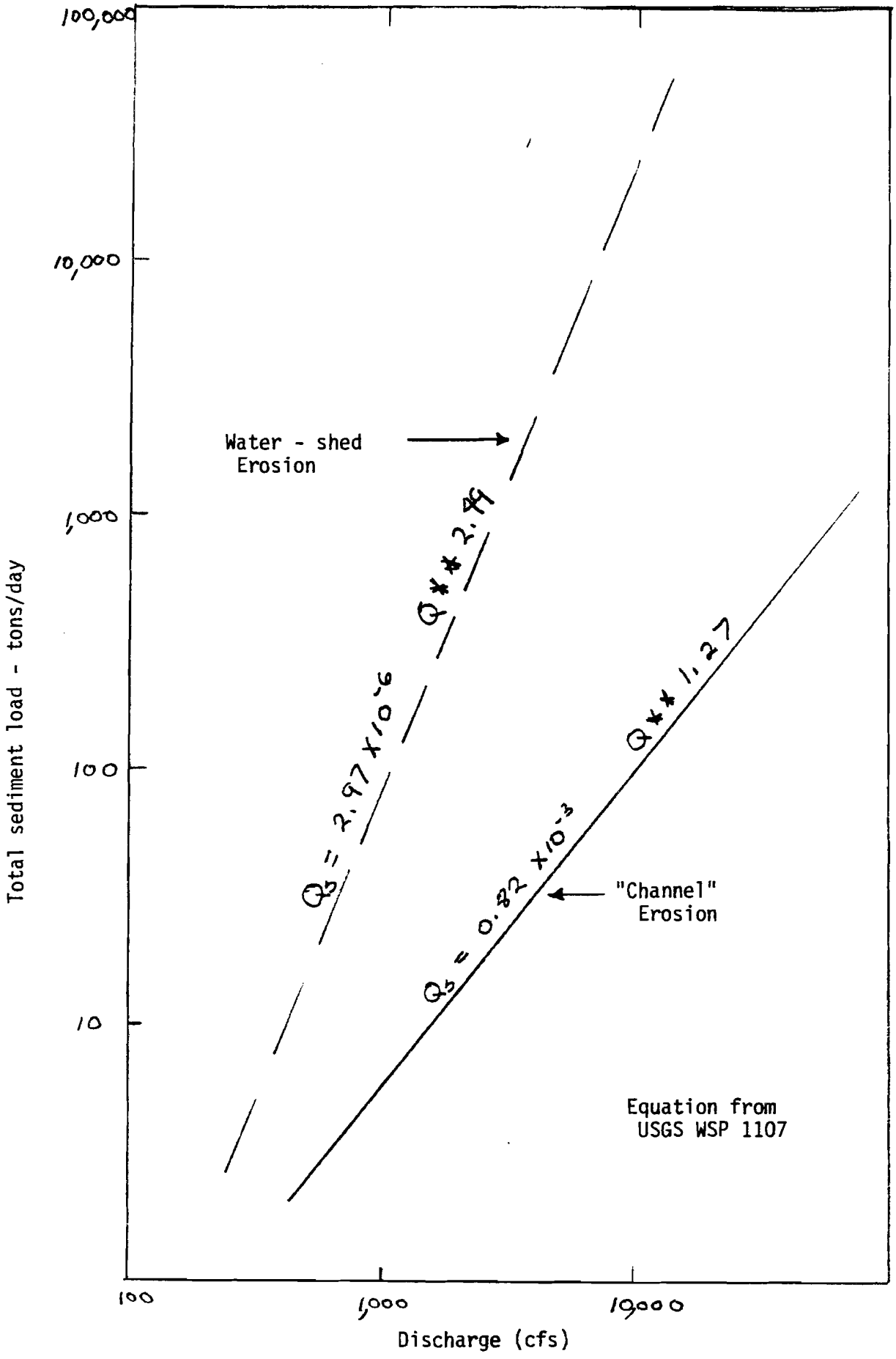

CHATTAHOOCHEE RIVER, BUFORD DAM TO GEORGIA HIGHWAY 141
DATA FROM USGS WATER SUPPLY PAPER 2063
RAINBOW TROUT
ADULT
HABITAT AREA - SQ. FT./FT.
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
DISCHARGE - CUSECS ×10²


CHATTAHOOCHEE RIVER, BUFORD DAM TO GEORGIA HIGHWAY 141
DATA FROM USGS WATER SUPPLY PAPER 2063
BROOK TROUT
ADULT
HABITAT AREA - SQ. FT./FT.
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
DISCHARGE - CUSECS ×10²

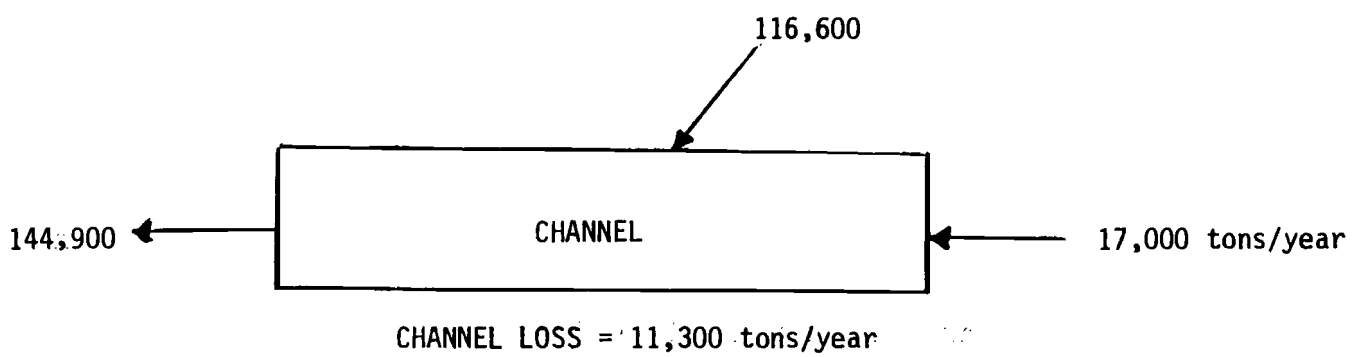

CHATTAHOOCHEE RIVER, BUFORD DAM TO GEORGIA HIGHWAY 141
DATA FROM USGS WATER SUPPLY PAPER 2063
BOATING TUBING FLOATING
HABITAT AREA - SQ. FT./FT.
0.00
40.00
80.00
120.00
160.00
200.00
240.00
280.00
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
DISCHARGE - CUSECS ×10²


CHATTAHOOCHEE RIVER, BUFORD DAM TO GEORGIA HIGHWAY 141
DATA FROM USGS WATER SUPPLY PAPER 2063
WATER CONTACT WADING
HABITAT AREA - SQ. FT./FT.
0.00
20.00
40.00
60.00
80.00
100.00
120.00
140.00
DISCHARGE - CUSECS ×10²

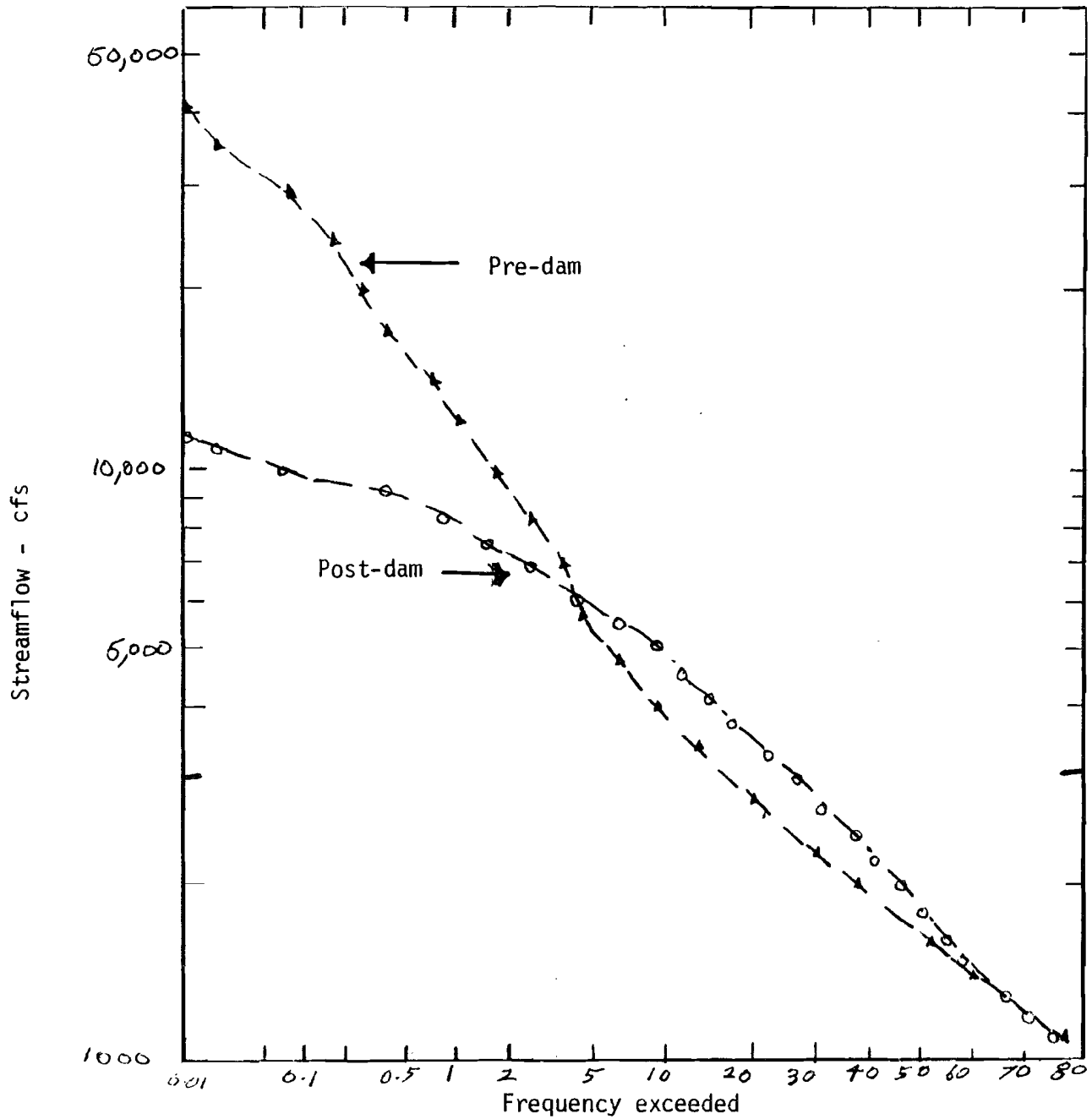
Attachment B - Sediment transport - Chattahooche River at Atlanta, Georgia.



Attachment C - Total sediment balance between Buford Dam and the Atlanta Gage.



Attachment D - Duration curves for Chattahooche River.

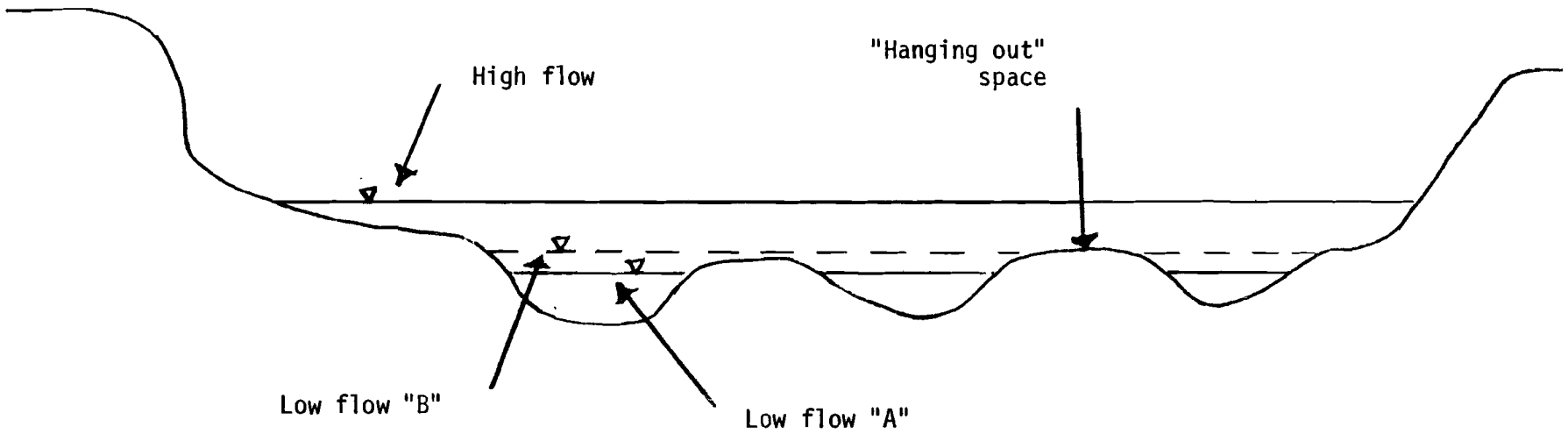


Attachment E - Recreational Use Along Chattahoochee River.

	Buford Dam to Jones Bridge	Jones Bridge to Bull Sluice Lake	Morgan Falls Dam to Peach Tree Creek
Fishing Pressure (hours/day)	111	183	108
Fish per hour fishing	0.34	0.41	0.41
Location of Fishing: (percent)			
a. from banks	50	75	52
b. from boat/raft	31	12	16
c. wading	19	13	22
% Fish taken that were trout	0.95	0.98	0.43
River based recreational use* (percent)			
Angling	90	48	17
Rafting, floating, and canoeing	4	18	80
Swimming and wading	6	34	3
Total trips/year	15680	58003	68133

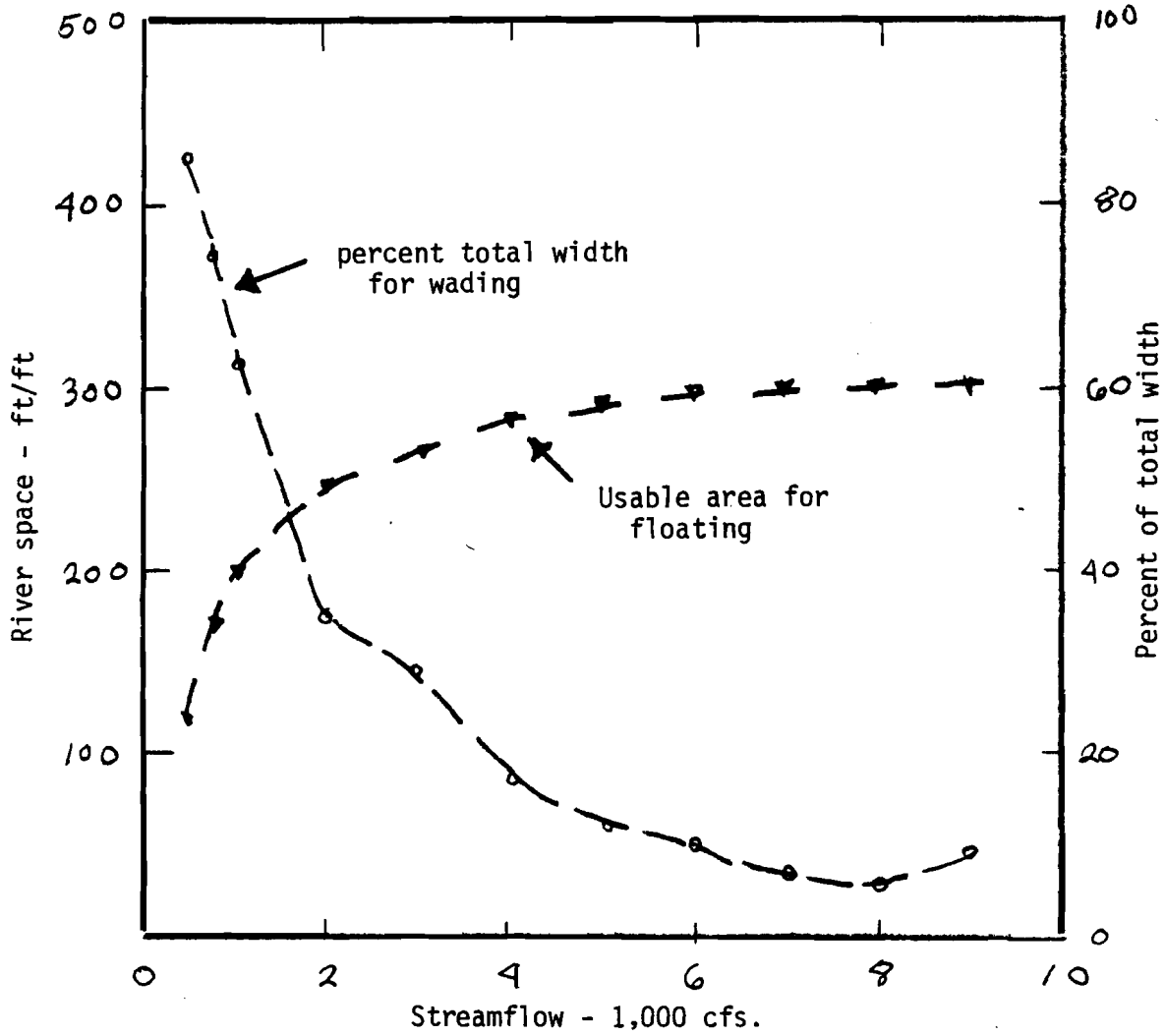
*Trout season only (last Saturday through October 31) - Buford Dam to Bull Sluice Lake, year round for Morgan Falls Dam to Peach Tree Creek

Attachment F - "Hanging out" space in schoal areas.



Attachment G - Chattahooche River near Atlanta, Georgia.

RM 719.57 to 324.68



APPENDIX G

DETAILED LISTING OF TOTAL HABITAT AREA

APPENDIX G

Detailed listing of total habitat area, by river mile, available for each trout species life-stage. The top tier of variables represents the amount of habitat (in square feet) available for a length of river 1000 long. The bottom array of variables represents the total amount of habitat available for each species life-stage for the reach from the beginning to ending river mile. The variable "Reach Multiplier" is the number of thousands of feet in each reach. The lower tier of variables was obtained by multipling each variable in the upper tier by the "Reach Multiplier". The data in this appendix are presented by major reach beginning with the major reach near Buford Dam and proceeding downstream. Within each major reach, the data are presented from most downstream subreach to the most upstream subreach. This appendix allows for direct comparison between specific reaches on the river.

----------BEGIN RIVER MILE=342.11 END RIVER MILE=345.79----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
1	500	8247	8991	11765	7144
2	750	6698	11233	11567	5848
3	1000	5746	11905	11352	4690
4	1250	4911	12215	10784	3888
5	1500	3987	12101	10083	3321
6	1750	3231	11662	9310	2999
7	2000	2827	11180	8669	2644
8	2500	2269	9984	7692	2189
9	3500	1899	7619	6420	1576
10	5000	1415	5431	4969	1120
11	7500	1077	3365	3772	843
12	12000	1199	3004	3462	1521

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
1	19.4832	160678	175173	229220	139188
2	19.4832	130498	218855	225362	113938
3	19.4832	111950	231947	221173	91376
4	19.4832	95682	237987	210107	75751
5	19.4832	77680	235766	196449	64704
6	19.4832	62950	227213	181389	58430
7	19.4832	55079	217822	168900	51514
8	19.4832	44207	194520	149865	42649
9	19.4832	36999	148443	125082	30706
10	19.4832	27569	105813	96812	21821
11	19.4832	20983	65561	73491	16424
12	19.4832	23360	58528	67451	29634

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BUFORD DAM TO SITE OF THE PROPOSED REREGULATION DAM 2
13:41 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=345.8 END RIVER MILE=347.06----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
13	500	25248	30605	35150	20295
14	750	20718	34297	35950	11577
15	1000	19208	33335	34539	7274
16	1250	16909	31810	32895	5433
17	1500	16962	30317	31055	4570
18	1750	17255	28605	29686	4130
19	2000	17112	27081	28602	4090
20	2500	16523	23627	27653	3487
21	3500	16230	20995	25773	2790
22	5000	13948	19321	23632	2124
23	7500	12517	18430	21960	2202
24	12000	11092	17031	19140	1497

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
13	6.7056	169303	205225	235702	136090
14	6.7056	138927	229982	241066	77631
15	6.7056	128801	223531	231605	48777
16	6.7056	113385	213305	220581	36432
17	6.7056	113740	203294	208242	30645
18	6.7056	115705	191814	199062	27694
19	6.7056	114746	181594	191794	27426
20	6.7056	110797	158433	185430	23382
21	6.7056	108832	140784	172823	18709
22	6.7056	93530	129559	158467	14243
23	6.7056	83934	123584	147255	14766
24	6.7056	74379	114203	128345	10038

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BUFORD DAM TO SITE OF THE PROPOSED REREGULATION DAM 3
13:42 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=347.07 END RIVER MILE=348.1----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
25	500	150377	85800	157885	64226
26	750	136538	109805	162871	43492
27	1000	104986	130418	151252	33754
28	1250	81967	142720	139963	27172
29	1500	61513	148480	127247	23225
30	1750	45230	150750	118923	19118
31	2000	36566	148657	110356	15768
32	2500	24828	139743	94645	10493
33	3500	14906	107984	72507	5638
34	5000	11607	71820	52069	4390
35	7500	10749	42541	36372	3250
36	12000	8528	21706	28840	1874

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
25	5.4912	825750	471145	866978	352678
26	5.4912	749757	602961	894357	238823
27	5.4912	576499	716151	830555	185350
28	5.4912	450097	783704	768565	149207
29	5.4912	337780	815333	698739	127533
30	5.4912	248367	827798	653030	104981
31	5.4912	200791	816305	605987	86585
32	5.4912	136336	767357	519715	57619
33	5.4912	81852	592962	398150	30959
34	5.4912	63736	394378	285921	24106
35	5.4912	59025	233601	199726	17846
36	5.4912	46829	119192	158366	10291

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 1
TO ABOVE MORGAN FALLS 12:56 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=317 END RIVER MILE=319.09----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
1	500	17243	12545	19820	7871
2	750	12052	16513	18292	5842
3	1000	8453	18544	16399	4807
4	1250	4715	18705	14207	4049
5	1500	3130	18136	12576	3392
6	1750	2723	17375	11490	2840
7	2000	2373	15517	10342	2566
8	2500	1426	11911	8158	2284
9	3500	1306	6500	5398	1921
10	5000	1040	2444	3458	1369
11	7500	830	1495	2835	1537
12	12000	2352	1826	3842	9135

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
1	11.088	191190	139099	219764	87274
2	11.088	133633	183096	202822	64776
3	11.088	93727	205616	181832	53300
4	11.088	52280	207401	157527	44895
5	11.088	34705	201092	139443	37610
6	11.088	30193	192654	127401	31490
7	11.088	26312	172052	114672	28452
8	11.088	15811	132069	90456	25325
9	11.088	14481	72072	59853	21300
10	11.088	11532	27099	38342	15179
11	11.088	9203	16577	31434	17042
12	11.088	26079	20247	42600	101289

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 2
TO ABOVE MORGAN FALLS 12:57 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=319.1 END RIVER MILE=321.19----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
13	500	109776	55127	129905	151745
14	750	123234	79832	151135	150104
15	1000	119686	127498	162608	134142
16	1250	101197	153163	163178	118216
17	1500	88145	166749	160688	102367
18	1750	79296	176602	157559	87752
19	2000	69794	178269	151485	75360
20	2500	60326	168150	140219	55127
21	3500	49512	142008	119081	33657
22	5000	36466	111230	94749	20188
23	7500	28459	78624	72491	12439
24	12000	24146	47084	50350	9458

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
13	11.088	1217196	611248	1440387	1682549
14	11.088	1366419	885177	1675785	1664353
15	11.088	1327078	1413698	1802998	1487366
16	11.088	1122072	1698271	1809318	1310779
17	11.088	977352	1848913	1781709	1135045
18	11.088	879234	1958163	1747014	972994
19	11.088	773876	1976647	1679666	835592
20	11.088	668895	1864447	1554748	611248
21	11.088	548989	1574585	1320370	373189
22	11.088	404335	1233318	1050577	223845
23	11.088	315553	871783	803780	137924
24	11.088	267731	522067	558281	104870

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 3
TO ABOVE MORGAN FALLS 12:58 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=321.2 END RIVER MILE=321.49----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
25	500	177478	87962	195061	221660
26	750	172268	119983	210432	193353
27	1000	151367	173954	217039	164177
28	1250	123067	207506	211469	137757
29	1500	108498	217269	204639	112930
30	1750	94252	222619	191935	93512
31	2000	78554	213373	179259	77057
32	2500	66247	194647	158130	53802
33	3500	52129	149574	129292	32147
34	5000	32687	120558	100020	16355
35	7500	21438	88837	72708	8334
36	12000	10766	49802	40593	4326

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
25	1.584	281125	139332	308977	351109
26	1.584	272873	190053	333324	306271
27	1.584	239765	275543	343790	260056
28	1.584	194938	328690	334967	218207
29	1.584	171861	344154	324148	178881
30	1.584	149295	352628	304025	148123
31	1.584	124430	337983	283946	122058
32	1.584	104935	308321	250478	85222
33	1.584	82572	236925	204799	50921
34	1.584	51776	190964	158432	25906
35	1.584	33958	140718	115169	13201
36	1.584	17053	78886	64299	6852

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 4
TO ABOVE MORGAN FALLS 12:59 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=321.5 END RIVER MILE=325.99----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
37	500	17243	12545	19820	7871
38	750	12052	16513	18292	5842
39	1000	8453	18544	16399	4807
40	1250	4715	18705	14207	4049
41	1500	3130	18136	12576	3392
42	1750	2723	17375	11490	2840
43	2000	2373	15517	10342	2566
44	2500	1426	11911	8158	2284
45	3500	1306	6500	5398	1921
46	5000	1040	2444	3458	1369
47	7500	830	1495	2835	1537
48	12000	2352	1826	3842	9135

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
37	23.76	409694	298069	470923	187015
38	23.76	286356	392349	434618	138806
39	23.76	200843	440605	389640	114214
40	23.76	112028	444431	337558	96204
41	23.76	74369	430911	298806	80594
42	23.76	64698	412830	273002	67478
43	23.76	56382	368684	245726	60968
44	23.76	33882	283005	193834	54268
45	23.76	31031	154440	128256	45643
46	23.76	24710	58069	82162	32527
47	23.76	19721	35521	67360	36519
48	23.76	55884	43386	91286	217048

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 5
TO ABOVE MORGAN FALLS 13:00 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=326 END RIVER MILE=327.49----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
49	500	17243	12545	19820	7871
50	750	12052	16513	18292	5842
51	1000	8453	18544	16399	4807
52	1250	4715	18705	14207	4049
53	1500	3130	18136	12576	3392
54	1750	2723	17375	11490	2840
55	2000	2373	15517	10342	2566
56	2500	1426	11911	8158	2284
57	3500	1306	6500	5398	1921
58	5000	1040	2444	3458	1369
59	7500	830	1495	2835	1537
60	12000	2352	1826	3842	9135

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
49	7.92	136565	99356	156974	62338.3
50	7.92	95452	130783	144873	46268.6
51	7.92	66948	146868	129880	38071.4
52	7.92	37343	148144	112519	32068.1
53	7.92	24790	143637	99602	26864.6
54	7.92	21566	137610	91001	22492.8
55	7.92	18794	122895	81909	20322.7
56	7.92	11294	94335	64611	18089.3
57	7.92	10344	51480	42752	15214.3
58	7.92	8237	19356	27387	10842.5
59	7.92	6574	11840	22453	12173.0
60	7.92	18628	14462	30429	72349.2

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 6
TO ABOVE MORGAN FALLS 13:00 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=327.5 END RIVER MILE=327.99----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
61	500	8586	21175	32376	105745
62	750	18754	65089	72965	131007
63	1000	26527	93555	97074	119433
64	1250	28605	107412	101448	99691
65	1500	29973	139433	97604	82589
66	1750	30308	145696	96659	65296
67	2000	28009	130975	92408	51643
68	2500	26480	102633	81553	33979
69	3500	25446	61584	66979	16970
70	5000	22993	39936	52074	12672
71	7500	24141	29644	44822	10523
72	12000	14087	28579	33835	6388

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
61	2.64	22667.0	55902	85473	279167
62	2.64	49510.6	171835	192628	345858
63	2.64	70031.3	246985	256275	315303
64	2.64	75517.2	283568	267823	263184
65	2.64	79128.7	368103	257675	218035
66	2.64	80013.1	384637	255180	172381
67	2.64	73943.8	345774	243957	136338
68	2.64	69907.2	270951	215300	89705
69	2.64	67177.4	162582	176825	44801
70	2.64	60701.5	105431	137475	33454
71	2.64	63732.2	78260	118330	27781
72	2.64	37189.7	75449	89324	16864

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 7
TO ABOVE MORGAN FALLS 13:01 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=328 END RIVER MILE=330.59----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
73	500	27925	23855	48670	95563
74	750	38627	51082	79653	110788
75	1000	42479	75847	91372	103837
76	1250	41965	90247	98126	90610
77	1500	40669	109042	96204	78455
78	1750	37897	119533	94747	66018
79	2000	36247	112898	91797	55443
80	2500	32169	102991	82177	40219
81	3500	25881	74822	68236	22042
82	5000	18673	52126	52354	13232
83	7500	14816	34219	38162	9511
84	12000	7890	24044	24386	7277

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
73	13.728	383354	327481	668142	1311889
74	13.728	530271	701254	1093476	1520898
75	13.728	583152	1041228	1254355	1425474
76	13.728	576096	1238911	1347074	1243894
77	13.728	558304	1496929	1320689	1077030
78	13.728	520250	1640949	1300687	906295
79	13.728	497599	1549864	1260189	761122
80	13.728	441616	1413860	1128126	552126
81	13.728	355294	1027156	936744	302593
82	13.728	256343	715586	718716	181649
83	13.728	203394	469758	523888	130567
84	13.728	108314	330076	334771	99899

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM TO ABOVE MORGAN FALLS 8
13:02 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=330.6 END RIVER MILE=342.1----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
85	500	8247	8991	11765	7144
86	750	6698	11233	11567	5848
87	1000	5746	11905	11352	4690
88	1250	4911	12216	10784	3888
89	1500	3987	12101	10083	3321
90	1750	3231	11662	9310	2999
91	2000	2827	11180	8669	2644
92	2500	2269	9984	7692	2189
93	3500	1899	7618	6420	1576
94	5000	1415	5431	4969	1120
95	7500	1077	3365	3772	843
96	12000	1189	3004	3462	1521

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
85	60.7728	501193	546408	714992	434161
86	60.7728	407056	682661	702959	355399
87	60.7728	349201	723500	689893	285024
88	60.7728	298455	742401	655374	236285
89	60.7728	242301	735412	612772	201826
90	60.7728	196357	708732	565795	182258
91	60.7728	171805	679440	526839	160683
92	60.7728	137893	606756	467464	133032
93	60.7728	115408	462967	390161	95778
94	60.7728	85994	330057	301980	68066
95	60.7728	65452	204500	229235	51231
96	60.7728	72259	182561	210395	92435

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 1
TO PEACHTREE CREEK 13:51 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=300.5 END RIVER MILE=302.09----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
1	500	51099	26489	55605	10483
2	750	46229	33756	55534	7223
3	1000	34836	41434	51237	5871
4	1250	25546	46360	45547	5133
5	1500	17422	47430	40662	4533
6	1750	14958	46293	37473	4141
7	2000	13684	43980	35243	4582
8	2500	12172	37809	30423	4394
9	3500	10848	24583	22930	3933
10	5000	10676	12758	17383	4566
11	7500	9472	9869	15813	5529
12	12000	9460	10676	13152	7200

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
1	8.448	431684	223779	469751	88560.4
2	8.448	390543	285171	469151	61019.9
3	8.448	294295	350034	432850	49598.2
4	8.448	215813	391649	384781	43363.6
5	8.448	147181	400689	343513	38294.8
6	8.448	126365	391083	316572	34983.2
7	8.448	115602	371543	297733	38708.7
8	8.448	102829	319410	257014	37120.5
9	8.448	91644	207677	193713	33226.0
10	8.448	90191	107780	146852	38573.6
11	8.448	80019	83373	133588	46709.0
12	8.448	79918	90191	111108	60825.6

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 2
TO PEACHTREE CREEK 13:51 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=302.1 END RIVER MILE=302.49----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
13	500	4766	11764	17987	58748
14	750	10233	36160	40536	73179
15	1000	14320	51975	53930	66607
16	1250	16235	59689	56498	55733
17	1500	17136	77494	54432	46541
18	1750	16604	80998	53911	38071
19	2000	15630	72868	51553	31317
20	2500	15006	57407	46065	22385
21	3500	17417	34866	40297	15000
22	5000	18651	23775	33649	14467
23	7500	21975	20574	34135	13402
24	12000	14014	23542	28068	7146

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
13	2.112	10065.8	24846	37989	124076
14	2.112	21612.1	76370	85612	154554
15	2.112	30243.8	109771	113900	140674
16	2.112	34288.3	126063	119324	117708
17	2.112	36191.2	163667	114960	98295
18	2.112	35067.6	171068	113860	80406
19	2.112	33010.6	153897	108880	66142
20	2.112	31692.7	121244	97289	47277
21	2.112	36784.7	73637	85107	31680
22	2.112	39390.9	50213	71067	30554
23	2.112	46411.2	43452	72093	28305
24	2.112	29597.6	49721	59280	15092

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 3
TO PEACHTREE CREEK 13:51 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=302.5 END RIVER MILE=303.79----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
25	500	137092	69893	155363	185622
26	750	131913	97691	169984	164428
27	1000	113597	143700	175681	140499
28	1250	89538	172863	169520	118733
29	1500	76996	183342	162824	98196
30	1750	65610	188730	151728	80652
31	2000	53686	179221	141220	66273
32	2500	44700	160490	122548	45445
33	3500	34800	115687	98299	26600
34	5000	22743	88058	74351	13330
35	7500	15343	60931	52623	7434
36	12000	8962	31811	28927	4277

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
25	6.864	940999	479746	1066412	1274109
26	6.864	905451	670551	1166770	1128634
27	6.864	779730	986357	1205874	964385
28	6.864	614589	1186532	1163585	814983
29	6.864	528501	1258459	1117624	674017
30	6.864	450347	1295443	1041461	553595
31	6.864	368501	1230173	969334	454898
32	6.864	306821	1101603	841169	311934
33	6.864	238867	794076	674724	182582
34	6.864	156108	604430	510345	91497
35	6.864	105314	418230	361204	51027
36	6.864	61515	218351	198555	29357

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 4
TO PEACHTREE CREEK 13:51 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=303.8 END RIVER MILE=303.99----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
37	500	53731	39128	77274	142606
38	750	60558	43626	88214	117366
39	1000	59587	52143	88469	96421
40	1250	54860	61099	87474	80152
41	1500	49639	82740	85953	69339
42	1750	46656	89351	88635	57017
43	2000	46218	86386	89797	48730
44	2500	46148	82625	89403	38554
45	3500	47882	81732	92678	24751
46	5000	55969	82328	97523	15294
47	7500	62332	85786	105610	15270
48	12000	70116	84605	113141	7672

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
37	1.056	56739.9	41319.2	81601	150592
38	1.056	63949.2	46069.1	93154	123938
39	1.056	62923.9	55063.0	93423	101821
40	1.056	57932.2	64520.5	92373	84641
41	1.056	52418.8	87373.4	90766	73222
42	1.056	49268.7	94354.7	93599	60210
43	1.056	48806.2	91223.6	94826	51459
44	1.056	48732.3	87252.0	94410	40713
45	1.056	50563.4	86309.0	97868	26137
46	1.056	59103.3	86938.4	102984	16150
47	1.056	65822.6	90590.0	111524	16125
48	1.056	74042.5	89342.9	119477	8102

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 5
TO PEACHTREE CREEK 13:51 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=304 END RIVER MILE=304.69----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
49	500	159941	81541	181257	216559
50	750	153898	113973	198314	191822
51	1000	132529	167649	204961	163881
52	1250	104460	201673	197774	138420
53	1500	89829	213898	189961	114408
54	1750	76544	220184	177016	93915
55	2000	62633	209087	164757	77114
56	2500	52110	187229	142915	52766
57	3500	40468	134945	114493	30560
58	5000	26326	102678	86497	14921
59	7500	17601	70880	60930	7954
60	12000	9956	36770	33306	4405

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
49	3.696	591142	301376	669926	800402
50	3.696	568807	421244	732969	708974
51	3.696	489827	619631	757536	605704
52	3.696	386084	745383	730973	511600
53	3.696	332008	790567	702096	422852
54	3.696	282907	813800	654251	347110
55	3.696	231492	772786	608942	285013
56	3.696	192599	691998	528214	195023
57	3.696	149570	498757	423166	112950
58	3.696	97301	379498	319693	55148
59	3.696	65053	261972	225197	29398
60	3.696	36797	135902	123099	16281

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 6
TO PEACHTREE CREEK 13:51 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=304.7 END RIVER MILE=305.1----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
61	500	159941	81541	181257	216559
62	750	153898	113973	198314	191822
63	1000	132529	167649	204961	163881
64	1250	104460	201673	197774	138420
65	1500	89829	213898	189961	114408
66	1750	76544	220184	177016	93915
67	2000	62633	209087	164757	77114
68	2500	52110	187229	142915	52766
69	3500	40468	134945	114493	30560
70	5000	26326	102678	86497	14921
71	7500	17601	70880	60930	7954
72	12000	9956	36770	33306	4405

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
61	2.1648	346240	176520	392385	468807
62	2.1648	333158	246729	429310	415256
63	2.1648	286899	362927	443700	354770
64	2.1648	226135	436582	428141	299652
65	2.1648	194462	463046	411228	247670
66	2.1648	165702	476654	383204	203307
67	2.1648	135588	452632	356666	166936
68	2.1648	112808	405313	309382	114228
69	2.1648	87605	292129	247854	66156
70	2.1648	56991	222277	187249	32301
71	2.1648	38103	153441	131901	17219
72	2.1648	21553	79600	72101	9536

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 7
TO PEACHTREE CREEK 13:51 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=305.11 END RIVER MILE=305.44----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
73	500	69367	26891	76364	4040
74	750	66425	34465	76945	3563
75	1000	59657	43048	75873	3633
76	1250	45724	50398	68375	3499
77	1500	40712	53278	63714	3379
78	1750	37338	52150	61120	3233
79	2000	35306	50437	58237	3268
80	2500	32977	45483	51607	3846
81	3500	25842	32939	41177	8383
82	5000	21636	29480	36983	8179
83	7500	11958	29104	25700	7884
84	12000	6112	21635	17159	9738

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
73	1.7952	124528	48274.7	137089	7252.6
74	1.7952	119246	61871.6	138132	6396.3
75	1.7952	107096	77279.8	136207	6522.0
76	1.7952	82084	90474.5	122747	6281.4
77	1.7952	73086	95644.7	114379	6066.0
78	1.7952	67029	93619.7	109723	5803.9
79	1.7952	63381	90544.5	104547	5866.7
80	1.7952	59200	81651.1	92645	6904.3
81	1.7952	46392	59132.1	73921	15049.2
82	1.7952	38841	52922.5	66392	14682.9
83	1.7952	21467	52247.5	46137	14153.4
84	1.7952	10972	38839.2	30804	17481.7

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 8
TO PEACHTREE CREEK 13:51 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=305.45 END RIVER MILE=305.52----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
85	500	137327	56976	152990	130027
86	750	163954	77929	187842	156786
87	1000	189203	102646	209856	155544
88	1250	192855	131505	214467	142977
89	1500	172443	148237	209815	131534
90	1750	148390	170351	202656	119796
91	2000	119848	201374	191333	110219
92	2500	82402	206521	176587	86331
93	3500	57113	166452	142327	51289
94	5000	43360	99342	95799	26658
95	7500	30729	53682	62076	19743
96	12000	19378	32863	40475	19756

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
85	0.4224	58006.9	24066.7	64623.0	54923.4
86	0.4224	69254.2	32917.2	79344.5	66226.4
87	0.4224	79919.3	43357.7	88643.2	65701.8
88	0.4224	81462.0	55547.7	90590.9	60393.5
89	0.4224	72839.9	62615.3	88625.9	55560.0
90	0.4224	62679.9	71956.3	85601.9	50601.8
91	0.4224	50623.8	85060.4	80819.1	46556.5
92	0.4224	34806.6	87234.5	74590.3	36466.2
93	0.4224	24124.5	70309.3	60118.9	21664.5
94	0.4224	18315.3	41962.1	40465.5	11260.3
95	0.4224	12979.9	22675.3	26220.9	8339.4
96	0.4224	8185.3	13881.3	17096.6	8344.9

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 9
TO PEACHTREE CREEK 13:51 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=305.53 END RIVER MILE=305.62----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
97	500	142448	90468	202261	408983
98	750	185222	119327	266976	418024
99	1000	164642	147782	259206	402995
100	1250	146686	173061	270493	371763
101	1500	127296	198408	266206	338556
102	1750	118611	222718	269062	310316
103	2000	111946	250783	261036	283694
104	2500	93246	276615	236856	233103
105	3500	49753	244109	186648	144651
106	5000	37792	156362	133775	85684
107	7500	17547	82942	81244	33049
108	12000	5633	31222	42080	11760

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
97	0.528	75212.5	47767	106794	215943
98	0.528	97797.2	63005	140963	220717
99	0.528	86931.0	78029	136861	212781
100	0.528	77450.2	91376	142820	196291
101	0.528	67212.3	104759	140557	178758
102	0.528	62626.6	117595	142065	163847
103	0.528	59107.5	132413	137827	149790
104	0.528	49233.9	146053	125060	123078
105	0.528	26269.6	128890	98550	76376
106	0.528	19954.2	82559	70633	45241
107	0.528	9264.8	43793	42897	17450
108	0.528	2974.2	16485	22218	6209

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 10
TO PEACHTREE CREEK 13:51 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=305.63 END RIVER MILE=305.85----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
109	500	66499	37779	76991	126206
110	750	88646	46864	95789	182445
111	1000	118905	55006	129310	201984
112	1250	140368	66665	153358	208550
113	1500	144509	74838	156217	220776
114	1750	142994	87400	153809	218334
115	2000	147121	92029	162259	211934
116	2500	149762	109436	174642	201529
117	3500	134300	120504	172825	183426
118	5000	104004	133654	168960	132619
119	7500	83978	122416	143254	84512
120	12000	57805	106778	107004	49396

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
109	1.2144	80756	45879	93498	153265
110	1.2144	107652	56912	116326	221561
111	1.2144	144398	66799	157034	245289
112	1.2144	170463	80958	186238	253263
113	1.2144	175492	90883	189710	268110
114	1.2144	173652	106139	186786	265145
115	1.2144	178664	111760	197047	257373
116	1.2144	181871	132899	212085	244737
117	1.2144	163094	146340	209879	222753
118	1.2144	126302	162309	205185	161053
119	1.2144	101983	148662	173968	102631
120	1.2144	70198	129671	129946	59987

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 11
TO PEACHTREE CREEK 13:51 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=305.86 END RIVER MILE=305.92----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
121	500	6651	26460	28624	90012
122	750	19734	31347	52955	129079
123	1000	37650	40378	77803	159344
124	1250	52007	60679	100969	164870
125	1500	56244	91081	115292	152852
126	1750	48005	115535	123724	140387
127	2000	38205	134250	123001	133018
128	2500	35584	159773	128018	100996
129	3500	26801	143023	113770	55972
130	5000	20764	111915	88652	29294
131	7500	9574	75571	60777	14473
132	12000	11333	33638	39274	10208

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
121	0.3696	2458.2	9779.6	10579.4	33268.4
122	0.3696	7293.7	11585.9	19572.2	47707.6
123	0.3696	13915.4	14923.7	28756.0	58893.5
124	0.3696	19221.8	22427.0	37318.1	60936.0
125	0.3696	20787.8	33663.5	42611.9	56494.1
126	0.3696	17742.6	42701.7	45728.4	51887.0
127	0.3696	14120.6	49618.8	45461.2	49163.5
128	0.3696	13151.8	59052.1	47315.5	37328.1
129	0.3696	9905.6	52861.3	42049.4	20687.3
130	0.3696	7674.4	41363.8	32765.8	10827.1
131	0.3696	3538.6	27931.0	22463.2	5349.2
132	0.3696	4188.7	12432.6	14515.7	3772.9

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 12
TO PEACHTREE CREEK 13:51 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=305.93 END RIVER MILE=306.6----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
133	500	159941	81541	181257	216559
134	750	153898	113973	198314	191822
135	1000	132529	167649	204961	163881
136	1250	104460	201673	197774	138420
137	1500	89829	213898	189961	114408
138	1750	76544	220184	177016	93915
139	2000	62633	209087	164757	77114
140	2500	52110	187229	142915	52766
141	3500	40468	134945	114493	30560
142	5000	26326	102678	86497	14921
143	7500	17601	70880	60930	7954
144	12000	9956	36770	33306	4405

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
133	3.5904	574252	292765	650785	777533
134	3.5904	552555	409209	712027	688718
135	3.5904	475832	601927	735892	588398
136	3.5904	375053	724087	710088	496983
137	3.5904	322522	767979	682036	410770
138	3.5904	274824	790549	635558	337192
139	3.5904	224878	750706	591544	276870
140	3.5904	187096	672227	513122	189451
141	3.5904	145296	484507	411076	109723
142	3.5904	94521	368655	310559	53572
143	3.5904	63195	254488	218763	28558
144	3.5904	35746	132019	119582	15816

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 13
TO PEACHTREE CREEK 13:51 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=306.61 END RIVER MILE=306.8----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
145	500	8088	22631	25735	71887
146	750	16455	29214	44221	99332
147	1000	30608	36113	63024	119494
148	1250	41204	51638	79306	122463
149	1500	44243	73648	89716	113267
150	1750	38270	92873	95793	104140
151	2000	31025	106096	95831	98278
152	2500	28551	124179	99011	74819
153	3500	20624	111990	88129	41881
154	5000	16102	89204	69252	22402
155	7500	7711	61349	48685	11663
156	12000	10138	28635	32376	9359

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
145	1.056	8540.9	23898	27176	75913
146	1.056	17376.5	30850	46697	104895
147	1.056	32322.0	38135	66553	126186
148	1.056	43511.4	54530	83747	129321
149	1.056	46720.6	77772	94740	119610
150	1.056	40413.1	98074	101157	109972
151	1.056	32762.4	112037	101198	103782
152	1.056	30149.9	131133	104556	79009
153	1.056	21778.9	118261	93064	44226
154	1.056	17003.7	94199	73130	23657
155	1.056	8142.8	64785	51411	12316
156	1.056	10705.7	30239	34189	9883

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS TO PEACHTREE CREEK

14
13:51 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=306.81 END RIVER MILE=312.5----------

OBS	DISCHARGE	ADULT BROOK TROUT WUA PER 1000 FEET	ADULT RAINBOW TROUT WUA PER 1000 FEET	ADULT BROWN TROUT WUA PER 1000 FEET	JUVENILE BROWN TROUT WUA PER 1000 FEET
157	500	26234	27575	38092	36762
158	750	17054	35523	36241	29647
159	1000	13251	39261	34502	25079
160	1250	10331	40694	33295	21159
161	1500	8613	40717	31920	18709
162	1750	6522	39807	30106	16781
163	2000	5514	38267	27820	15049
164	2500	5170	33816	25281	13039
165	3500	4963	26535	22264	8969
166	5000	3083	20336	16775	7171
167	7500	1920	11484	12152	14069
168	12000	5619	15944	17114	10776

OBS	REACH MULTIPLIER	WUA FOR ADULT BROOK TROUT	WUA FOR ADULT RAINBOW TROUT	WUA FOR ADULT BROWN TROUT	WUA FOR JUVENILE BROWN TROUT
157	30.096	789538	829897	1146417	1106389
158	30.096	513257	1069100	1090709	892256
159	30.096	398802	1181599	1038372	754778
160	30.096	310922	1224727	1002046	636801
161	30.096	259217	1225419	960664	563066
162	30.096	196286	1198031	906070	505041
163	30.096	165949	1151684	837271	452915
164	30.096	155596	1017726	760857	392422
165	30.096	149366	798597	670057	269931
166	30.096	92786	612032	504860	215818
167	30.096	57784	345622	365727	423421
168	30.096	169109	479851	515063	324314

APPENDIX H

DETAILED LISTING OF TOTAL RIVER SURFACE AREA ANGLING ACTIVITIES

APPENDIX H

Detailed listing of total river surface area, by river mile, available for four types of angling activites. The top tier of variables represents the river surface area potentially available for each angling acitivity (in square feet) per 1000 feet of river. The bottom array of variables represents the total amount of river surface area potentially available for each angling activity for the reach from the beginning to ending river mile. The variable "Reach Multiplier" is the number of thousands of feet in each reach. The lower tier of variables was obtained by multipling each variable in the upper tier by the "Reach Multiplier". The data in this appendix are presented by major reach beginning with the major reach near Buford Dam and proceeding downstream. Within each major reach, the data are presented from most downstream subreach to the most upstream subreach. This appendix allows for direct comparison between specific reaches on the river.

----------BEGIN RIVER MILE=342.11 END RIVER MILE=345.79----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
1	500	110575	48241	141477	60067
2	750	101440	47296	151638	83930
3	1000	82129	44489	154949	108516
4	1250	62604	40488	155217	127510
5	1500	48216	34692	153284	138463
6	1750	37649	27492	150209	144634
7	2000	31194	20521	146754	148719
8	2500	22599	10586	138539	153212
9	3500	12983	4179	119530	151426
10	5000	9162	2715	90825	138312
11	7500	4105	1598	55182	111830
12	12000	5661	1017	29663	63617

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
1	19.4832	2154355	939889	2756425	1170297
2	19.4832	1976376	921477	2954393	1635225
3	19.4832	1600136	866788	3018902	2114239
4	19.4832	1219726	788836	3024124	2484303
5	19.4832	939402	675911	2986463	2697702
6	19.4832	733523	535632	2926552	2817933
7	19.4832	607759	399815	2859238	2897522
8	19.4832	440301	206249	2699183	2985060
9	19.4832	252950	81420	2328827	2950263
10	19.4832	178505	52897	1769562	2694760
11	19.4832	79979	31134	1075122	2178806
12	19.4832	110294	19814	577930	1239463

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BUFORD DAM TO SITE OF THE PROPOSED 2
REREGULATION DAM 15:04 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=345.8 END RIVER MILE=347.06----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
13	500	113362	35854	159401	78626
14	750	67429	488355	163798	131595
15	1000	32583	555719	164292	159678
16	1250	15433	60515	163148	164035
17	1500	14788	56939	161541	165474
18	1750	14968	53032	159656	164612
19	2000	16014	49280	156357	163159
20	2500	16853	47091	149263	161906
21	3500	11968	51127	135492	160088
22	5000	9165	45234	113041	147695
23	7500	9339	38170	91061	120826
24	12000	5069	33617	80603	97456

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
13	6.7056	760160	240423	1068879	527235
14	6.7056	452152	3274713	1098364	882423
15	6.7056	218489	3726429	1101676	1070737
16	6.7056	103488	405789	1094005	1099953
17	6.7056	99162	381810	1083229	1109602
18	6.7056	100369	355611	1070589	1103822
19	6.7056	107383	330452	1048467	1094079
20	6.7056	113009	315773	1000898	1085677
21	6.7056	80253	342837	908555	1073486
22	6.7056	61457	303321	758008	990384
23	6.7056	62624	255953	610619	810211
24	6.7056	33991	225422	540491	653501

----------BEGIN RIVER MILE=347.07 END RIVER MILE=348.1----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
25	500	115270	127953	227400	143964
26	750	88651	156589	23359	181497
27	1000	69961	159809	243750	202611
28	1250	55849	146922	246902	218184
29	1500	46312	121220	248104	225604
30	1750	33247	102388	248317	232090
31	2000	27727	80781	246039	234330
32	2500	19674	44915	240518	240614
33	3500	9379	17957	221378	242576
34	5000	7241	7950	191844	231050
35	7500	8680	5182	139371	203131
36	12000	2048	14610	103199	170878

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
25	5.4912	632971	702616	1248699	790535
26	5.4912	486800	859862	128269	996636
27	5.4912	384170	877543	1338480	1112578
28	5.4912	306678	806778	1355788	1198092
29	5.4912	254308	665643	1362389	1238837
30	5.4912	182566	562233	1363558	1274453
31	5.4912	152255	443585	1351049	1286753
32	5.4912	108034	246637	1320732	1321260
33	5.4912	51502	98605	1215631	1332033
34	5.4912	39762	43655	1053454	1268742
35	5.4912	47664	28455	765314	1115433
36	5.4912	11246	80226	566686	938325

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 2
TO ABOVE MORGAN FALLS 15:08 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=319.1 END RIVER MILE=321.49----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
13	500	284480	58073	241371	13615
14	750	320175	76776	290673	22295
15	1000	344756	92983	307160	29295
16	1250	358133	106304	305602	35420
17	1500	355455	119357	300126	43067
18	1750	345368	132495	290650	56054
19	2000	333438	144957	275598	70456
20	2500	307223	168191	240802	94317
21	3500	245011	211084	177967	112451
22	5000	181812	214726	127420	115194
23	7500	124553	161342	95188	106540
24	12000	93691	103375	71500	76482

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
13	12.672	3604932	735900	3058657	172529
14	12.672	4057260	972910	3683407	282522
15	12.672	4368752	1178283	3892326	371226
16	12.672	4538264	1347082	3872593	448842
17	12.672	4504328	1512491	3803198	545749
18	12.672	4376507	1678980	3683122	710313
19	12.672	4225331	1836900	3492382	892818
20	12.672	3893128	2131316	3051444	1195180
21	12.672	3104781	2674858	2255198	1424977
22	12.672	2303926	2721013	1614672	1459740
23	12.672	1578335	2044531	1206217	1350072
24	12.672	1187256	1309970	906052	969179

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 3
TO ABOVE MORGAN FALLS 15:08 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=321.5 END RIVER MILE=325.49----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
25	500	11859.8	98220	202711	122649
26	750	99157.9	114137	210987	161452
27	1000	79021.1	104537	215291	178333
28	1250	62840.7	71470	215830	187288
29	1500	51297.0	46000	213155	194561
30	1750	43421.6	28304	211529	202191
31	2000	39223.1	14181	206071	201892
32	2500	34505.9	8749	191986	195531
33	3500	32922.5	332	150531	184400
34	5000	28760.8	140	97831	152375
35	7500	21295.5	181	50650	112067
36	12000	64167.7	711	24447	50370

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
25	21.12	250479	2074399	4281256	2590342
26	21.12	2094214	2410573	4456052	3409869
27	21.12	1668927	2207820	4546950	3766385
28	21.12	1327195	1509451	4558332	3955528
29	21.12	1083392	971523	4501827	4109126
30	21.12	917065	597775	4467497	4270266
31	21.12	828392	299507	4352224	4263955
32	21.12	728764	184782	4054747	4129605
33	21.12	695323	7006	3179209	3894537
34	21.12	607429	2953	2066190	3218169
35	21.12	449761	3825	1069723	2366864
36	21.12	1355221	15014	516312	1063808

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 4
TO ABOVE MORGAN FALLS 15:08 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=327.5 END RIVER MILE=327.99----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
37	500	113363	35854.8	159402	78627
38	750	67430	48835.1	163799	131595
39	1000	32583	55571.4	164292	159679
40	1250	15434	60515.7	163149	164035
41	1500	14789	56939.7	161541	165475
42	1750	14969	53032.9	159657	164613
43	2000	16014	49280.3	156357	163159
44	2500	16854	47091.1	149263	161907
45	3500	11968	51128.0	135492	160089
46	5000	9166	45234.6	113041	147696
47	7500	9340	38170.1	91061	120827
48	12000	5069	33617.9	80603	97457

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
37	2.64	299277	94657	420821	207574
38	2.64	178015	128925	432429	347411
39	2.64	86019	146708	433731	421552
40	2.64	40745	159762	430713	433053
41	2.64	39042	150321	426469	436854
42	2.64	39518	140007	421494	434578
43	2.64	42277	130100	412783	430740
44	2.64	44494	124320	394055	427434
45	2.64	31596	134978	357700	422634
46	2.64	24198	119419	298429	389916
47	2.64	24657	100769	240401	318983
48	2.64	13383	88751	212792	257285

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 5
TO ABOVE MORGAN FALLS 15:08 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=328 END RIVER MILE=330.59----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
49	500	230646	55683.3	149283	56212
50	750	243796	60176.8	205932	65271
51	1000	239628	61101.3	244859	82256
52	1250	228480	56952.5	264974	100639
53	1500	213261	50806.0	273108	119058
54	1750	194572	46735.9	274199	132607
55	2000	174788	44144.6	270490	148249
56	2500	137110	39519.9	258776	186925
57	3500	72677	26549.6	226373	231718
58	5000	33215	20402.4	172735	229257
59	12000	19080	10968.0	73833	100600

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
49	13.728	3166308	764421	2049361	771681
50	13.728	3346828	826106	2827038	896040
51	13.728	3289616	838799	3361418	1129205
52	13.728	3136569	781844	3637564	1381575
53	13.728	2927646	697465	3749223	1634430
54	13.728	2671080	641591	3764200	1820423
55	13.728	2399487	606017	3713290	2035165
56	13.728	1882244	542529	3552474	2566101
57	13.728	997708	364473	3107642	3181020
58	13.728	455978	280085	2371303	3147245
59	13.728	261936	150569	1013578	1381038

----------BEGIN RIVER MILE=330.6 END RIVER MILE=342.1----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
60	500	110576	48241.1	141477	60067
61	750	101440	47296.1	151638	83930
62	1000	82129	44489.8	154950	108517
63	1250	62604	40488.6	155218	127510
64	1500	48216	34692.1	153285	138464
65	1750	37649	27492.7	150209	144634
66	2000	31194	20521.5	146755	148719
67	2500	22600	10586.4	138540	153213
68	3500	12984	4179.8	119530	151427
69	5000	9162	2715.9	90826	138312
70	7500	4105	1598.0	55182	111830
71	12000	5661	1017.1	29664	63618

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
60	60.7728	6719983	2931744	8597958	3650460
61	60.7728	6164793	2874316	9215479	5100667
62	60.7728	4991212	2703767	9416723	6594872
63	60.7728	3804641	2460607	9433016	7749162
64	60.7728	2930247	2108339	9315552	8414836
65	60.7728	2288052	1670807	9128643	8789824
66	60.7728	1895766	1247151	8918711	9038083
67	60.7728	1373451	643364	8419435	9311167
68	60.7728	789054	254019	7264189	9202618
69	60.7728	556818	165055	5519744	8405609
70	60.7728	249501	97115	3353587	6796245
71	60.7728	344048	61810	1802763	3866217

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS
TO PEACHTREE CREEK 19:42 MONDAY, SEPTEMBER 10, 1984

----------BEGIN RIVER MILE=300.5 END RIVER MILE=302.09----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
1	500	25978	188399	201142	193606
2	750	15911	200379	206367	203898
3	1000	10296	195290	209457	206637
4	1250	9543	162235	211226	207313
5	1500	11086	110775	212309	207637
6	1750	12515	77082	210613	207946
7	2000	13710	52240	207952	208246
8	2500	13880	32497	199546	208544
9	3500	13451	23777	174978	201820
10	5000	13073	17908	126695	174310
11	7500	13920	20270	67057	114865
12	12000	14229	13531	47061	48037

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
1	8.448	219462	1591595	1699248	1635583
2	8.448	134416	1692802	1743388	1722530
3	8.448	86981	1649810	1769493	1745669
4	8.448	80619	1370561	1784437	1751380
5	8.448	93655	935827	1793586	1754117
6	8.448	105727	651189	1779259	1756728
7	8.448	115822	441324	1756778	1759262
8	8.448	117258	274535	1685765	1761780
9	8.448	113634	200868	1478214	1704975
10	8.448	110441	151287	1070319	1472571
11	8.448	117596	171241	566498	970380
12	8.448	120207	114310	397571	405817

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS
TO PEACHTREE CREEK 19:42 MONDAY, SEPTEMBER 10, 1984

----------BEGIN RIVER MILE=302.1 END RIVER MILE=302.49----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
13	500	284484	0	98475	1921
14	750	291137	0	179785	7855
15	1000	285262	0	235374	30685
16	1250	269264	461	258037	57477
17	1500	249713	1502	262480	86977
18	1750	221944	2234	257177	102927
19	2000	188236	3558	249076	127587
20	2500	130456	6832	232381	195208
21	3500	44916	13084	200174	255572
22	5000	26387	18140	152620	223999
23	7500	34877	14170	102915	161211
24	12000	19538	32180	81104	102936

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
13	2.112	600830	0.0	207970	4057
14	2.112	614881	0.0	379706	16590
15	2.112	602473	0.0	497112	64807
16	2.112	568686	973.6	544974	121391
17	2.112	527394	3172.2	554358	183695
18	2.112	468746	4718.2	543158	217382
19	2.112	397554	7514.5	526049	269464
20	2.112	275523	14429.2	490789	412279
21	2.112	94863	27633.4	422767	539768
22	2.112	55729	38311.7	322333	473096
23	2.112	73660	29927.0	217356	340479
24	2.112	41264	67964.2	171292	217401

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS
TO PEACHTREE CREEK 19:42 MONDAY, SEPTEMBER 10, 1984

----------BEGIN RIVER MILE=302.5 END RIVER MILE=303.79----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
25	500	448484	2239	311514	5599
26	750	436258	15910	375074	39275
27	1000	420823	35458	411377	80903
28	1250	400266	55561	422104	118550
29	1500	374217	75050	424935	146135
30	1750	340139	89366	419885	173804
31	2000	299070	97870	411330	202698
32	2500	223015	92478	389777	253633
33	3500	113064	61987	334867	330922
34	5000	32176	37165	253597	336499
35	7500	17043	21525	176724	243155
36	12000	12356	11116	123944	166033

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
25	6.864	3078394	15368	2138232	38432
26	6.864	2994475	109206	2574508	269584
27	6.864	2888529	243384	2823692	555936
28	6.864	2747426	381371	2897322	813727
29	6.864	2568625	515143	2916754	1003071
30	6.864	2334714	613408	2882091	1192991
31	6.864	2052816	671780	2823369	1391250
32	6.864	1530775	634769	2675429	1740937
33	6.864	776071	425479	2298527	2271449
34	6.864	220856	255101	1740690	2309729
35	6.864	116983	147748	1213034	1669016
36	6.864	84812	76300	850752	1139651

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS
TO PEACHTREE CREEK 19:42 MONDAY, SEPTEMBER 10, 1984

----------BEGIN RIVER MILE=303.8 END RIVER MILE=303.99----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
37	500	265729	0	151807	280
38	750	255475	0	184796	5979
39	1000	240977	0	199089	17221
40	1250	225825	1740	201417	34662
41	1500	228480	5430	198754	55711
42	1750	239074	10770	198355	74605
43	2000	242727	17951	200091	101127
44	2500	197706	37640	211847	163471
45	3500	71584	58967	225325	228978
46	5000	20349	62190	206189	254099
47	7500	20357	61343	201182	254099
48	12000	7158	83094	200442	255999

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
37	1.056	280610	0.0	160308	296
38	1.056	269782	0.0	195145	6314
39	1.056	254472	0.0	211188	18185
40	1.056	238471	1837.4	212696	36603
41	1.056	241275	5734.1	209884	58831
42	1.056	252462	11373.1	209463	78783
43	1.056	256320	18956.3	211296	106790
44	1.056	208778	39747.8	223710	172625
45	1.056	75593	62269.2	237943	241901
46	1.056	21489	65672.6	217736	268329
47	1.056	21497	64778.2	212448	269279
48	1.056	7559	87747.3	211667	270335

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS
TO PEACHTREE CREEK 19:42 MONDAY, SEPTEMBER 10, 1984

----------BEGIN RIVER MILE=304 END RIVER MILE=304.69----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
49	500	448485	2240	311514	5600
50	750	436258	15910	375975	39275
51	1000	420823	35459	411377	80994
52	1250	400267	55562	422105	118550
53	1500	374218	75050	424935	146136
54	1750	340139	89366	419885	173805
55	2000	299070	97870	411331	202688
56	2500	223016	92478	389777	253634
57	3500	113065	61988	334868	330923
58	5000	32176	37166	253597	336499
59	7500	17044	21526	176724	243155
60	12000	12356	11117	123945	166034

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
49	3.696	1657601	8279	1151356	20698
50	3.696	1612410	58803	1386277	145160
51	3.696	1555362	131056	1520449	299354
52	3.696	1479387	205357	1560100	438161
53	3.696	1383110	277385	1570560	540119
54	3.696	1257154	330297	1551895	642383
55	3.696	1105363	361728	1520279	749135
56	3.696	824267	341799	1440616	937431
57	3.696	417888	229108	1237672	1223091
58	3.696	118922	137366	937295	1243700
59	3.696	62995	79560	653172	898701
60	3.696	45668	41088	458101	613662

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS
TO PEACHTREE CREEK 19:42 MONDAY, SEPTEMBER 10, 1984

----------BEGIN RIVER MILE=304.7 END RIVER MILE=305.1----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPP) WUA PER 1000 FEET	FISHING(BOAT-PUR) WUA PER 1000 FEET
61	500	448435	2240	311514	5600
62	750	436258	15910	375075	39275
63	1000	420823	35459	411377	80994
64	1250	400267	55562	422105	118550
65	1500	374218	75050	424035	146136
66	1750	340139	89366	419825	173805
67	2000	299070	97870	411331	202688
68	2500	223016	92478	389777	253634
69	3500	113065	61988	334868	330923
70	5000	32176	37166	253597	336499
71	7500	17044	21526	176724	243155
72	12000	12356	11117	123945	166034

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPP)	WUA FOR FISHING (BOAT-PUR)
61	2.1648	970880	4849	674366	12123
62	2.1648	944411	34442	811962	85023
63	2.1648	910998	76762	890549	175336
64	2.1648	866498	120281	913773	256637
65	2.1648	810107	162468	918000	316355
66	2.1648	736333	193460	908967	376253
67	2.1648	647427	211869	890449	439779
68	2.1648	482785	200196	843789	549067
69	2.1648	244763	134192	724922	716392
70	2.1648	69655	80457	548907	728453
71	2.1648	36897	46589	382572	526382
72	2.1648	26748	24066	268316	359439

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS
TO PEACHTREE CREEK 19:42 MONDAY, SEPTEMBER 10, 1984

----------BEGIN RIVER MILE=305.11 END RIVER MILE=305.44----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
73	500	12590	142000	119889	115105
74	750	14842	142000	129559	123977
75	1000	15784	142760	134409	129369
76	1250	16142	133909	138862	134482
77	1500	16478	115723	142738	138797
78	1750	18072	96779	145549	142193
79	2000	19571	86688	146701	145446
80	2500	21122	73896	145985	147942
81	3500	20761	65930	135472	143812
82	5000	22299	48133	109780	125494
83	7500	25772	25102	89032	89772
84	12000	27356	3342	71744	70653

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
73	1.7952	22601.6	254918	215225	206636
74	1.7952	26644.4	254918	232584	222564
75	1.7952	28335.4	256283	241291	232243
76	1.7952	28978.1	240393	249285	241422
77	1.7952	29581.3	207746	256243	249168
78	1.7952	32442.9	173738	261290	255265
79	1.7952	35133.9	155622	263358	261105
80	1.7952	37918.2	132658	262072	265585
81	1.7952	37270.1	118358	243199	258171
82	1.7952	40031.2	86408	197077	225287
83	1.7952	46265.9	45063	159830	161159
84	1.7952	49109.5	6000	128795	126836

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS
TO PEACHTREE CREEK 19:42 MONDAY, SEPTEMBER 10, 1984

----------BEGIN RIVER MILE=305.45 END RIVER MILE=305.52----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
85	500	168688	138800	162277	132146
86	750	179322	147637	214403	144372
87	1000	178342	141404	254545	148502
88	1250	177286	129241	282654	149836
89	1500	177641	114934	295925	152000
90	1750	178373	100969	305937	156228
91	2000	177920	88341	310830	162215
92	2500	174908	70434	309273	175086
93	3500	149010	52889	290056	216447
94	5000	95478	47065	237135	247071
95	7500	51385	40943	156420	197923
96	12000	71343	34837	93997	110080

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
85	0.4224	71253.8	58629.1	68546	55818
86	0.4224	75745.6	62361.9	90564	60983
87	0.4224	75331.7	59729.0	107520	62727
88	0.4224	74885.6	54591.4	119393	63291
89	0.4224	75035.6	48548.1	124999	64205
90	0.4224	75344.8	42649.3	129228	65991
91	0.4224	75153.4	37315.2	131295	68520
92	0.4224	73881.1	29751.3	130637	73956
93	0.4224	62941.8	22340.3	122520	91427
94	0.4224	40329.9	19880.3	100166	104363
95	0.4224	21705.0	17294.3	66072	83603
96	0.4224	30135.3	14715.1	39704	46499

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS
TO PEACHTREE CREEK 10:43 MONDAY, SEPTEMBER 10, 1984

----------BEGIN RIVER MILE=305.53 END RIVER MILE=305.62----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PUP) WUA PER 1000 FEET
97	500	648538	639	264999	2400
98	750	663724	1037	354458	10060
99	1000	657317	3128	423345	21620
100	1250	647204	4209	481338	33780
101	1500	633740	4547	511745	44100
102	1750	620603	4823	533394	54740
103	2000	603321	5364	542729	64460
104	2500	569181	6045	542698	76616
105	3500	475820	5177	491134	96113
106	5000	336967	2984	399325	139242
107	7500	159008	5145	230656	198530
108	12000	47529	735	93224	159806

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PUP)
97	0.528	342428	337.39	139919	1267
98	0.528	350446	1022.74	187154	5312
99	0.528	347063	1651.58	223526	11415
100	0.528	341724	2222.35	254146	17836
101	0.528	334615	2400.82	270201	23285
102	0.528	327678	2546.54	281632	28903
103	0.528	318553	2832.19	286561	34035
104	0.528	300528	3191.76	286545	40453
105	0.528	251233	2733.46	259319	50748
106	0.528	177919	1575.55	210844	73520
107	0.528	83956	2716.56	121786	104824
108	0.528	25095	388.08	49222	84378

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS
TO PEACHTREE CREEK 10:43 MONDAY, SEPTEMBER 10, 1984

----------BEGIN RIVER MILE=305.63 END RIVER MILE=305.85----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
109	500	185533	33563	88155	49617
110	750	218971	26225	119910	51468
111	1000	250592	23471	154673	51478
112	1250	270326	19803	180521	52072
113	1500	288819	17744	201654	53918
114	1750	301015	15950	222272	56276
115	2000	308824	15961	236825	58570
116	2500	316241	17136	250385	65489
117	3500	294496	23133	260649	84926
118	5000	245681	37463	258074	120180
119	7500	169915	44351	233986	143714
120	12000	93695	44287	189935	153314

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
109	1.2144	225311	40758.9	107055	60255
110	1.2144	265918	31847.6	145630	62503
111	1.2144	304319	28503.2	187835	62515
112	1.2144	328284	24048.8	219225	63236
113	1.2144	350742	21548.3	244889	65478
114	1.2144	365553	19369.7	269927	68342
115	1.2144	375036	19383.0	287600	71127
116	1.2144	384043	20810.0	304068	79530
117	1.2144	357636	28092.7	316532	103134
118	1.2144	298355	45495.1	313405	145947
119	1.2144	206345	53859.9	284153	174526
120	1.2144	113783	53782.1	230657	186185

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS
TO PEACHTREE CREEK 19:43 MONDAY, SEPTEMBER 10, 1984

----------BEGIN RIVER MILE=305.86 END RIVER MILE=305.92----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
121	500	243438	0	88575	7725
122	750	292843	0	134975	26824
123	1000	326019	267	183549	42790
124	1250	323669	926	229499	55747
125	1500	325636	1469	266559	61888
126	1750	311020	1998	290221	73200
127	2000	298142	2596	300650	83804
128	2500	267292	5234	306635	119489
129	3500	185612	10691	282403	206104
130	5000	73210	12377	233349	275167
131	7500	30152	822	172080	244208
132	12000	22133	0	123614	174111

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
121	0.3696	89975	0.00	32737	2855
122	0.3696	108235	0.00	49887	9914
123	0.3696	120497	98.68	67840	15815
124	0.3696	119628	342.25	84823	20604
125	0.3696	120355	542.94	98520	22874
126	0.3696	114953	738.46	107266	27055
127	0.3696	110193	959.48	111120	30974
128	0.3696	98791	1934.49	113332	44163
129	0.3696	68602	3951.39	104376	76176
130	0.3696	27058	4574.54	86246	101702
131	0.3696	11144	303.81	63601	90259
132	0.3696	8180	0.00	45688	64351

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS
TO PEACHTREE CREEK 19:43 MONDAY, SEPTEMBER 10, 1984

----------BEGIN RIVER MILE=305.93 END RIVER MILE=306.6----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
133	500	448485	2240	311514	5600
134	750	436258	15910	375075	39275
135	1000	420823	35459	411377	80994
136	1250	400267	55562	422105	118550
137	1500	374218	75050	424935	146136
138	1750	340139	89366	419885	173805
139	2000	299070	97870	411331	202688
140	2500	223016	92478	389777	253634
141	3500	113065	61988	334868	330923
142	5000	32176	37166	253597	336499
143	7500	17044	21526	176724	243155
144	12000	12356	11117	123945	166034

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
133	3.5904	1610241	8042	1118460	20106
134	3.5904	1566341	57123	1346669	141013
135	3.5904	1510923	127312	1477008	290801
136	3.5904	1437119	199499	1515526	425642
137	3.5904	1343592	269460	1525687	524687
138	3.5904	1221235	320860	1507555	624029
139	3.5904	1073781	351392	1476843	727731
140	3.5904	800717	332033	1399455	910648
141	3.5904	405949	222562	1202310	1188146
142	3.5904	115525	133441	910515	1208166
143	3.5904	61195	77287	634510	873024
144	3.5904	44363	39914	445012	596128

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS
TO PEACHTREE CREEK 19:43 MONDAY, SEPTEMBER 10, 1984

----------BEGIN RIVER MILE=306.61 END RIVER MILE=306.8----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
145	500	243438	0	88575	7725
146	750	292843	0	134975	26824
147	1000	326019	267	183549	42790
148	1250	323669	926	229499	55747
149	1500	325636	1469	266559	61888
150	1750	311020	1998	290221	73200
151	2000	298142	2596	300650	83804
152	2500	267292	5234	306635	119488
153	3500	185612	10691	282403	206104
154	5000	73210	12377	233349	275167
155	7500	30152	822	172080	244208
156	12000	22133	0	123614	174111

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
145	1.056	257071	0.0	93535	8158
146	1.056	309242	0.0	142534	28326
147	1.056	344276	282.0	193828	45186
148	1.056	341794	977.9	242351	58869
149	1.056	343872	1551.3	281486	65354
150	1.056	328437	2109.9	306473	77299
151	1.056	314838	2741.4	317486	88497
152	1.056	282260	5527.1	323807	126179
153	1.056	196006	11289.7	298218	217646
154	1.056	77310	13070.1	246417	290576
155	1.056	31841	868.0	181716	257884
156	1.056	23372	0.0	130536	183861

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS
TO PEACHTREE CREEK 19:43 MONDAY, SEPTEMBER 10, 1984

----------BEGIN RIVER MILE=306.81 END RIVER MILE=312.5----------

OBS	DISCHARGE	FISHING(WADING) WUA PER 1000 FEET	FISHING(TUBING) WUA PER 1000 FEET	FISHING(BOAT-NPR) WUA PER 1000 FEET	FISHING(BOAT-PWR) WUA PER 1000 FEET
157	500	259023	16901	170492	24231
158	750	235964	31621	194420	59463
159	1000	209569	35497	208271	93713
160	1250	177477	33597	215772	108572
161	1500	154731	30692	216425	116473
162	1750	144563	23506	214896	123471
163	2000	132965	17221	211321	129849
164	2500	110555	8215	200009	142146
165	3500	74235	1858	177889	160684
166	5000	52997	1539	149240	164596
167	7500	61531	302	109726	153594
168	12000	54700	3668	104443	118110

OBS	REACH MULTIPLIER	WUA FOR FISHING (WADING)	WUA FOR FISHING (TUBING)	WUA FOR FISHING (BOAT-NPR)	WUA FOR FISHING (BOAT-PWR)
157	30.096	7795556	508652	5131127	730741
158	30.096	7131573	951666	5851264	1789598
159	30.096	6307791	1068315	6269124	2820386
160	30.096	5341349	1011135	6493874	3267593
161	30.096	4656724	923706	6513527	3505522
162	30.096	4350768	707437	6467510	3715983
163	30.096	4001715	518283	6359917	3907936
164	30.096	3327263	247239	6019471	4278026
165	30.096	2236749	55919	5353747	4835946
166	30.096	1594998	46318	4491527	4953681
167	30.096	1851337	9099	3302314	4622565
168	30.096	1646251	110392	3143317	3554639

APPENDIX I

DETAILED LISTING OF TOTAL RIVER SURFACE AREA
RECREATIONAL RAFTING

APPENDIX I

Detailed listing of total river surface area, by river mile, available for recreational rafting. The top tier of variables represents the amount of river surface area (in square feet) available in a length of river 1000 feet long. The bottom array of variables represents the total amount of river surface area potentially available for each species life-stage for the reach from the beginning to ending river mile. The variable "Reach Multiplier" is the number of thousands of feet in each reach. The lower tier of variables was obtained by multipling each variable in the upper tier by the "Reach Multiplier". The data in this appendix are presented by major reach beginning with the major reach near Buford Dam and proceeding downstream. Within each major reach, the data are presented from most downstream subreach to the most upstream subreach. This appendix allows for direct comparison between specific reaches on the river.

----------BEGIN RIVER MILE=342.11 END RIVER MILE=345.79----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
1	500	28375	105587	112982	6028
2	750	18516	137111	134246	13494
3	1000	12265	158773	143363	22617
4	1250	9564	168474	143855	32264
5	1500	9067	174225	139544	42376
6	1750	7933	177742	133295	51949
7	2000	7041	180439	126218	60850
8	2500	5289	184406	111089	77527
9	3500	3404	188286	81965	107800
10	5000	1484	188387	52367	140707
11	7500	1769	167242	26977	170578
12	12000	2600	101906	17470	191312

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
1	19.4832	552836	2057173	2201251	117445
2	19.4832	360751	2671361	2615542	262906
3	19.4832	238961	3093406	2793170	440652
4	19.4832	186337	3282413	2802756	628606
5	19.4832	176654	3394461	2718764	825620
6	19.4832	154560	3462983	2597013	1012133
7	19.4832	137181	3515529	2459131	1185553
8	19.4832	103047	3592819	2164369	1510474
9	19.4832	66321	3668414	1596940	2100289
10	19.4832	28913	3670382	1020277	2741423
11	19.4832	34466	3258409	525598	3323405
12	19.4832	50656	1985455	340372	3727370

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BUFORD DAM TO SITE OF THE PROPOSED REREGULATION DAM 2
13:41 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=345.8 END RIVER MILE=347.06----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
13	500	31684	118715	128667	719
14	750	10702	131036	139781	3293
15	1000	8483	136491	143178	8710
16	1250	9131	141510	143437	17137
17	1500	8968	145534	141409	25443
18	1750	8505	149081	136503	33228
19	2000	7911	152803	128327	48080
20	2500	7486	156565	110308	55412
21	3500	5356	164451	84083	80025
22	5000	4427	165621	70624	105706
23	7500	2256	137847	63657	121018
24	12000	3994	96169	62370	135638

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
13	6.7056	212460	796055	862789	4821
14	6.7056	71763	878675	937315	22082
15	6.7056	56884	915254	960094	58406
16	6.7056	61229	948909	961831	114914
17	6.7056	60136	975893	948232	170611
18	6.7056	57031	999678	915335	222814
19	6.7056	53048	1024636	860510	322405
20	6.7056	50198	1049862	739681	371571
21	6.7056	35915	1102743	563827	536616
22	6.7056	29686	1110588	473576	708822
23	6.7056	15128	924347	426858	811498
24	6.7056	26782	644871	418228	909534

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BUFORD DAM TO SITE OF THE PROPOSED 3
REREGULATION DAM 13:41 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=347.07 END RIVER MILE=348.1----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
25	500	37332	89095	143641	0
26	750	21377	161443	193816	0
27	1000	14794	205419	221982	0
28	1250	12552	223087	233446	0
29	1500	10953	234776	240747	1789
30	1750	8699	240951	244848	5494
31	2000	7192	245839	247914	12488
32	2500	4508	250346	245464	26255
33	3500	3405	252191	208603	60322
34	5000	3611	253626	148808	111361
35	7500	1300	260704	94793	168852
36	12000	191	224101	46951	203418

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
25	5.4912	204997	489238	788761	0
26	5.4912	117385	886516	1064282	0
27	5.4912	81237	1127997	1218948	0
28	5.4912	68926	1225015	1281899	0
29	5.4912	60145	1289202	1321990	9824
30	5.4912	47768	1323110	1344509	30169
31	5.4912	39493	1349951	1361345	68574
32	5.4912	24754	1374700	1347892	144171
33	5.4912	18698	1384831	1145481	331240
34	5.4912	19829	1392711	817134	611506
35	5.4912	7139	1431578	520527	927200
36	5.4912	1049	1230583	257817	1117009

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 1
TO ABOVE MORGAN FALLS 13:34 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=317 END RIVER MILE=319.09----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
1	500	34208.2	136501	164586	0
2	750	25694.0	189122	197376	0
3	1000	22003.4	201072	207338	0
4	1250	19333.1	208224	212255	3771
5	1500	17888.1	216215	217377	13525
6	1750	17944.1	219835	220034	22192
7	2000	17666.5	221833	208841	33761
8	2500	16509.9	224679	179100	61890
9	3500	13538.4	230630	106833	118781
10	5000	6944.9	239051	51032	177958
11	7500	3086.0	199439	21547	222444
12	12000	59512.7	81706	14467	241837

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
1	11.088	379300	1513523	1824926	0
2	11.088	284895	2096981	2188510	0
3	11.088	243973	2229488	2298962	0
4	11.088	214365	2308783	2353485	41813
5	11.088	198344	2397394	2410280	149967
6	11.088	198965	2437528	2439734	246060
7	11.088	195886	2459687	2315629	374340
8	11.088	183062	2491240	1985859	686234
9	11.088	150114	2557228	1184565	1317040
10	11.088	77005	2650598	565847	1973194
11	11.088	34218	2211377	238909	2466454
12	11.088	659877	905961	160411	2681489

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 2
TO ABOVE MORGAN FALLS 13:34 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=319.1 END RIVER MILE=321.19----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
13	500	224536	130181	174368	23
14	750	159860	228076	252994	98
15	1000	105197	278978	296366	904
16	1250	68518	305484	319555	4306
17	1500	46992	325835	334826	10407
18	1750	35486	340599	341134	20631
19	2000	28277	349892	339210	33608
20	2500	19871	359616	315729	65716
21	3500	13197	369412	240670	131625
22	5000	10803	368082	175385	213252
23	7500	7773	290862	129842	272917
24	12000	6645	188183	79903	315136

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
13	11.088	2489655	1443447	1933392	255
14	11.088	1772528	2528907	2805197	1087
15	11.088	1166424	3093308	3286106	10024
16	11.088	759728	3387207	3543226	47745
17	11.088	521047	3612858	3712551	115393
18	11.088	393469	3776562	3782494	228757
19	11.088	313535	3879602	3761160	372646
20	11.088	220330	3987422	3500803	728659
21	11.088	146328	4096040	2668549	1459458
22	11.088	119784	4081293	1944669	2364538
23	11.088	86187	3225078	1439688	3026104
24	11.088	73680	2086573	885964	3494228

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 3
TO ABOVE MORGAN FALLS 13:34 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=321.5 END RIVER MILE=325.49----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
25	500	34208.2	136501	164586	0
26	750	25694.0	189122	197376	0
27	1000	22003.4	201072	207338	0
28	1250	19333.1	208224	212255	3771
29	1500	17888.1	216215	217377	13525
30	1750	17944.1	219835	220034	22192
31	2000	17666.5	221833	208841	33761
32	2500	16509.9	224679	179100	61890
33	3500	13538.4	230630	106833	118781
34	5000	6944.9	239051	51032	177958
35	7500	3086.0	199439	21547	222444
36	12000	59512.7	81706	14467	241837

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
25	21.12	722476	2882900	3476049	0
26	21.12	542657	3994250	4168590	0
27	21.12	464711	4246645	4378976	0
28	21.12	408315	4397683	4482829	79644
29	21.12	377797	4566465	4591009	285651
30	21.12	378980	4642911	4647112	468687
31	21.12	373117	4685119	4410722	713029
32	21.12	348690	4745219	3782588	1307112
33	21.12	285931	4870910	2256315	2508648
34	21.12	146676	5048758	1077803	3758465
35	21.12	65177	4212146	455064	4698008
36	21.12	1256908	1725641	305544	5107597

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 4
TO ABOVE MORGAN FALLS 13:34 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=327.5 END RIVER MILE=327.99----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
37	500	31684.8	118715	128668	720
38	750	10702.9	131037	139781	3294
39	1000	8483.6	136491	143179	8711
40	1250	9131.9	141511	143437	17137
41	1500	8968.6	145535	141409	25444
42	1750	8505.2	149082	136504	33229
43	2000	7911.1	152803	128327	48080
44	2500	7486.8	156565	110309	55412
45	3500	5356.8	164452	84084	80025
46	5000	4427.4	165621	70625	105707
47	7500	2256.9	137848	63658	121019
48	12000	3994.1	96169	62371	135639

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
37	2.64	83647.8	313408	339683	1900
38	2.64	28255.8	345936	369023	8695
39	2.64	22396.7	360338	377992	22996
40	2.64	24108.2	373588	378674	45242
41	2.64	23677.2	384211	373320	67171
42	2.64	22453.7	393576	360369	87724
43	2.64	20885.3	403400	338784	126932
44	2.64	19765.2	413332	291216	146288
45	2.64	14141.8	434153	221981	211267
46	2.64	11688.3	437240	186449	279066
47	2.64	5958.3	363918	168057	319489
48	2.64	10544.5	253887	164659	358087

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 5
TO ABOVE MORGAN FALLS 13:34 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=328 END RIVER MILE=330.59----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
49	500	141720	91006	94883	94421
50	750	93456	165131	163489	12629
51	1000	67488	206829	204974	17352
52	1250	45971	234461	229494	24383
53	1500	29768	258296	242641	33259
54	1750	22504	274615	246528	44372
55	2000	18860	283639	242989	57573
56	2500	15305	292682	219379	87614
57	3500	12930	301480	162485	142439
58	5000	12401	301210	112403	202832
59	7500	10933	240336	77345	248170
60	12000	6548	143905	51670	281158

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
49	13.728	1945534	1249334	1302549	1296210
50	13.728	1282966	2266924	2244375	173365
51	13.728	926475	2839347	2813889	238202
52	13.728	631091	3218683	3150490	334724
53	13.728	408655	3545892	3330976	456576
54	13.728	308941	3769910	3384330	609142
55	13.728	258906	3893795	3335755	790367
56	13.728	210109	4017942	3011635	1202760
57	13.728	177499	4138719	2230590	1955405
58	13.728	170237	4135009	1543066	2784481
59	13.728	150091	3299337	1061795	3406884
60	13.728	89891	1975526	709323	3859742

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 6
TO ABOVE MORGAN FALLS 13:34 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=330.6 END RIVER MILE=342.1----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
61	500	28375.1	105587	112983	6028
62	750	18516.9	137112	134246	13494
63	1000	12265.7	158774	143364	22618
64	1250	9564.0	168475	143855	32264
65	1500	9067.6	174226	139545	42376
66	1750	7933.1	177743	133296	51949
67	2000	7041.4	180440	126218	60851
68	2500	5289.8	184406	111089	77528
69	3500	3404.5	188286	81965	107801
70	5000	1484.8	188387	52368	140707
71	7500	1769.6	167242	26977	170578
72	12000	2600.6	101907	17470	191313

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
61	60.7728	1724432	6416818	6866263	366343
62	60.7728	1125324	8332675	8158519	820069
63	60.7728	745420	9649136	8712604	1374533
64	60.7728	581233	10238673	8742473	1960787
65	60.7728	551063	10588201	8480520	2575320
66	60.7728	482119	10801915	8100759	3157095
67	60.7728	427924	10965838	7670641	3698083
68	60.7728	321474	11206880	6751201	4711590
69	60.7728	206903	11442679	4981249	6551339
70	60.7728	90237	11448833	3182546	8551173
71	60.7728	107545	10163779	1639481	10366531
72	60.7728	158046	6193166	1061726	11626616

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 1
PEACHTREE CREEK 13:39 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=300.5 END RIVER MILE=302.09----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
1	500	4568	47495	111040	0
2	750	5675	148666	169818	0
3	1000	6543	178879	188707	0
4	1250	7383	185808	192904	0
5	1500	8076	192634	196317	282
6	1750	8505	197657	199364	5528
7	2000	8820	200000	201550	12767
8	2500	8254	200000	192972	33091
9	3500	7645	200000	137335	79035
10	5000	7596	210371	65712	139633
11	7500	8466	162324	39695	183461
12	12000	9356	58820	32400	195019

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
1	8.448	38590.5	401238	938066	0
2	8.448	47942.4	1255930	1434622	0
3	8.448	55275.3	1511170	1594197	0
4	8.448	62371.6	1569706	1629653	0
5	8.448	68226.0	1627372	1658486	2382
6	8.448	71850.2	1669806	1684227	46701
7	8.448	74511.4	1689600	1702694	107856
8	8.448	69729.8	1689600	1630227	279553
9	8.448	64585.0	1689600	1160206	667688
10	8.448	64171.0	1777214	555135	1179620
11	8.448	71520.8	1371313	335343	1549879
12	8.448	79039.5	496911	273715	1647521

----------BEGIN RIVER MILE=302.1 END RIVER MILE=302.49----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
13	500	173393	104531	80461	15524
14	750	74791	182706	165050	19593
15	1000	37481	232760	214967	26585
16	1250	27670	259260	235329	37773
17	1500	22196	276687	242307	51907
18	1750	18337	288667	234798	68559
19	2000	16328	295570	219096	86664
20	2500	14856	298013	177531	125247
21	3500	15714	298054	108440	176613
22	5000	18893	293359	68185	230946
23	7500	15730	252444	61796	262923
24	12000	6124	134532	60489	282415

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
13	2.112	366206	220769	169934	32787
14	2.112	157959	385875	348586	41380
15	2.112	79160	491589	454010	56148
16	2.112	58439	547557	497015	79777
17	2.112	46878	584363	511752	109628
18	2.112	38728	609665	495893	144797
19	2.112	34485	624244	462731	183034
20	2.112	31376	629403	374945	264522
21	2.112	33188	629490	229025	373007
22	2.112	39902	619574	144007	487758
23	2.112	33222	533162	130513	555293
24	2.112	12934	284132	127753	596460

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 3
PEACHTREE CREEK 13:39 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=302.5 END RIVER MILE=303.79----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
25	500	292408	193876	233367	0
26	750	180638	288643	313865	85
27	1000	92877	342630	360845	1358
28	1250	45241	371981	386528	7286
29	1500	22025	393251	401339	17829
30	1750	13646	408474	402924	32154
31	2000	11661	417845	391810	49909
32	2500	11434	428552	348200	91569
33	3500	10876	443344	252122	173075
34	5000	10520	431334	198253	266210
35	7500	6140	309839	147510	319482
36	12000	3973	207757	77848	365486

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
25	6.864	2007089	1330765	1601831	0
26	6.864	1239899	1981246	2154369	583
27	6.864	637508	2351812	2476840	9321
28	6.864	310534	2553278	2653128	50011
29	6.864	151180	2699275	2754791	122378
30	6.864	93666	2803766	2765670	220705
31	6.864	80041	2868088	2689384	342575
32	6.864	78483	2941581	2390045	628530
33	6.864	74653	3043113	1730565	1187987
34	6.864	72209	2960677	1360809	1827265
35	6.864	42145	2126735	1012509	2192924
36	6.864	27271	1426044	534349	2508696

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 4
PEACHTREE CREEK 13:39 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=303.8 END RIVER MILE=303.99----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
37	500	143349	114771	122816	12868
38	750	82426	163784	140359	27156
39	1000	57248	199120	144125	43952
40	1250	50875	224425	140632	62229
41	1500	47731	243748	137919	79775
42	1750	37095	255012	141836	95307
43	2000	37182	264431	143148	108278
44	2500	17601	289622	138284	129606
45	3500	8059	344056	129567	169672
46	5000	9682	352806	125525	238941
47	7500	6463	290026	125084	260377
48	12000	0	257097	117498	268542

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
37	1.056	151377	121198	129694	13589
38	1.056	87042	172956	148219	28677
39	1.056	60454	210271	152196	46413
40	1.056	53724	236993	148507	65714
41	1.056	50404	257398	145642	84242
42	1.056	39172	269293	149779	100644
43	1.056	39264	279239	151164	114342
44	1.056	18587	305841	146028	136864
45	1.056	8510	363323	136823	179174
46	1.056	10224	372563	132554	252322
47	1.056	6825	306267	132089	274958
48	1.056	0	271494	124078	283580

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 5
PEACHTREE CREEK 13:39 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=304 END RIVER MILE=304.69----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
49	500	292408	193876	233367	0
50	750	180638	288643	313865	85
51	1000	92877	342630	369845	1358
52	1250	45241	371981	386528	7286
53	1500	22025	393251	401339	17829
54	1750	13646	408474	402924	32154
55	2000	11661	417845	391810	49909
56	2500	11434	428552	348200	91569
57	3500	10876	443344	252122	173075
58	5000	10520	431334	198253	266210
59	7500	6140	309839	147510	319482
60	12000	3973	207757	77848	365486

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
49	3.696	1080740	716566	862524	0
50	3.696	667638	1066825	1160045	314
51	3.696	343273	1266360	1366947	5019
52	3.696	167211	1374842	1428607	26929
53	3.696	81404	1453456	1483349	65896
54	3.696	50436	1509720	1489207	118841
55	3.696	43099	1544355	1448130	184464
56	3.696	42260	1583928	1286947	338439
57	3.696	40198	1638599	931843	639685
58	3.696	38882	1594210	732743	983912
59	3.696	22693	1145165	545197	1180805
60	3.696	14684	767870	287726	1350836

----------BEGIN RIVER MILE=304.7 END RIVER MILE=305.1----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
61	500	292408	193876	233367	0
62	750	180638	288643	313865	85
63	1000	92877	342630	369845	1358
64	1250	45241	371981	386528	7286
65	1500	22025	393251	401339	17829
66	1750	13646	408474	402924	32154
67	2000	11661	417845	391810	49909
68	2500	11434	428552	348200	91569
69	3500	10876	443344	252122	173075
70	5000	10520	431334	198253	266210
71	7500	6140	309839	147510	319482
72	12000	3973	207757	77848	365486

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
61	2.1648	633005	419703	505193	0
62	2.1648	391045	624854	679455	184
63	2.1648	201060	741725	800640	2940
64	2.1648	97938	805264	836756	15773
65	2.1648	47680	851310	868819	38596
66	2.1648	29541	884265	872250	69607
67	2.1648	25244	904551	848190	108043
68	2.1648	24752	927729	753783	198229
69	2.1648	23544	959751	545794	374673
70	2.1648	22774	933752	429178	576291
71	2.1648	13292	670739	319330	691615
72	2.1648	8601	449752	168525	791204

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 7
PEACHTREE CREEK 13:39 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=305.11 END RIVER MILE=305.44----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
73	500	7451	1130	27542	0
74	750	7553	37799	58668	0
75	1000	7621	65698	77878	0
76	1250	7668	77294	88663	0
77	1500	8656	82726	95952	0
78	1750	11243	89045	103002	840
79	2000	13235	95925	110189	4460
80	2500	16143	106243	117414	13976
81	3500	16920	125648	98747	38795
82	5000	16337	145505	81781	68588
83	7500	15772	106692	77057	89242
84	12000	15328	92400	62209	100772

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
73	1.7952	13376.0	2029	49443	0
74	1.7952	13559.1	67857	105321	0
75	1.7952	13681.2	117941	139807	0
76	1.7952	13765.6	138758	159168	0
77	1.7952	15539.3	148510	172253	0
78	1.7952	20183.4	159854	184909	1508
79	1.7952	23759.5	172205	197811	8007
80	1.7952	28979.9	190727	210782	25090
81	1.7952	30374.8	225563	177271	69645
82	1.7952	29328.2	261211	146813	123129
83	1.7952	28313.9	191533	138333	160207
84	1.7952	27516.8	165876	111678	180906

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 8
PEACHTREE CREEK 13:39 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=305.45 END RIVER MILE=305.52----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
85	500	145402	29530	63754	0
86	750	153352	72052	107618	0
87	1000	138042	116043	154582	0
88	1250	121727	166100	197350	0
89	1500	104855	208608	229325	1753
90	1750	88782	228156	247872	4518
91	2000	69959	246715	260403	8587
92	2500	40737	275177	271982	22174
93	3500	24577	288724	243025	66549
94	5000	24616	302330	168021	148004
95	7500	24182	250523	100693	229845
96	12000	48635	162258	66055	283650

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
85	0.4224	61417.8	12473	26930	0
86	0.4224	64775.9	30435	45458	0
87	0.4224	58308.9	49017	65295	0
88	0.4224	51417.5	70161	83361	0
89	0.4224	44290.8	88116	96867	740
90	0.4224	37501.5	96373	104701	1908
91	0.4224	29550.7	104212	109994	3627
92	0.4224	17207.3	116235	114885	9366
93	0.4224	10381.3	121957	102654	28110
94	0.4224	10397.8	127704	70972	62517
95	0.4224	10214.5	105821	42533	97087
96	0.4224	20543.4	68538	27902	119814

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 9
PEACHTREE CREEK 13:39 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=305.53 END RIVER MILE=305.62----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
97	500	529399	186766	212195	0
98	750	491087	282409	300471	465
99	1000	411639	345771	360739	3091
100	1250	313775	407724	412181	7792
101	1500	237666	458632	443517	14176
102	1750	178509	496390	469164	23191
103	2000	137096	521331	478866	36035
104	2500	83620	554330	484002	68718
105	3500	34080	591104	431733	150085
106	5000	9582	578791	267749	279501
107	7500	5823	555686	132618	468877
108	12000	4740	295293	49027	565620

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
97	0.528	279523	98612	112039	0
98	0.528	259294	149112	158649	246
99	0.528	217345	182567	190470	1632
100	0.528	165673	215278	217632	4114
101	0.528	125488	242158	234177	7485
102	0.528	94253	262094	247719	12245
103	0.528	72387	275263	252841	19026
104	0.528	44151	292686	255553	36283
105	0.528	17994	312103	227955	79245
106	0.528	5059	305602	141371	147577
107	0.528	3075	293402	70022	247567
108	0.528	2503	155915	25886	298647

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 10
PEACHTREE CREEK 13:39 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=305.63 END RIVER MILE=305.85----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
109	500	168415	32959	43239	703
110	750	192716	52792	60091	4828
111	1000	211381	73534	78143	10350
112	1250	210659	101447	96259	16277
113	1500	200698	114977	109498	20668
114	1750	185719	124302	124994	24722
115	2000	175511	131739	140711	30323
116	2500	161917	167995	166303	44845
117	3500	124639	230581	178777	76740
118	5000	69309	254282	192216	116820
119	7500	9509	246627	189506	159711
120	12000	38169	248544	159606	202135

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
109	1.2144	204523	40025	52509	854
110	1.2144	234034	64111	72975	5863
111	1.2144	256701	89300	94897	12569
112	1.2144	255824	123197	116897	19767
113	1.2144	243728	139628	132974	25099
114	1.2144	225537	150952	151793	30022
115	1.2144	213141	159984	170879	36824
116	1.2144	196632	204013	201958	54460
117	1.2144	151362	280018	217107	93193
118	1.2144	84169	308800	233427	141866
119	1.2144	11548	299504	230136	193953
120	1.2144	46352	301832	193826	245473

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 11
PEACHTREE CREEK 13:39 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=305.86 END RIVER MILE=305.92----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
121	500	153663	99189	78911	19053
122	750	190140	146379	110634	31818
123	1000	207595	194813	148212	41730
124	1250	154390	246454	188192	50699
125	1500	119346	290976	220881	59498
126	1750	79856	323102	240391	68512
127	2000	57812	345492	249364	80114
128	2500	38003	373516	255617	105794
129	3500	16296	389255	221478	163484
130	5000	13217	386381	184806	236304
131	7500	10717	330169	132690	285779
132	12000	13927	232170	77120	345091

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
121	0.3696	56793.8	36660	29165.5	7042
122	0.3696	70275.7	54102	40890.3	11760
123	0.3696	76727.1	72003	54779.2	15423
124	0.3696	57062.5	91089	69555.8	18738
125	0.3696	44110.3	107545	81637.6	21990
126	0.3696	29514.8	119418	88848.5	25322
127	0.3696	21367.3	127694	92164.9	29610
128	0.3696	14045.9	138052	94476.0	39101
129	0.3696	6023.0	143869	81858.3	60424
130	0.3696	4885.0	142806	68304.3	87338
131	0.3696	3961.0	122030	49042.2	105624
132	0.3696	5147.4	85810	28503.6	127546

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 12
PEACHTREE CREEK 13:39 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=305.93 END RIVER MILE=306.6----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
133	500	292408	193876	233367	0
134	750	180638	288643	313865	85
135	1000	92877	342630	360845	1358
136	1250	45241	371981	386528	7286
137	1500	22025	393251	401339	17829
138	1750	13646	408474	402924	32154
139	2000	11661	417845	391810	49909
140	2500	11434	428552	348200	91569
141	3500	10876	443344	252122	173075
142	5000	10520	431334	198253	266210
143	7500	6140	309839	147510	319482
144	12000	3973	207757	77848	365486

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
133	3.5904	1049862	696092	837881	0
134	3.5904	648563	1036344	1126901	305
135	3.5904	333466	1230179	1295578	4876
136	3.5904	162433	1335561	1387790	26160
137	3.5904	79079	1411928	1440968	64013
138	3.5904	48995	1466585	1446658	115446
139	3.5904	41868	1500231	1406755	179193
140	3.5904	41053	1538673	1250177	328769
141	3.5904	39049	1591782	905219	621408
142	3.5904	37771	1548662	711808	955800
143	3.5904	22045	1112446	529620	1147068
144	3.5904	14265	745931	279505	1312241

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 13
PEACHTREE CREEK 13:39 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=306.61 END RIVER MILE=306.8----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
145	500	153662	99188	78910	19053
146	750	190140	146378	110633	31818
147	1000	207594	194813	148211	41729
148	1250	154389	246453	188191	50699
149	1500	119346	290975	220880	59497
150	1750	79856	323101	240390	68511
151	2000	57811	345491	249364	80113
152	2500	38002	373516	255617	105794
153	3500	16296	389254	221478	163483
154	5000	13216	386381	184805	236304
155	7500	10717	330169	132689	285779
156	12000	13927	232169	77119	345090

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
145	1.056	162267	104743	83329	20120
146	1.056	200788	154575	116828	33600
147	1.056	219219	205723	156511	44066
148	1.056	163035	260254	198730	53538
149	1.056	126029	307270	233249	62829
150	1.056	84328	341195	253852	72348
151	1.056	61048	364838	263328	84599
152	1.056	40130	394433	269932	111718
153	1.056	17209	411052	233881	172638
154	1.056	13956	408018	195154	249537
155	1.056	11317	348658	140120	301783
156	1.056	14707	245170	81438	364415

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 14
PEACHTREE CREEK 13:39 TUESDAY, SEPTEMBER 4, 1984

----------BEGIN RIVER MILE=306.81 END RIVER MILE=312.5----------

OBS	DISCHARGE	RAFTING(LANDING) WUA PER 1000 FEET	RAFTING(NOVICE) WUA PER 1000 FEET	RAFTING(NOVICE-P) WUA PER 1000 FEET	RAFTING(MID-LEVEL) WUA PER 1000 FEET
157	500	85078	144082	149249	1092
158	750	46112	188025	174037	5180
159	1000	35021	218815	183733	12374
160	1250	29424	239205	185061	23770
161	1500	29659	252910	182209	38295
162	1750	30530	264449	181669	53591
163	2000	30298	274717	179778	69707
164	2500	26912	292232	166602	101401
165	3500	18218	304990	143850	158317
166	5000	5726	274226	107040	217727
167	7500	29864	228822	66983	269299
168	12000	16147	203156	55481	317330

OBS	REACH MULTIPLIER	WUA FOR RAFTING (LANDING)	WUA FOR RAFTING (NOVICE)	WUA FOR RAFTING (NOVICE-P)	WUA FOR RAFTING (MID-LEVEL)
157	30.096	2560507	4336292	4491798	32865
158	30.096	1387787	5658800	5237818	155897
159	30.096	1053992	6585456	5529628	372408
160	30.096	885545	7199114	5569596	715382
161	30.096	892617	7611579	5483762	1152526
162	30.096	918831	7958857	5467510	1612875
163	30.096	911849	8267883	5410599	2097902
164	30.096	809944	8795014	5014054	3051764
165	30.096	548289	9178979	4329310	4764708
166	30.096	172330	8253106	3221476	6552712
167	30.096	898787	6886627	2015920	8104823
168	30.096	485960	6114183	1669756	9550364

APPENDIX J

DETAILED LISTING OF TOTAL RIVER SURFACE AREA RECREATIONAL CANOEING

APPENDIX J

Detailed listing of total river surface area, by river mile, available for recreational canoeing. The top tier of variables represents the amount of river surface area (in square feet) available for a length of river 1000 feet long. The bottom array of variables represents the total amount of river surface area available for each canoeing activity from the beginning to ending river mile. The variable "Reach Multiplier" is the number of thousands of feet in each reach. The lower tier of variables was obtained by multipling each variable in the upper tier by the "Reach Multiplier". The data in this appendix are presented by major reach beginning with the major reach near Buford Dam and proceeding downstream. Within each major reach, the data are presented from most downstream subreach to the most upstream subreach. This appendix allows for direct comparison between specific reaches on the river.

----------BEGIN RIVER MILE=342.11 END RIVER MILE=345.79----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
1	500	132262	18754
2	750	151206	33161
3	1000	158876	47426
4	1250	161296	61587
5	1500	160524	75617
6	1750	158334	88548
7	2000	154983	99787
8	2500	145566	118743
9	3500	119511	147252
10	5000	89210	170831
11	7500	56708	186161
12	12000	33320	193598

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
1	19.4832	2576887	365388
2	19.4832	2945977	646082
3	19.4832	3095413	924010
4	19.4832	3142562	1199912
5	19.4832	3127521	1473261
6	19.4832	3084853	1725198
7	19.4832	3019565	1944170
8	19.4832	2836091	2313494
9	19.4832	2328457	2868940
10	19.4832	1738096	3328335
11	19.4832	1104853	3627012
12	19.4832	649180	3771909

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BUFORD DAM TO SITE OF THE PROPOSED REREGULATION DAM 2
14:03 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=345.8 END RIVER MILE=347.06----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
13	500	140257	1690
14	750	150889	6632
15	1000	155662	17469
16	1250	157547	33928
17	1500	157415	41290
18	1750	157092	62696
19	2000	156376	74361
20	2500	152549	94688
21	3500	120496	111334
22	5000	100990	122056
23	7500	87919	131742
24	12000	79074	133815

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
13	6.7056	940507	11332
14	6.7056	1011801	44472
15	6.7056	1043807	117140
16	6.7056	1056447	227508
17	6.7056	1055562	276874
18	6.7056	1053396	420414
19	6.7056	1048595	498635
20	6.7056	1022933	634940
21	6.7056	807998	746561
22	6.7056	677199	818459
23	6.7056	589550	883409
24	6.7056	530239	897310

----------BEGIN RIVER MILE=347.07 END RIVER MILE=348.1----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
25	500	203405	0
26	750	228421	0
27	1000	239297	0
28	1250	244147	0
29	1500	246829	3579
30	1750	248810	10988
31	2000	250048	24977
32	2500	251900	52510
33	3500	249300	117526
34	5000	190696	173990
35	7500	163452	228781
36	12000	95185	245894

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
25	5.4912	1116938	0
26	5.4912	1254305	0
27	5.4912	1314028	0
28	5.4912	1340660	0
29	5.4912	1355387	19653
30	5.4912	1366265	60337
31	5.4912	1373064	137154
32	5.4912	1383233	288343
33	5.4912	1368956	645359
34	5.4912	1047150	955414
35	5.4912	897548	1256282
36	5.4912	522680	1350253

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 1
TO ABOVE MORGAN FALLS 14:18 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=317 END RIVER MILE=319.09----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
1	500	194365	0
2	750	206354	0
3	1000	213697	0
4	1250	216345	7542
5	1500	218565	27050
6	1750	221288	44383
7	2000	222712	67533
8	2500	223391	122457
9	3500	154201	177355
10	5000	99511	218019
11	7500	53796	235489
12	12000	29511	248744

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
1	11.088	2155119	0
2	11.088	2288053	0
3	11.088	2369472	0
4	11.088	2398833	83626
5	11.088	2423449	299930
6	11.088	2453641	492119
7	11.088	2469431	748806
8	11.088	2476959	1357803
9	11.088	1709781	1966512
10	11.088	1103378	2417395
11	11.088	596490	2611102
12	11.088	327218	2758073

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 2
TO ABOVE MORGAN FALLS 14:18 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=319.1 END RIVER MILE=321.19----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
13	500	223000	3526
14	750	280248	7488
15	1000	313974	13157
16	1250	332221	26376
17	1500	345465	42581
18	1750	354061	63282
19	2000	356502	84459
20	2500	347122	128752
21	3500	292649	204692
22	5000	199860	268926
23	7500	130149	318273
24	12000	79066	310540

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
13	11.088	2472624	39096
14	11.088	3107390	83027
15	11.088	3481344	145885
16	11.088	3683666	292457
17	11.088	3830516	472138
18	11.088	3925828	701671
19	11.088	3952894	936481
20	11.088	3848889	1427602
21	11.088	3244892	2269625
22	11.088	2216048	2981851
23	11.088	1443092	3529011
24	11.088	876684	3443268

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 3
TO ABOVE MORGAN FALLS 14:18 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=321.5 END RIVER MILE=325.49----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
25	500	194365	0
26	750	206354	0
27	1000	213697	0
28	1250	216345	7542
29	1500	218565	27050
30	1750	221288	44383
31	2000	222712	67533
32	2500	223391	122457
33	3500	154201	177355
34	5000	99511	218019
35	7500	53796	235489
36	12000	29511	248744

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
25	21.12	4104989	0
26	21.12	4358196	0
27	21.12	4513281	0
28	21.12	4569206	159287
29	21.12	4616093	571296
30	21.12	4673603	937369
31	21.12	4703677	1426297
32	21.12	4718018	2586292
33	21.12	3256725	3745738
34	21.12	2101672	4604561
35	21.12	1136172	4973528
36	21.12	623272	5253473

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 4
TO ABOVE MORGAN FALLS 14:18 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=327.5 END RIVER MILE=327.99----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
37	500	140257	1690
38	750	150889	6632
39	1000	155662	17469
40	1250	157547	33928
41	1500	157415	41290
42	1750	157092	62696
43	2000	156376	74361
44	2500	152549	94688
45	3500	120496	111334
46	5000	100990	122056
47	7500	87919	131742
48	12000	79074	133815

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
37	2.64	370278	4462
38	2.64	398347	17508
39	2.64	410948	46118
40	2.64	415924	89570
41	2.64	415576	109006
42	2.64	414723	165517
43	2.64	412833	196313
44	2.64	402729	249976
45	2.64	318109	293922
46	2.64	266614	322228
47	2.64	232106	347799
48	2.64	208755	353272

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 5
TO ABOVE MORGAN FALLS 14:18 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=328 END RIVER MILE=330.59----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
49	500	91469	27014
50	750	143440	29937
51	1000	178930	42563
52	1250	201556	62262
53	1500	215083	81283
54	1750	223449	102244
55	2000	223848	123271
56	2500	204750	160517
57	3500	153454	209738
58	5000	84869	243638
59	7500	46032	276226
60	12000	28978	245547

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
49	13.728	1255686	370848
50	13.728	1969144	410975
51	13.728	2456351	584305
52	13.728	2766961	854733
53	13.728	2952659	1115853
54	13.728	3067508	1403606
55	13.728	3072985	1692264
56	13.728	2810808	2203577
57	13.728	2106617	2879283
58	13.728	1165082	3344662
59	13.728	631927	3792031
60	13.728	397810	3370869

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM REREGULATION DAM 6
TO ABOVE MORGAN FALLS 14:18 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=330.6 END RIVER MILE=342.1----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
61	500	132262	18754
62	750	151206	33161
63	1000	158876	47426
64	1250	161296	61587
65	1500	160524	75617
66	1750	158334	88548
67	2000	154983	99787
68	2500	145566	118743
69	3500	119511	147252
70	5000	89210	170831
71	7500	56708	186161
72	12000	33320	193598

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
61	60.7728	8037932	1139733
62	60.7728	9189212	2015287
63	60.7728	9655339	2882211
64	60.7728	9802410	3742814
65	60.7728	9755493	4595457
66	60.7728	9622401	5381310
67	60.7728	9418751	6064335
68	60.7728	8846453	7216345
69	60.7728	7263018	8948916
70	60.7728	5421541	10381878
71	60.7728	3446304	11313525
72	60.7728	2024950	11765493

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 1
TO PEACHTREE CREEK 14:21 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=300.5 END RIVER MILE=302.09----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
1	500	109965	0
2	750	86264	0
3	1000	64750	0
4	1250	47129	0
5	1500	33117	564
6	1750	21286	11057
7	2000	14352	25535
8	2500	8495	66183
9	3500	7809	139654
10	5000	10852	180037
11	7500	11419	192927
12	12000	12780	153912

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
1	8.448	928984	0
2	8.448	728758	0
3	8.448	547008	0
4	8.448	398146	0
5	8.448	279772	4765
6	8.448	179824	93410
7	8.448	121246	215720
8	8.448	71766	559114
9	8.448	65970	1179797
10	8.448	91678	1520953
11	8.448	96468	1629847
12	8.448	107965	1300249

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 2
TO PEACHTREE CREEK 14:21 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=302.1 END RIVER MILE=302.49----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
13	500	95799	48902
14	750	181518	50033
15	1000	231835	68962
16	1250	257704	103220
17	1500	272211	134955
18	1750	279032	162418
19	2000	275873	184559
20	2500	241835	220697
21	3500	144931	251009
22	5000	57267	269062
23	7500	31682	283733
24	12000	35829	273994

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
13	2.112	202327	103281
14	2.112	383366	105670
15	2.112	489636	145648
16	2.112	544271	218001
17	2.112	574910	285025
18	2.112	589316	343027
19	2.112	582644	389789
20	2.112	510756	466112
21	2.112	306094	530131
22	2.112	120948	568259
23	2.112	66912	599244
24	2.112	75671	578675

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 3
TO PEACHTREE CREEK 14:21 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=302.5 END RIVER MILE=303.79----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
25	500	277273	0
26	750	341734	458
27	1000	381017	6209
28	1250	402556	29762
29	1500	419614	62675
30	1750	430623	101548
31	2000	432298	136550
32	2500	411579	197197
33	3500	292775	263160
34	5000	164948	310703
35	7500	61835	355396
36	12000	18882	327779

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
25	6.864	1903202	0
26	6.864	2345662	3144
27	6.864	2615301	42619
28	6.864	2763144	204286
29	6.864	2880230	430201
30	6.864	2955796	697025
31	6.864	2967293	937279
32	6.864	2825078	1353560
33	6.864	2009608	1806330
34	6.864	1132203	2132665
35	6.864	424435	2439438
36	6.864	129606	2249875

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 4
TO PEACHTREE CREEK 14:21 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=303.8 END RIVER MILE=303.99----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
37	500	149946	49152
38	750	189491	85416
39	1000	191453	116406
40	1250	185967	143955
41	1500	182138	160862
42	1750	184514	170646
43	2000	189761	183535
44	2500	196080	222480
45	3500	172874	294505
46	5000	71944	310075
47	7500	4710	313308
48	12000	3975	319408

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
37	1.056	158343	51905
38	1.056	200102	90199
39	1.056	202174	122925
40	1.056	196381	152016
41	1.056	192338	169870
42	1.056	194847	180202
43	1.056	200388	193813
44	1.056	207060	234939
45	1.056	182555	310997
46	1.056	75973	327439
47	1.056	4974	330853
48	1.056	4198	337295

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 5
TO PEACHTREE CREEK 14:21 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=304 END RIVER MILE=304.69----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
49	500	277274	0
50	750	341734	458
51	1000	381017	6209
52	1250	402556	29762
53	1500	419614	62675
54	1750	430623	101548
55	2000	432298	136550
56	2500	411579	197197
57	3500	292775	263160
58	5000	164948	310703
59	7500	61835	355396
60	12000	18882	327779

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
49	3.696	1024805	0
50	3.696	1263049	1693
51	3.696	1408239	22948
52	3.696	1487847	110000
53	3.696	1550893	231647
54	3.696	1591583	375321
55	3.696	1597773	504689
56	3.696	1521196	728840
57	3.696	1082096	972639
58	3.696	609648	1148358
59	3.696	228542	1313544
60	3.696	69788	1211471

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 6
TO PEACHTREE CREEK 14:21 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=304.7 END RIVER MILE=305.1----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
61	500	277274	0
62	750	341734	458
63	1000	381017	6209
64	1250	402556	29762
65	1500	419614	62675
66	1750	430623	101548
67	2000	432298	136550
68	2500	411579	197197
69	3500	292775	263160
70	5000	164948	310703
71	7500	61835	355396
72	12000	18882	327779

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
61	2.1648	600243	0
62	2.1648	739786	991
63	2.1648	824826	13441
64	2.1648	871453	64429
65	2.1648	908380	135679
66	2.1648	932213	219831
67	2.1648	935839	295603
68	2.1648	890986	426892
69	2.1648	633799	569689
70	2.1648	357079	672610
71	2.1648	133860	769361
72	2.1648	40876	709576

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 7
TO PEACHTREE CREEK 14:21 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=305.11 END RIVER MILE=305.44----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
73	500	0	0
74	750	0	0
75	1000	0	0
76	1250	318	0
77	1500	698	0
78	1750	1303	1681
79	2000	2297	8921
80	2500	3891	27953
81	3500	9340	63218
82	5000	14064	81076
83	7500	21744	97211
84	12000	22638	70504

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
73	1.7952	0.0	0
74	1.7952	0.0	0
75	1.7952	0.0	0
76	1.7952	570.9	0
77	1.7952	1253.0	0
78	1.7952	2339.1	3018
79	1.7952	4123.6	16015
80	1.7952	6985.1	50181
81	1.7952	16767.2	113489
82	1.7952	25247.7	145548
83	1.7952	39034.8	174513
84	1.7952	40639.7	126569

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 8
TO PEACHTREE CREEK 14:21 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=305.45 END RIVER MILE=305.52----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
85	500	13508	0
86	750	41593	0
87	1000	83313	0
88	1250	113007	0
89	1500	129862	3506
90	1750	142355	9037
91	2000	149672	17298
92	2500	158317	45457
93	3500	165472	123368
94	5000	128685	209246
95	7500	75357	268933
96	12000	33132	212053

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
85	0.4224	5705.8	0
86	0.4224	17568.9	0
87	0.4224	35191.4	0
88	0.4224	47734.2	0
89	0.4224	54853.7	1481
90	0.4224	60130.8	3817
91	0.4224	63221.5	7307
92	0.4224	66873.1	19201
93	0.4224	69895.4	52111
94	0.4224	54356.5	88386
95	0.4224	31830.8	113597
96	0.4224	13995.0	89571

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 9
TO PEACHTREE CREEK 14:21 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=305.53 END RIVER MILE=305.62----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
97	500	240566	1322
98	750	324507	10562
99	1000	390610	30290
100	1250	441988	47837
101	1500	474098	71561
102	1750	499569	96225
103	2000	512179	133339
104	2500	523402	219599
105	3500	528359	381431
106	5000	385785	505885
107	7500	221112	567825
108	12000	94062	536224

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
97	0.528	127019	698
98	0.528	171340	5577
99	0.528	206242	15993
100	0.528	233370	25258
101	0.528	250324	37784
102	0.528	263772	50807
103	0.528	270431	70403
104	0.528	276356	115948
105	0.528	278974	201396
106	0.528	203694	267107
107	0.528	116747	299812
108	0.528	49665	283126

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 10
TO PEACHTREE CREEK 14:21 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=305.63 END RIVER MILE=305.85----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
109	500	18681	1407
110	750	35980	9655
111	1000	63362	17362
112	1250	83921	23382
113	1500	107536	27933
114	1750	132409	34031
115	2000	156771	44399
116	2500	189345	75652
117	3500	214233	111855
118	5000	226124	143310
119	7500	216222	191516
120	12000	159357	169609

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
109	1.2144	22686	1709
110	1.2144	43694	11725
111	1.2144	76947	21084
112	1.2144	101914	28395
113	1.2144	130592	33922
114	1.2144	160797	41327
115	1.2144	190383	53918
116	1.2144	229941	91872
117	1.2144	260165	135837
118	1.2144	274605	174036
119	1.2144	262580	232577
120	1.2144	193523	205973

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 11
TO PEACHTREE CREEK 14:21 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=305.86 END RIVER MILE=305.92----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
121	500	94275	55165
122	750	140632	81766
123	1000	186220	95845
124	1250	225156	104662
125	1500	256504	116192
126	1750	276014	134905
127	2000	283281	156610
128	2500	287901	194030
129	3500	261735	245444
130	5000	199880	290255
131	7500	104626	338613
132	12000	29596	353663

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
121	0.3696	34844	20389
122	0.3696	51978	30221
123	0.3696	68827	35424
124	0.3696	83218	38683
125	0.3696	94804	42945
126	0.3696	102015	49861
127	0.3696	104701	57883
128	0.3696	106408	71713
129	0.3696	96737	90716
130	0.3696	73876	107278
131	0.3696	38670	125151
132	0.3696	10939	130714

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 12
TO PEACHTREE CREEK 14:21 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=305.93 END RIVER MILE=306.6----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
133	500	277274	0
134	750	341734	458
135	1000	381017	6209
136	1250	402556	29762
137	1500	419614	62675
138	1750	430623	101548
139	2000	432298	136550
140	2500	411579	197197
141	3500	292775	263160
142	5000	164948	310703
143	7500	61835	355396
144	12000	18882	327779

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
133	3.5904	995525	0
134	3.5904	1226962	1644
135	3.5904	1368003	22293
136	3.5904	1445337	106857
137	3.5904	1506582	225028
138	3.5904	1546109	364598
139	3.5904	1552123	490269
140	3.5904	1477733	708016
141	3.5904	1051179	944850
142	3.5904	592229	1115548
143	3.5904	222012	1276014
144	3.5904	67794	1176858

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 13
TO PEACHTREE CREEK 14:21 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=306.61 END RIVER MILE=306.8----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
145	500	94275	55165
146	750	140632	81766
147	1000	186220	95845
148	1250	225156	104662
149	1500	256504	116192
150	1750	276014	134905
151	2000	283281	156610
152	2500	287901	194030
153	3500	261735	245444
154	5000	199880	290255
155	7500	104626	338613
156	12000	29596	353662

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
145	1.056	99554	58254
146	1.056	148507	86345
147	1.056	196648	101212
148	1.056	237765	110523
149	1.056	270868	122699
150	1.056	291471	142460
151	1.056	299145	165380
152	1.056	304023	204896
153	1.056	276392	259189
154	1.056	211073	306509
155	1.056	110485	357575
156	1.056	31253	373467

TOTALED WEIGHTED USABLE AREA, BY RIVER SEGMENT, FROM BELOW MORGAN FALLS 14
TO PEACHTREE CREEK 14:21 FRIDAY, AUGUST 31, 1984

----------BEGIN RIVER MILE=306.81 END RIVER MILE=312.5----------

OBS	DISCHARGE	CANOEING(NOVICE) WUA PER 1000 FEET	CANOEING(MID-LEVEL) WUA PER 1000 FEET
157	500	167387	24090
158	750	194857	51074
159	1000	206393	77396
160	1250	209421	101434
161	1500	208538	124964
162	1750	209624	145127
163	2000	208052	162701
164	2500	205809	193875
165	3500	195566	240524
166	5000	160874	281068
167	7500	116752	319308
168	12000	92627	318359

OBS	REACH MULTIPLIER	WUA FOR CANOEING (NOVICE)	WUA FOR CANOEING (MID-LEVEL)
157	30.096	5037679	725013
158	30.096	5864416	1537123
159	30.096	6211604	2329310
160	30.096	6302734	3052758
161	30.096	6276160	3760917
162	30.096	6308844	4367742
163	30.096	6261533	4896649
164	30.096	6194028	5834862
165	30.096	5885754	7238810
166	30.096	4841664	8459023
167	30.096	3513768	9609894
168	30.096	2787702	9581332

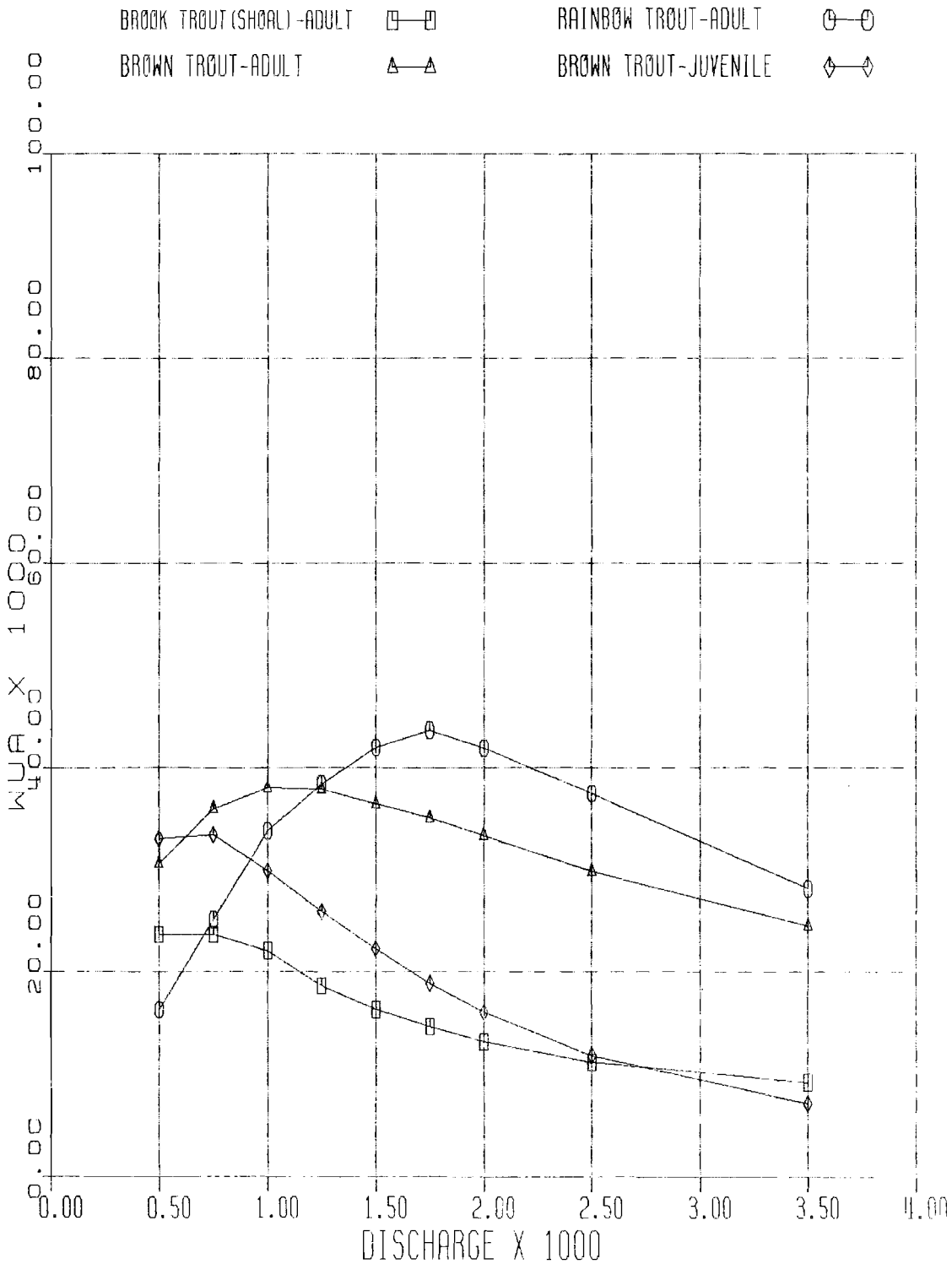
APPENDIX K

WUA/DISCHARGE RELATIONSHIP

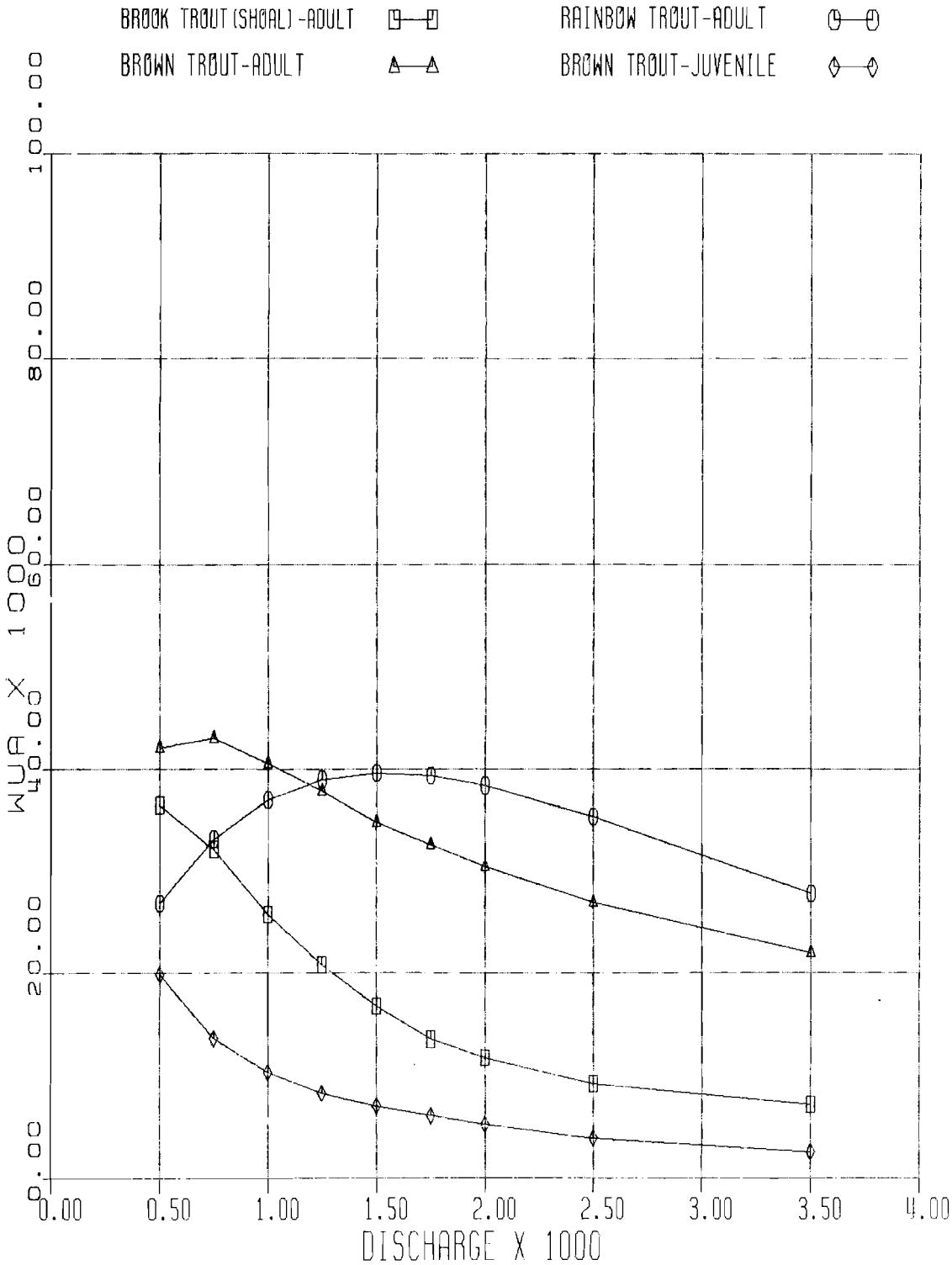
APPENDIX K

WUA versus discharge relationship for trout life-stages with scale expanded between the discharges of 500 to 3500 cfs as requested by the Georgia Game and Fish Division.

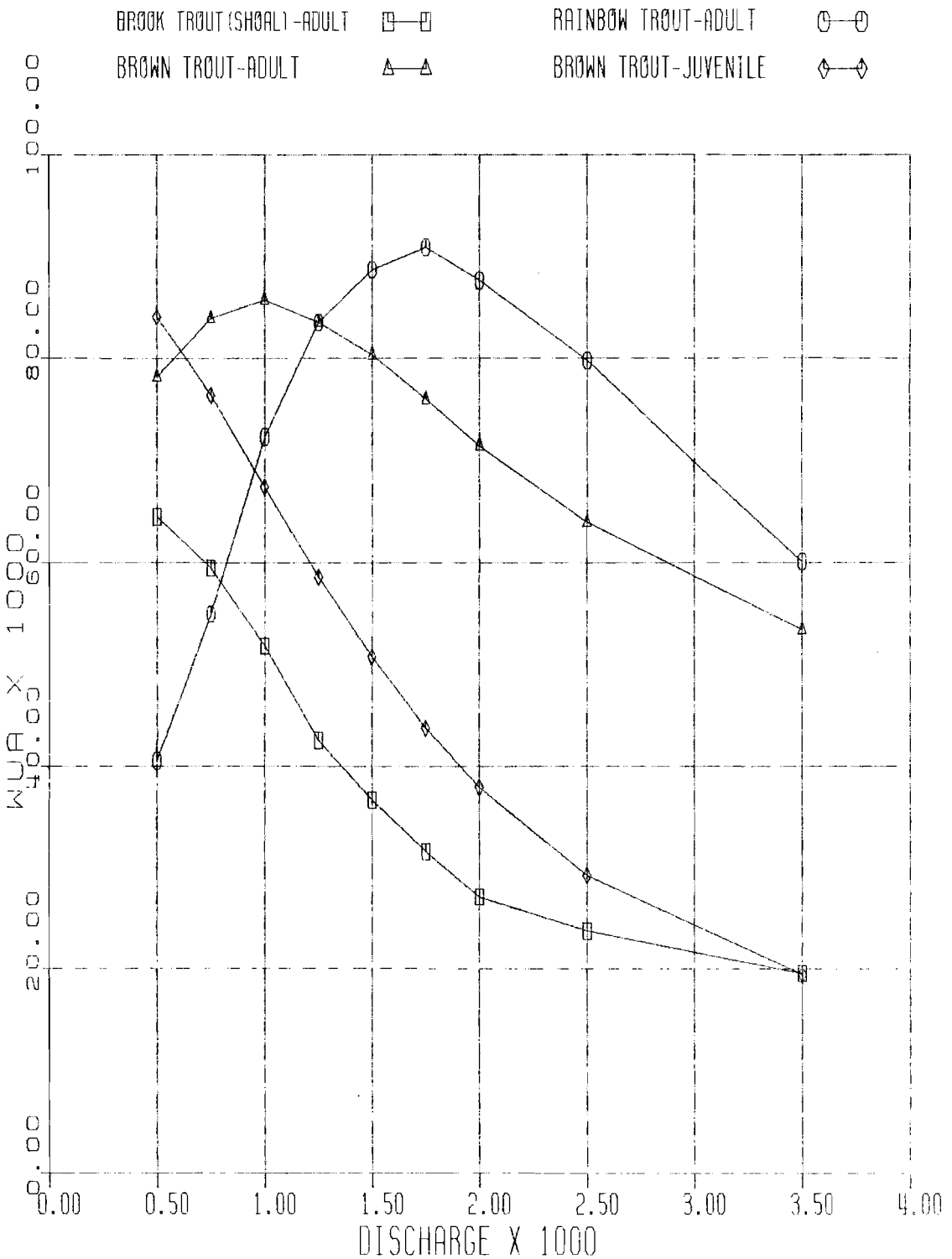
RELATIONSHIP BETWEEN DISCHARGE AND WUA FOR CHATTAHOOCHEE RIVER
FROM SITE OF PROPOSED DAM TO HEADWATERS OF BULL SLUICE LAKE



RELATIØNSHIP BETWEEN DISCHARGE AND WUA FØR CHATTAHØØCHEE RIVER BELØW BUFØRD DAM TØ SITE ØF PRØPØSED REREG DAM



RELATIØNSHIP BETWEEN DISCHARGE AND WUA FØR CHATTAHØØCHEE RIVER
BELØW MØRGAN FALLS DAM TØ CØNFLUENCE WITH PEACHTREE CREEK



APPENDIX L

AVERAGE VELOCITIES

APPENDIX L

Average velocities (feet per second) in different reaches of the Chattahoochee River between Buford Dam and Peachtree Creek.

FLOW (CFS)	UPSTREAM OF SR20 BRIDGE	SR 20 TO MEDLOCK BRIDGE	MEDLOCK BR. TO BULL SLUICE L.	MORGAN FALLS TO POWERS IS.	POWERS IS. TO PACES MILL	MORGAN FALLS TO PEACHTREE CREEK
500	0.59*	0.98	0.69	1.10	0.74	0.98
750	0.77	1.22	0.88	1.32	0.94	1.19
1000	0.94	1.42	1.06	1.49	1.10	1.36
1250	1.09	1.59	1.22	1.66	1.25	1.52
1500	1.24	1.74	1.40	1.80	1.39	1.66
1700	1.35	1.88	1.53	1.92	1.52	1.79
2000	1.48	2.01	1.67	2.04	1.65	1.91
2500	1.68	2.23	1.93	2.25	1.88	2.13
3500	2.03	2.61	2.42	2.61	2.31	2.51
5000	2.42	3.07	3.05	3.06	2.89	3.00
7500	2.87	3.67	3.79	3.64	3.75	3.68
12000	3.30	4.49	4.63	4.38	5.09	4.62

* feet per second