

The Fishes of George Washington Carver National Monument, Missouri, 2003

Prepared in cooperation with the
National Park Service

Scientific Investigations Report 2005-5128

U.S. Department of the Interior
U.S. Geological Survey

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U.S. Department of the Interior
Gale A. Norton, Secretary

U.S. Geological Survey
P. Patrick Leahy, Acting Director

U.S. Geological Survey, Reston, Virginia: 2005

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By B.G. Justus and James C. Petersen

Abstract

Fish were collected at six sites at George Washington Carver National Monument by seining and electrofishing during a base-flow period on July 17-18, 2003. Approximately 700 fish were collected and identified at the six sampling sites. Those individuals represented 17 species (and 1 hybrid) and 13 genera. The number of species collected at the five stream sites ranged from 9 to 12; a hybrid sunfish and 4 species were collected from a pond. Fish collected at stream sites were typical of small headwater streams and no species collected in this study are federally-listed threatened or endangered species. The three most common species were the southern redbelly dace, central stoneroller, and green sunfish.

Some differences existed between the assemblages (groups of species) collected in 2003 and in the previous inventories. Four of the 17 fish species collected in this inventory previously had not been collected at the monument. However, 11 species collected in one or more of the previous inventories were not collected in this effort. There is no indication that a change in environmental conditions is responsible for the absence of these species; more likely reasons are seasonal variability, extirpation, low population density, and misidentification.

Four species collected at George Washington Carver National Monument may be of special interest to National Park Service managers and others. The cardinal shiner and stippled darter are endemic to the Ozark Plateaus. The Arkansas darter is considered a species of conservation concern by the State of Missouri. The grass carp is an introduced species.

Introduction

The National Parks Omnibus Management Act (1998) facilitated a monitoring program that enables National Park Service (NPS) employees to effectively monitor important selected natural resources located on parks managed by the NPS. The Heartland Network, a part of the NPS Inventory and Monitoring Program, is coordinating inventories of vascular plants and vertebrates in 15 parks in 8 midwestern States (Boetsch and others, 2000). Data collected over extended periods

eventually will be evaluated to determine how biological communities are changing and to ensure that resources are being managed properly.

One of the 15 parks being inventoried is the George Washington Carver National Monument. The monument is managed by the NPS and honors George Washington Carver, an African-American scientist, educator, and humanitarian. The monument was established in 1943 by an act of Congress with an enabling legislation that states that the purpose of the monument is "... to memorialize the life of Dr. George Washington Carver..." and "... to preserve the setting of the Moses Carver farm..."

The monument encompasses a majority of the original Moses Carver farm, the birthplace and childhood home of Dr. Carver. There are approximately 50,000 visitors to the monument each year and hence the protection of the monument's natural resources is a high priority based upon the Resource Management Plan, General Management Plan and Cultural Landscape Report (National Park Service, 2004). To address this need, the U.S. Geological Survey, in cooperation with the NPS Heartland Network, inventoried fishes of the monument.

The purpose of this report is to provide the NPS with information related to fish species of the monument. This information includes a list of fish collected during an inventory of the fish species of the monument conducted during July 2003, relative abundance of each species at each collection site, and a revised list of expected species at the monument. Methods used to conduct the inventory also are described.

Thanks are extended to Erica Malmberg of George Washington Carver National Monument who assisted with locating sampling sites and with field sampling. Dena Matteson of George Washington Carver National Monument provided logistical help prior to and following the sampling.

Description of Study Area

George Washington Carver National Monument is located in southwestern Missouri, a few miles southeast of the city of Joplin, on approximately 85 hectares (210 acres) of rolling, tallgrass prairie (National Park Service, 2004). Although most of the monument is prairie grassland, streams within the monument are bordered by mature deciduous hardwoods.

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The monument is roughly rectangular-shaped, with the exception of a 12.2 hectares (30 acres) square missing in the southwest corner (the remainder of the original Carver Farm currently (2005) under private ownership). Approximately 52.6 hectares (130 acres) of the monument are in various stages of restoration to native tallgrass prairie. The monument's woodlands are small in area, with the total acreage being approximately 24.3 hectares (60 acres). The remaining 8.1 hectares (20 acres) of the monument are in the "development subzone" and encompass the areas surrounding the administrative/housing and visitor center/maintenance complexes.

The monument lies in the Springfield Plateau section (Fenneman, 1938) of the Ozark Plateaus in southwestern Missouri, and the topography consists of gently rolling uplands dissected by stream channels that carry water from natural springs and excess water during rainy periods. Elevation ranges from 317-329 meters (1,040-1,080 feet). A soil covering of several feet in thickness is present throughout the monument, with Hagerstown and Eldon silt loams and Baxter gravelly loam being predominant in the monument (U.S. Department of Agriculture, 1980). Three small streams occur in the monument: Carver Branch, Harkins Branch, and Williams Branch. The latter two flow into Carver Branch, which is a tributary of Shoal Creek. The monument also has two springs of historical and natural

significance, Carver Spring and Williams Spring. Williams Spring has been inundated by Williams Pond. Several areas of the monument experience wet conditions throughout much of the year. The south central, west central, and east central (just east of Williams Pond) parts often have standing water in them during the winter and spring. Some of the water results from runoff, while much of it results from ground-water seepage. In comparison to the surrounding area, the land within the monument does not stand out in distinct contrast. The surrounding farmlands all possess somewhat of a mosaic pattern: alternating grassland pastures and forest.

Fish were sampled at six sites (fig. 1, table 1) that included three small streams and a pond. Carver Branch and Williams Branch are known to be spring fed and an unnamed tributary locally referred to as Harkins Branch is suspected of being spring fed (off of park property). Williams Pond is a large, spring-fed pond (approximately 0.30 hectare (0.75 acre) in size) located in the headwaters of Williams Branch (fig. 1). All three streams were flowing at all sampling sites during July 2003. However, flow was less than 0.03 cubic meter per second (1 cubic foot per second) at a site on Harkins Branch and at the upper site on Carver Branch. The two streams are likely to be intermittent at these sampling sites during extended dry periods.

Table 1. Site-specific information for six fish sampling sites at George Washington Carver National Monument.

[EBP, electrofishing backpack; EB, electrofishing boat; BPS, electrofishing backpack/backpack/seine combination; n/a, not applicable]

Site number and name (fig. 1)	Reach length (meters)	Easting (upstream) ¹	Northing (upstream) ¹	Gear	Estimated sampling time (minutes)
1 Carver Branch (at eastern boundary)	120	0379057 E	04094479 N	EBP	30
2 Carver Branch (below spring)	75	0379688 E	04094387 N	BPS	55
3 Carver Branch (at western boundary)	150	0379057 E	04094479 N	BPS	50
4 Harkins Branch	150	0379043 E	04094610 N	BPS	70
5 Williams Branch	75	0379380 E	04094469 N	EBP	40
6 Williams Pond	n/a	0379375 E ²	04094410 N ²	EB	75

¹The horizontal datum used for obtaining Universe Transverse Mercator (UTM) measurements was North American Datum of 1983 (NAD83).

²Reading at pond dam.

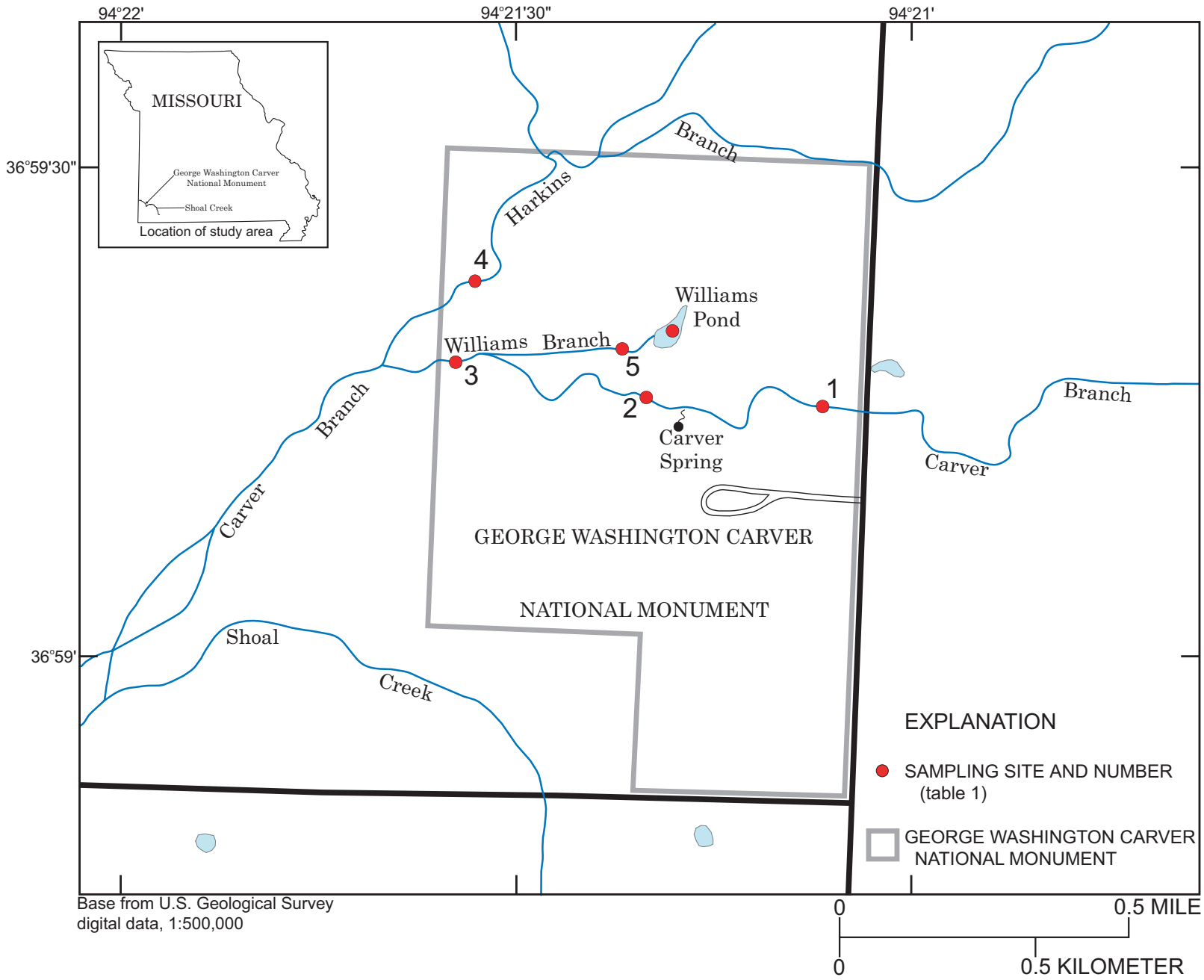


Figure 1. Location of sampling sites at George Washington Carver National Monument, Missouri, 2003.

Methods

Prior to fish sampling in the streams, a sampling reach was designated. A military issue global positioning system (GPS) unit utilizing the Precise Positioning Service (PPS, authorized to U.S. Federal Civilian Agencies by the Department of Defense) was used to obtain Universe Transverse Mercator (UTM) measurements according to North American Datum of 1983 (NAD83). UTM measurements were made at the upstream and downstream ends of the reach. Because the measurements were made with PPS, no correction to the position was necessary.

Fish were collected by seining and electrofishing (using direct current) during a base-flow period on July 17-18, 2003. Because the streams were small and wadeable, a battery powered backpack-electrofishing unit was used to collect fish at all five stream sites. An electrofishing boat was used to sample fish in Williams Pond.

Small mesh dipnets were used to collect fish incapacitated by the sampling equipment. Once fish had been netted, they were temporarily placed in a plastic bucket containing ambient stream water. After a brief sampling period (and partial sampling of the reach), fish in the bucket were identified (Pflieger, 1997; Nelson and others, 2004) and counted; fish numbers were recorded on field sheets by species. Photographs were taken of each species collected, and specimens that could be identified in the field were released outside of the area being sampled. Fish that were not readily identifiable in the field were preserved for laboratory identification. This process was repeated until the entire stream reach was sampled. The amount of time spent sampling and identifying fish at each site also was recorded on field sheets. Site-specific location and collecting information for all sampling efforts are provided in table 1.

At the five stream sites, all fish that were collected were counted and relative abundance was determined for each species. The sole purpose of sampling Williams Pond, however, was to determine what species were in the pond. Consequently, only one or two representatives of each species encountered at Williams Pond were collected.

Fish species collected also are classified according to how common they occurred in this study. Criteria for this classification were based on percent relative abundance and were as follows: most common—greater than 20.0 percent, common—10.0 to 20.0 percent, least common—2.0 to 10.0 percent, and rare—less than 2.0 percent, and not collected. Fish occurrence for this study was compared to fish occurrence in four previous inventories at the monument (Elick, 1983; Bock, 1984; Angle, 1986; Ellis, no date).

At the onset of the study, the NPS provided the USGS with a preliminary list of fish (Boetsch and others, 2000) (based on county records provided by Julie Fleming, Missouri Department of Conservation in August 2003) that were suspected to occur at George Washington Carver National Monument. This list was provided with the intent that the USGS would make revisions that would result in a more accurate list of fish species

that could reasonably be expected to occur at the monument and was to be used as a guide to determine if 90 percent of those species reasonably expected to occur at the monument had been documented. The preliminary list included some fish that probably do not occur at George Washington Carver National Monument because the monument is outside of the species' range, or the aquatic habitats in the National Monument are not representative of the typical habitat inhabited by the species. After reviewing the literature and environmental settings at George Washington Carver National Monument, the list was revised to better reflect species that have been collected and could occur in the monument.

Fishes of George Washington Carver National Monument

Approximately 700 fish were collected and identified (tables 2 and 3) at the six sampling sites. Those individuals represented 17 species (plus 1 hybrid) and 13 genera. The number of species collected at the five stream sites ranged from 9 to 12; a hybrid sunfish (bluegill X green sunfish) and 4 species were collected at Williams Pond. Fish sampled at stream sites were typical of small headwater streams and no species collected in this study are federally-listed threatened or endangered species (U.S. Fish and Wildlife Service, 2004).

Three species were classified as “most common”—the southern redbelly dace (*Phoxinus erythrogaster*), the central stoneroller (*Campostoma anomalum*), and the green sunfish (*Lepomis cyanellus*) (table 4). Several species were collected at two or less sites and were not common at these sites.

The preliminary expected species list incorrectly listed 22 species because of incorrect species range or habitat requirements. Upon revising this list, the inventory yielded 17 of the 35 expected species (49 percent) and one hybrid (table 5). Eighteen additional species not collected in 2003 may occur at George Washington Carver National Monument for two primary reasons—because the species had been collected previously at the monument, or because the monument occurs within the known species range and habitats found at the monument are suitable for the species.

Listing of one of the species as listed as “present” is questionable. The plains topminnow (*Fundulus sciadicus*) is mostly absent from the area near George Washington Carver National Monument; since 1945 it has been collected from only one site in the Shoal Creek Basin (Pflieger, 1997).

Table 2. Number of fish collected at sampling sites at George Washington Carver National Monument.

[--, not collected; presence (P) and absence (A) is used to denote occurrence; n/a, not applicable]

Common name	Scientific name	Carver Branch (at eastern boundary)	Carver Branch (below spring)	Carver Branch (at western boundary)	Harkin Branch	Williams Branch	Williams Pond
Arkansas darter	<i>Etheostoma cragini</i>	9	--	--	--	14	A
Banded sculpin	<i>Cottus carolinae</i>	1	11	5	2	16	A
Black bullhead	<i>Ameiurus melas</i>	--	--	--	--	--	A
Bluegill	<i>Lepomis macrochirus</i>	3	--	--	--	--	P
Bluegill x green sunfish hybrid	<i>L. macrochirus X L. cyanellus</i>	--	--	--	--	--	P
Cardinal shiner	<i>Luxilus cardinalis</i>	--	2	20	2	--	A
Central stoneroller	<i>Campostoma anomalum</i>	15	112	14	53	5	A
Creek chub	<i>Semotilus atromaculatus</i>	5	23	19	7	13	A
Fantail darter	<i>Etheostoma flabellare</i>	--	--	6	8	1	A
Grass carp	<i>Ctenopharyngodon idella</i>	--	--	--	--	--	P
Green sunfish	<i>Lepomis cyanellus</i>	29	1	6	23	24	P
Largemouth bass	<i>Micropterus salmoides</i>	1	--	--	--	5	P
Orangethroat darter	<i>Etheostoma spectabile</i>	--	11	17	23	14	A
Slender madtom	<i>Noturus exilis</i>	--	--	4	4	--	A
Southern redbelly dace	<i>Phoxinus erythrogaster</i>	23	18	53	18	--	A
Stippled darter	<i>Etheostoma punctulatum</i>	1	5	12	8	2	A
Western mosquitofish	<i>Gambusia affinis</i>	1	--	--	--	1	A
White sucker	<i>Catostomus commersoni</i>	--	7	3	2	1	A
Number of species collected		10	9	11	12	12	4
Number of individuals collected		88	190	159	150	96	n/a

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Table 3. Relative abundance of fish collected at five sampling sites at George Washington Carver National Monument.

[--, not collected; fish sampling at Williams Pond was qualitative and relative abundance (percent) was not calculated]

Common name	Scientific name	Carver Branch (at eastern boundary)	Carver Branch (below spring)	Carver Branch (at western boundary)	Harkins Branch	Williams Branch
Arkansas darter	<i>Etheostoma cragini</i>	10.2	--	--	--	14.4
Banded sculpin	<i>Cottus carolinae</i>	1.0	5.8	3.1	1.3	16.5
Black bullhead	<i>Ameiurus melas</i>	--	--	--	--	1.0
Bluegill	<i>Lepomis macrochirus</i>	3.4	--	--	--	--
Bluegill x green sunfish hybrid	<i>Lepomis macrochirus X L. cyanellus</i>	--	--	--	--	--
Cardinal shiner	<i>Luxilus cardinalis</i>	--	1.1	12.6	1.3	--
Central stoneroller	<i>Campostoma anomalum</i>	17.0	58.9	8.8	35.3	5.2
Creek chub	<i>Semotilus atromaculatus</i>	5.7	12.1	11.9	4.7	13.4
Fantail darter	<i>Etheostoma flabellare</i>	--	--	3.8	5.3	1.0
Grass carp	<i>Ctenopharyngodon idella</i>	--	--	--	--	--
Green sunfish	<i>Lepomis cyanellus</i>	33.0	<0.1	3.8	15.3	24.7
Largemouth bass	<i>Micropterus salmoides</i>	1.1	--	--	--	5.2
Orangethroat darter	<i>Etheostoma spectabile</i>	--	5.8	10.7	15.3	14.4
Slender madtom	<i>Noturus exilis</i>	--	--	2.5	2.7	--
Southern redbelly dace	<i>Phoxinus erythrogaster</i>	26.1	9.5	33.3	12.0	--
Stippled darter	<i>Etheostoma punctulatum</i>	1.1	2.6	7.5	5.3	2.1
Western mosquitofish	<i>Gambusia affinis</i>	1.1	--	--	--	1.0
White sucker	<i>Catostomus commersoni</i>	--	3.7	1.9	1.3	1.0

Table 4. Classification of fish collected at five sampling sites at George Washington Carver National Monument.

[MC, most common (greater than 20.0 percent); C, common (10.0-20.0 percent); LC, least common (2.0-10.0 percent); R, rare (less than 2.0 percent); --, not collected; based on relative abundance and semiquantitative sampling, fish sampling at Williams Pond was qualitative and relative abundance was not calculated for species only collected there]

Common name	Scientific name	Carver Branch (at eastern boundary)	Carver Branch (below Spring)	Carver Branch (at western boundary)	Harkins Branch	Williams Branch
Arkansas darter	<i>Etheostoma cragini</i>	C	--	--	R	C
Banded sculpin	<i>Cottus carolinae</i>	R	LC	LC	R	C
Black bullhead	<i>Ameiurus melas</i>	--	--	--	--	R
Bluegill	<i>Lepomis macrochirus</i>	LC	--	--	--	--
Cardinal shiner	<i>Luxilus cardinalis</i>	--	R	C	R	--
Central stoneroller	<i>Camptostoma anomalum</i>	C	MC	LC	MC	LC
Creek chub	<i>Semotilus atromaculatus</i>	LC	C	C	LC	C
Fantail darter	<i>Etheostoma flabellare</i>	--	--	LC	LC	LC
Green sunfish	<i>Lepomis cyanellus</i>	MC	R	LC	C	MC
Largemouth bass	<i>Micropterus salmoides</i>	R	--	--	--	LC
Orangethroat darter	<i>Etheostoma spectabile</i>	--	LC	C	C	C
Slender madtom	<i>Noturus exilis</i>	--	--	LC	LC	--
Southern redbelly dace	<i>Phoxinus erythrogaster</i>	MC	LC	MC	C	--
Stippled darter	<i>Etheostoma punctulatum</i>	R	LC	LC	LC	LC
Western mosquitofish	<i>Gambusia affinis</i>	R	--	--	--	LC
White sucker	<i>Catostomus commersoni</i>	--	LC	LC	R	R

Table 5. List of fish species expected to occur at George Washington Carver National Monument.

[Preliminary list, list provided by National Park Service; Revised list, list compiled by USGS after review of pertinent literature; USGS, collected by USGS in 2003; 0, unexpected, George Washington Carver National Monument is outside of species' range or lacks appropriate habitat; 1, species is expected within George Washington Carver National Monument; ?, uncertain; 2, collected. Comments based on information from Pflieger (1997)]

Family name	Scientific name	Common name	Pre-liminary list	Revised list	USGS	Comment
Amblyopsidae	<i>Amblyopsis rosae</i>	Ozark cavefish	1	0	no	Restricted to caves and spring outlets
Atherinidae	<i>Labidesthes sicculus</i>	Brook silverside	1	0	no	Typically avoids cooler water
Catostomidae	<i>Ictiobus niger</i>	Black buffalo	1	0	no	Typically occurs in larger streams
Catostomidae	<i>Moxostoma duquesnei</i>	Black redhorse	1	0	no	Typically avoids cooler water
Catostomidae	<i>Moxostoma erythrurum</i>	Golden redhorse	2	2	no	
Catostomidae	<i>Hypentelium nigricans</i>	Northern hog sucker	1	1	no	
Catostomidae	<i>Catostomus commersoni</i>	White sucker	1	2	yes	
Centrarchidae	<i>Pomoxis nigromaculatus</i>	Black crappie	1	0	no	Typically avoids cooler water
Centrarchidae	<i>Lepomis macrochirus</i>	Bluegill	2	2	yes	
Centrarchidae	<i>Lepomis cyanellus</i>	Green sunfish	2	2	yes	
Centrarchidae	<i>Micropterus salmoides</i>	Largemouth bass	2	2	yes	
Centrarchidae	<i>Lepomis megalotis</i>	Longear sunfish	2	2	no	
Centrarchidae	<i>Lepomis humilis</i>	Orangespotted sunfish	2	2	no	
Centrarchidae	<i>Lepomis microlophus</i>	Redear sunfish	1	0	no	Typically avoids cooler water
Centrarchidae	<i>Ambloplites rupestris</i>	Rock bass	1	0	no	Typically occurs in larger streams
Centrarchidae	<i>Micropterus dolomieu</i>	Smallmouth bass	2	2	no	
Centrarchidae	<i>Micropterus punctulatus</i>	Spotted bass	1	0	no	Typically occurs in larger streams
Centrarchidae	<i>Lepomis gulosus</i>	Warmouth	1	0	no	Typically avoids cooler water
Centrarchidae	<i>Pomoxis annularis</i>	White crappie	1	0	no	Typically occurs in larger streams
Cottidae	<i>Cottus carolinae</i>	Banded sculpin	1	2	yes	
Cyprinidae	<i>Notropis boops</i>	Bigeye shiner	1	0	no	Typically avoids cooler water
Cyprinidae	<i>Cyprinella camura</i>	Bluntnose shiner	1	0	no	Not in Arkansas River Basin
Cyprinidae	<i>Pimephales notatus</i>	Bluntnose minnow	2	2	no	
Cyprinidae	<i>Luxilus cardinalis</i>	Cardinal shiner	2	2	yes	
Cyprinidae	<i>Campostoma anomalum</i>	Central stoneroller	2	2	yes	
Cyprinidae	<i>Semotilus atromaculatus</i>	Creek chub	2	2	yes	
Cyprinidae	<i>Pimephales promelas</i>	Fathead minnow	2	2	no	
Cyprinidae	<i>Notemigonus crysoleucas</i>	Golden shiner	1	1	no	
Cyprinidae	<i>Ctenopharyngodon idella</i>	Grass carp	2	2	yes	

Table 5. List of fish species expected to occur at George Washington Carver National Monument.—Continued

[Preliminary list, list provided by National Park Service; Revised list, list compiled by USGS after review of pertinent literature; USGS, collected by USGS in 2003; 0, unexpected, George Washington Carver National Monument is outside of species' range or lacks appropriate habitat; 1, species is expected within George Washington Carver National Monument; ?, uncertain; 2, collected. Comments based on information from Pflieger (1997)]

Family name	Scientific name	Common name	Pre-liminary list	Revised list	USGS	Comment
Cyprinidae	<i>Erimystax x-punctatus</i>	Gravel chub	1	0	no	Typically occurs in larger streams
Cyprinidae	<i>Notropis nubilus</i>	Ozark minnow	2	2	no	
Cyprinidae	<i>Cyprinella lutrensis</i>	Red shiner	1	0	no	Typically avoid cooler water
Cyprinidae	<i>Nocomis asper</i>	Redspot chub	1	1	no	
Cyprinidae	<i>Notropis percobromus</i>	Carmine shiner	2	2	no	
Cyprinidae	<i>Phoxinus erythrogaster</i>	Southern redbelly dace	2	2	yes	
Cyprinidae	<i>Luxilus chrysocephalus</i>	Striped shiner	1	1	no	
Cyprinidae	<i>Pimephales tenellus</i>	Slim minnow	1	0	no	Typically occurs in larger streams
Fundulidae	<i>Fundulus olivaceus</i>	Blackspotted topminnow	1	1	no	
Fundulidae	<i>Fundulus notatus</i>	Blackstripe topminnow	1	1	no	
Fundulidae	<i>Fundulus sciadicus</i>	Plains topminnow	1	1?	no	
Ictaluridae	<i>Ameiurus melas</i>	Black bullhead	1	2	yes	
Ictaluridae	<i>Pylodictis olivaris</i>	Flathead catfish	1	0	no	Typically occurs in larger streams
Ictaluridae	<i>Noturus exilis</i>	Slender madtom	1	2	yes	
Ictaluridae	<i>Ameiurus natalis</i>	Yellow bullhead	2	2	no	
Percidae	<i>Etheostoma cragini</i>	Arkansas darter	2	2	yes	
Percidae	<i>Etheostoma zonale</i>	Banded darter	1	0	no	Typically occurs in larger streams
Percidae	<i>Percina copelandi</i>	Channel darter	1	0	no	Typically occurs in larger streams
Percidae	<i>Etheostoma flabellare</i>	Fantail darter	1	2	yes	
Percidae	<i>Etheostoma blennioides</i>	Greenside darter	1	1	no	
Percidae	<i>Etheostoma nigrum</i>	Johnny darter	1	0	no	Not reported from Shoal Creek Basin
Percidae	<i>Percina caprodes</i>	Logperch	1	0	no	Typically occurs in larger streams
Percidae	<i>Etheostoma spectabile</i>	Orangethroat darter	2	2	yes	
Percidae	<i>Etheostoma stigmaeum</i>	Speckled darter	2	2	no	
Percidae	<i>Etheostoma punctulatum</i>	Stippled darter	2	2	yes	
Percidae	<i>Etheostoma juliae</i>	Yoke darter	1	0	no	Not in Arkansas River Basin
Poeciliidae	<i>Gambusia affinis</i>	Western mosquitofish	2	2	yes	
Salmonidae	<i>Oncorhynchus mykiss</i>	Rainbow trout	2	0	no	Introduced species

Relation of Fishes to Habitats and Distributional Ranges

The three most common species (southern redbelly dace, central stoneroller, and green sunfish) are typical of habitats found in streams of George Washington Carver National Monument. Southern redbelly dace often are a common fish in small, springfed streams such as the streams of George Washington Carver National Monument (Pflieger, 1997). Central stonerollers are common in many streams of the Ozark Plateaus (Pflieger, 1997) and may be the most common species in the smallest streams (Petersen, 2004). Green sunfish are another common fish species in small Ozark streams (Pflieger, 1997).

Several species were collected at two or less sites and were not common at these sites. Less than ten black bullhead (*Ameiurus melas*), bluegill (*Lepomis macrochirus*), grass carp (*Ctenopharyngodon idella*), western mosquitofish (*Gambusia affinis*), and slender madtom (*Noturus exilis*) were collected from George Washington Carver National Monument. Habitats such as the clear, cool streams of George Washington Carver National Monument are not typical habitats for black bullhead, bluegill, and western mosquitofish (Pflieger, 1997). Grass carp are not native to the United States, but have been stocked in Missouri impoundments, including Williams Pond. The slender madtom is common in Ozark streams, but generally is scarce in streams that are extremely clear (Pflieger, 1997).

Several species potentially present within the boundaries of George Washington Carver National Monument (and on the preliminary list of expected species) were not collected during 2003 and many of these species, while potentially present, are unlikely to be found within George Washington Carver National Monument (for reasons described in Pflieger, 1997). Ten species typically occur in larger streams and seven species typically avoid the cooler water of spring-fed streams (table 5). The Ozark cavefish (*Amblyopsis rosae*), listed as threatened by the U.S. Fish and Wildlife Service (2004) and endangered by the Missouri Department of Conservation (2004), is rare and primarily is restricted to caves and spring outlets. The rainbow trout (*Oncorhynchus mykiss*) is an introduced species that apparently is no longer present in Williams Pond.

Other species were removed from the list because they are absent from or rare in the Arkansas River drainage. Bluntnose shiner (*Cyprinella camura*) and yoke darter (*Etheostoma juliae*) do not occur in the Arkansas River Basin and the johnny darter (*Etheostoma nigrum*) has not been reported from the Shoal Creek Basin (table 5).

One species has questionable status. The plains topminnow is mostly absent from the Shoal Creek Basin.

Comparison to Past Inventories

Some differences existed between the assemblages (groups of species) collected in each of the four inventories (table 6). Four of the 17 fish species collected in this inventory (black bullhead, fantail darter (*Etheostoma flabellare*), slender

madtom, and white sucker (*Catostomus commersoni*), as well as the sunfish hybrid), previously had not been collected at the monument.

Eleven species collected from George Washington Carver National Monument in four previous studies during the 1980's were not collected in 2003, even though suitable habitat is present. These species are the golden redbelly (*Moxostoma erythrurum*), orangespotted sunfish (*Lepomis humilis*), longear sunfish (*Lepomis megalotis*), smallmouth bass (*Micropterus dolomieu*), Ozark minnow (*Notropis nubilus*), rosyface shiner (*Notropis percobromus*), bluntnose minnow (*Pimephales notatus*), fathead minnow (*Pimephales promelas*), yellow bullhead (*Ameiurus natalis*), rainbow trout, and speckled darter (*Etheostoma stigmaeum*) (Elick, 1983; Bock, 1984; Angle, 1986; Ellis, no date). Rainbow trout previously were collected from Williams Pond (Elick, 1983) and probably no longer occur in Williams Pond because of a lack of reproduction.

Species of Interest

Four species collected at George Washington Carver National Monument may be of special interest to NPS managers and others. Two of the species collected, cardinal shiner (*Luxilus cardinalis*) and stippled darter (*Etheostoma punctulatum*), are endemic to the Ozark Plateaus; however, both are rather common in certain parts of the Ozark Plateaus. The Arkansas darter (*Etheostoma cragini*) is restricted to parts of the Ozark Plateaus in the Arkansas River Basin and to other localities in the Arkansas River Basin west of the Ozark Plateaus (Robison and Buchanan, 1988). It has been a candidate for federal listing as a threatened or endangered species and the largest remaining populations are probably in southwestern Missouri (Pflieger, 1997). The Arkansas darter is a species of conservation concern (Missouri Natural Heritage Program, 2003). The grass carp, which is a native of eastern Asia, is present in Williams Pond. The introduction of grass carp into the United States is a controversial issue because of possible (but undocumented) harmful effects on native species and habitats (Pflieger, 1997).

Table 6. List of fish collected in five inventories at George Washington Carver National Monument from 1983 to 2003.

[X, collected; --, not collected]

Common name	Scientific name	2003 study	Historical occurrence ¹	Historical inventory ²
Arkansas darter	<i>Etheostoma cragini</i>	X	X	1986
Banded sculpin	<i>Cottus carolinae</i>	X	X	1983, 1986
Black bullhead	<i>Ameiurus melas</i>	X	--	
Bluegill	<i>Lepomis macrochirus</i>	X	X	1983, 1984, 1986, no date
Sunfish hybrid	<i>L. macrochirus</i> X <i>L. cyanellus</i>	X	--	
Bluntnose minnow	<i>Pimephales notatus</i>	--	X	1983, 1984, 1986
Cardinal shiner	<i>Luxilus cardinalis</i>	X	X	no date
Carmine shiner ³	<i>Notropis percobromus</i> ³	--	X	1986
Central stoneroller	<i>Campostoma anomalum</i>	X	X	1983, 1984, 1986, no date
Creek chub	<i>Semotilus atromaculatus</i>	X	X	1983, 1984, 1986, no date
Fantail darter	<i>Etheostoma flabellare</i>	X	--	
Fathead minnow	<i>Pimephales promelas</i>	--	X	1983, 1984, 1986
Golden redhorse	<i>Moxostoma erythrurum</i>	--	X	1986
Grass carp	<i>Ctenopharyngodon idella</i>	X	X	1983, 1984, 1986, no date
Green sunfish	<i>Lepomis cyanellus</i>	X	X	1983, 1984, 1986, no date
Largemouth bass	<i>Micropterus salmoides</i>	X	X	1983, 1986, no date
Longear sunfish	<i>Lepomis megalotis</i>	--	X	1986
Orangespotted sunfish	<i>Lepomis humilis</i>	--	X	1983
Orangethroat darter	<i>Etheostoma spectabile</i>	X	X	1983, 1986, no date
Ozark minnow	<i>Notropis nubilus</i>	--	X	1983, 1984, 1986
Rainbow trout	<i>Oncorhynchus mykiss</i>	--	X	1983
Slender madtom	<i>Noturus exilis</i>	X	--	
Smallmouth bass	<i>Micropterus dolomieu</i>	--	X	1983
Southern redbelly dace	<i>Phoxinus erythrogaster</i>	X	X	1983, 1986, no date
Speckled darter	<i>Etheostoma stigmaeum</i>	--	X	1986
Stippled darter	<i>Etheostoma punctulatum</i>	X	X	1986
Yellow bullhead	<i>Ameiurus natalis</i>	--	X	1983, 1984
Western mosquitofish	<i>Gambusia affinis</i>	X	X	1983, 1984, 1986, no date
White sucker	<i>Catostomus commersoni</i>	X	--	

¹Based on data from four previous fish surveys at George Washington Carver National Monument.

²Elick (1983), Bock (1984), Angle (1986), Ellis (no date).

³Formerly known as rosyface shiner (*Notropis rubellus*)

Summary

A fish inventory was conducted at six sites located on three streams and a pond at George Washington Carver National Monument. Fish were collected by seining and electrofishing during a base-flow period in July 2003. All individuals collected were identified to species. Approximately 700 fish were collected, comprising 17 species and 13 genera. The number of species collected at the five stream sites ranged from 9 to 12.

Fish species collected at the stream sites were typical of small headwater streams. The three most common species were the southern redbelly dace, the central stoneroller, and the green sunfish. Four species and a hybrid were collected at the site at Williams Pond. The hybrid was a bluegill X green sunfish hybrid and one of the four species was not native to the United States (the grass carp).

The preliminary expected species list incorrectly listed 22 species because of incorrect species range or habitat requirements. Upon revising this list, the inventory yielded 17 of the 35 species (49 percent) and one hybrid. Eleven species collected in past inventories were not collected in this effort. Possible reasons for the absence of those fish species are seasonal variability, extirpation, low population density, and misidentification. Four species collected in this inventory previously had not been collected at the monument.

None of the species collected had a threatened or endangered status. However, four species collected at George Washington Carver National Monument may be of special interest to National Park Service managers and others. Two of the species (cardinal shiner and stippled darter) are endemic to the Ozark Plateaus; however, both are rather common in certain parts of the Ozark Plateaus. The Arkansas darter has been a candidate for federal listing as a threatened or endangered species and is considered a species of conservation concern by the State of Missouri. The fourth species is the grass carp, which is a native of eastern Asia. The introduction of grass carp into the United States is a controversial issue because of possible (but undocumented) harmful effects on native species and habitats.

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