

Part III:
**Scoring Criteria for the Index of Biotic Integrity to Monitor Fish
Communities in Wadeable Streams in the Apalachicola and Atlantic
Slope Drainage Basins of the Southeastern Plains Ecoregion of
Georgia**

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Wildlife Resources Division
Fisheries Management Section

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Introduction

The Southeastern Plains ecoregion (SEP) is the largest of the six Level III ecoregions found in Georgia (Part I, Figure 1). It covers most of the southern portion of Georgia, bordering the Piedmont ecoregion to the north and the Southern Coastal Plain ecoregion to the southeast. It includes all or portions of 80 counties (Figure 1), covering a land area of over 25,000 square miles (United States Census Bureau 2000). Major drainage basins found within the (SEP) include the Chattahoochee, Flint, Ocmulgee, Oconee, Altamaha, Ogeechee, Savannah, Satilla, Suwannee, and Ochlockonee.

The biotic index developed by the GAWRD is based on Level III ecoregion delineations (Griffith *et al.* 2001). The metrics and scoring criteria were developed from biomonitoring samples collected in the Chattahoochee, Flint, Ocmulgee, Oconee, Altamaha, Ogeechee, and the Savannah Drainage Basins. Based on similarities in species richness and composition, these seven drainages were aligned into two groups: the Apalachicola Drainage Basin (ACF), including the Chattahoochee and Flint drainage basins, and the Atlantic Slope Drainage Basin (AS), including the Altamaha, Ocmulgee, Oconee, Ogeechee, and Savannah Drainage Basins. Biotic indices have not yet been developed for streams in the (SEP) that are part of the Satilla, Suwannee, and Ochlockonee basins.

Between 1998 and 2018, a total of 299 biomonitoring samples have been collected by GAWRD in the (ACF) and (AS) basins of the (SEP). Out of these 299 samples, 91 native species have been collected in both basins combined. The (AS) is the most species rich, with a total of 70 native species collected while 63 native species have been collected in the (ACF).

Fifteen state listed species, ranked as endangered (E), threatened (T), or rare (R) based on the Endangered Wildlife Act of 1973, have been collected in the (SEP) (Table1) (GAWRD Wildlife Conservation Section; <http://georgiabiodiversity.org/> 2019).

Based on the IBI integrity classes (Part I, Table 3), 19 sites scored in the excellent class, 64 scored in the good class, 68 scored in the fair class, 58 scored in the poor class, and 60 scored in the very poor class. IBI scores in the Southeastern ecoregion range from a maximum of 58 to a minimum of 0. Approximately 44% of sites scored in the poor and very poor integrity classes ($[118 / 270] * 100 = 43.7\%$), whereas 31% of the streams sampled in the (SEP) scored in the excellent and good integrity classes ($[83 / 270] * 100 = 30.7\%$). Major impacts to streams in the

(SEP) include the effects of groundwater irrigation, instream withdrawals, and erosion and sedimentation.

Table 2 shows the scoring criteria for the IBI metrics in the Apalachicola and Atlantic Slope drainage basins in the (SEP). The Maximum Species Richness (MSR) graphs for the Apalachicola and Atlantic Slope drainage basins within the (SEP) are included in (Appx. 1). Figures ACF1 - SEP through ACF6b - SEP depict the Maximum Species Richness (MSR) graphs used to score the species richness metrics (metrics 1 – 6b) in the Apalachicola drainage basin. Figures AS1 - SEP through AS6b - SEP depict the (MSR) graphs used to score the species richness metrics in the Atlantic Slope drainage basins. The fish list for the Apalachicola and Atlantic Slope drainage basins within the (SEP) showing the water quality tolerance rankings, feeding guilds, and species categories used in calculating the IBI score is also included in (Appx 1).

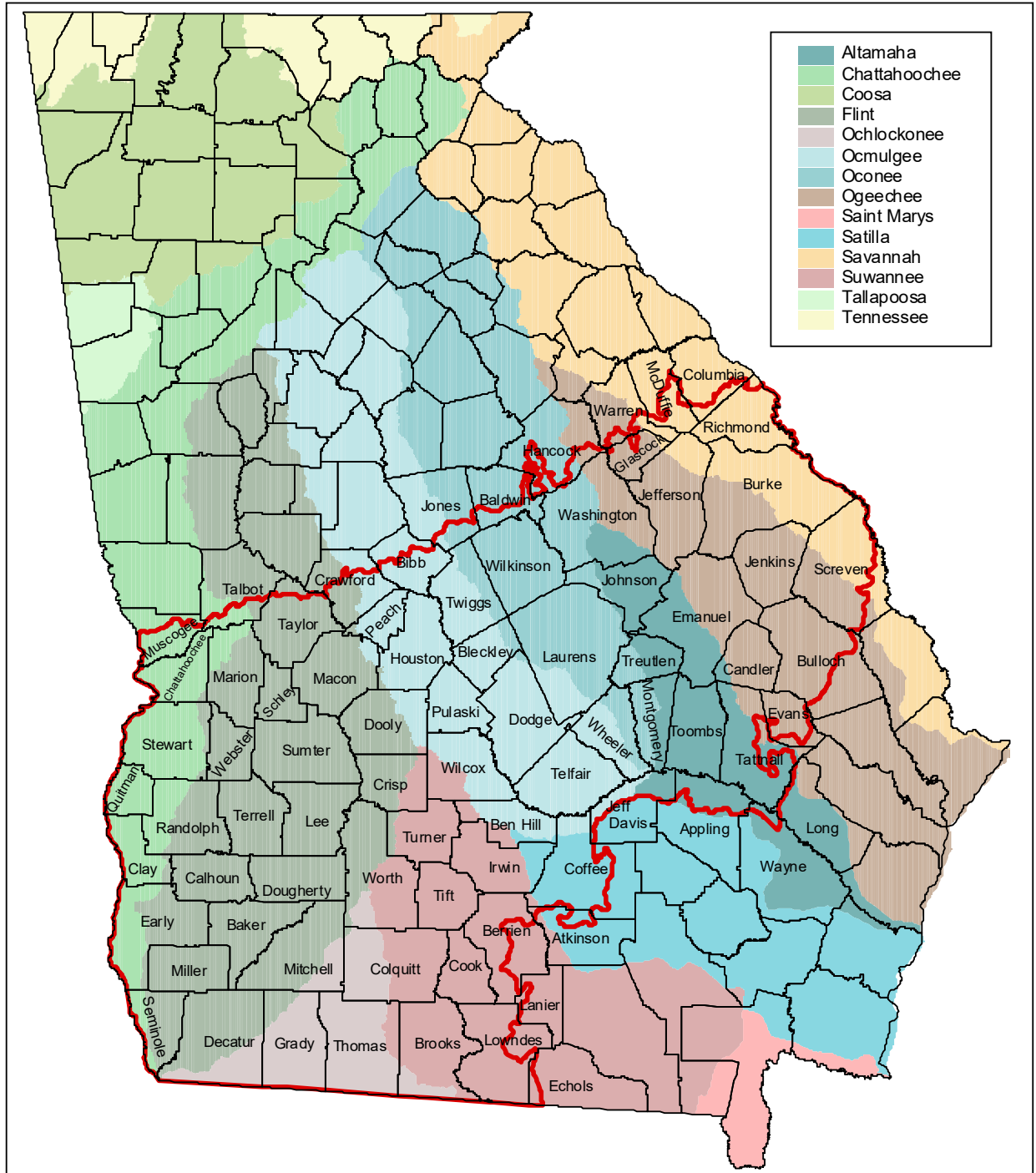


Figure 1. Level III Southeastern Plains ecoregion (outlined in bold red) in Georgia. Major drainage basins include the Chattahoochee, Flint, Ochlockonee, Suwannee, Satilla, Ocmulgee, Oconee, Altamaha, Ogeechee, and Savannah.

Table 1. State listed fish found in the Apalachicola and Atlantic Slope drainage basins of the Southeastern Plains ecoregion of Georgia (GAWRD, Wildlife Conservation Section, <http://georgiabiodiversity.org/> 2019).

Species	State Status	Federal Status	Basin
Shortnose Sturgeon (<i>Acipenser brevirostrum</i>)	E	E	ALT, OGE, SAV
Gulf Sturgeon (<i>Acipenser oxyrinchus desotoi</i>)	E	E	CHT, FLI
Atlantic Sturgeon (<i>Acipenser oxyrinchus oxyrinchus</i>)	E	E	ALT, OCM, OCO, OGE, SAV
Alabama Shad (<i>Alosa alabamae</i>)	T	None	CHT, FLI
Spotted Bullhead (<i>Ameiurus serracanthus</i>)	R	None	CHT, FLI
Bluestripe Shiner (<i>Cyprinella callitaenia</i>)	R	None	CHT, FLI
Bluebarred Pygmy Sunfish (<i>Elassoma okatie</i>)	E	None	SAV
Blackbanded Sunfish (<i>Enneacanthus chaetodon</i>)	E	None	SAV
Goldstripe Darter (<i>Etheostoma parvipinne</i>) **	R	None	CHT, FLI, OCM, OCO
Bluefin Killifish (<i>Lucania goodei</i>)	R	None	FLI, OGE
Robust Redhorse (<i>Moxostoma robustum</i>)	E	None	ALT, OCM, OCO, OGE, SAV
Highscale Shiner (<i>Notropis hypsilepis</i>)	R	None	CHT, FLI
Halloween Darter (<i>Percina crypta</i>)	T	None	FLI
Broadstripe Shiner (<i>Pteronotropis euryzonus</i>) **	R	None	CHT
Bluenose Shiner (<i>Pteronotropis welaka</i>)	T	None	CHT, FLI

Status: E = endangered; T = threatened; R = rare

Basin: ALT = Altamaha; CHT = Chattahoochee; FLI = Flint; OCM = Ocmulgee; OCO = Oconee; OGE = Ogeechee; SAV = Savannah

** = collected by the Georgia DNR Stream Survey Team within the SEP ecoregion of the Apalachicola and Atlantic slope drainage basins.

Table 2. Index of Biotic Integrity metrics for wadeable streams in the Apalachicola and Atlantic Slope drainage basins in the Southeastern Plains ecoregion of Georgia.

Metric	Basin Group	Scoring Criteria	
		<u>5/3 Breaks</u>	<u>3/1 Breaks</u>
		<u>Species Richness Metrics</u>	
1. Number of native species	ACF	$y = 9.88x + 5.16$ (1.87, 23.6)	$y = 7.22x + 3.77$ (1.87, 17.3)
	AS	$y = 6.53x + 8.12$ (2.24, 22.8)	$y = 4.16x + 5.18$ (2.24, 14.5)
2. Number of benthic invertivore species	ACF	$y = 1.67x + 0.17$ (1.89, 3.3)	$y = 0.84x + 0.09$ (1.89, 1.7)
	AS	$y = 1.34x + 1.30$ (1.52, 3.3)	$y = 0.67x + 0.65$ (1.52, 1.7)
3a. Number of native sunfish species ^a	ACF	$y = 3.31x + 0.43$ (1.08, 4.0)	$y = 1.65x + 0.21$ (1.08, 2.0)
	AS	$y = 2.24x + 2.38$ (1.25, 5.2)	$y = 1.45x + 1.54$ (1.25, 3.4)
3b. Number of native centrarchid species ^b	ACF	$y = 2.72x + 1.79$ (1.48, 5.8)	$y = 1.69x + 1.11$ (1.48, 3.6)
	AS	$y = 2.01x + 3.21$ (2.52, 8.3)	$y = 1.34x + 2.15$ (2.52, 5.5)
4. Number of native insectivorous cyprinid species	ACF	$y = 3.06x + 0.68$ (1.64, 5.7)	$y = 1.83x + 0.41$ (1.64, 3.4)
	AS	$y = 1.99x + 0.50$ (2.10, 4.7)	$y = 0.99x + 0.25$ (2.10, 2.3)
5. Number of native round-bodied sucker species	ACF	$y = 1.20x - 0.26$ (2.44, 2.7)	$y = 0.60x - 0.13$ (2.44, 1.3)
	AS	$y = 0.92x + 0.65$ (2.20, 2.7)	$y = 0.46x + 0.32$ (2.20, 1.3)
6a. Number of sensitive species ^a	ACF	$y = 2.91x - 1.13$ (1.30, 2.7)	$y = 1.46x - 0.56$ (1.30, 1.3)
	AS	$y = 3.24x + 0.27$ (1.15, 4.0)	$y = 1.62x + 0.13$ (1.15, 2.0)
6b. Number of Intolerant species ^b	ACF	$y = 3.41x - 2.15$ (1.80, 4.0)	$y = 1.71x - 1.08$ (1.80, 2.0)
	AS	$y = 2.18x - 0.59$ (1.80, 3.3)	$y = 1.09x - 0.29$ (1.80, 1.7)

<u>Species Composition Metrics</u>		<u>5</u>	<u>3</u>	<u>1</u>
7. Evenness	ACF	≥ 79.7	79.7 - ≥ 69.5	< 69.5
	AS	≥ 80.1	80.1 - ≥ 68.6	< 68.6
8. % of individuals as <i>Lepomis</i> species	ACF	≤ 25.4	25.4 - ≤ 48.3	> 48.3
	AS	≤ 30.3	30.3 - ≤ 51.3	> 51.3
9. % of individuals as insectivorous cyprinids	ACF	≥ 47.9	47.9 - ≥ 24.5	< 24.5
	AS	≥ 39.9	39.9 - ≥ 19.9	< 19.9
10a. % of individuals as generalist feeders and Herbivores	ACF	≤ 17.3	17.3 - ≤ 32.9	> 32.9
	AS	≤ 22.5	22.5 - ≤ 45.0	> 45.0
10b. % of individuals as top carnivores ^b	ACF	≥ 4.8 - ≤ 11.8	≥ 2.4 - < 4.8 > 11.8 - ≤ 14.1	< 2.4 > 14.1
	AS	≥ 3.8 - ≤ 9.4	≥ 1.9 - < 3.8 > 9.4 - ≤ 11.3	< 1.9 > 11.3
11. % of individuals as benthic fluvial specialist	ACF	≥ 31.0	31.0 - ≥ 16.6	< 16.6
	AS	≥ 21.6	21.6 - ≥ 10.8	< 10.8
12. Number of individuals per 200 meters	ACF	≥ 405.8	405.8 - ≥ 221.7	< 221.7
	AS	≥ 457.8	457.8 - ≥ 234.5	< 234.5
13. % of individuals with external anomalies	ACF / AS	> 2.0 – subtract 4 points from total score		

^a used at sites with an upstream drainage basin area < 15 square miles

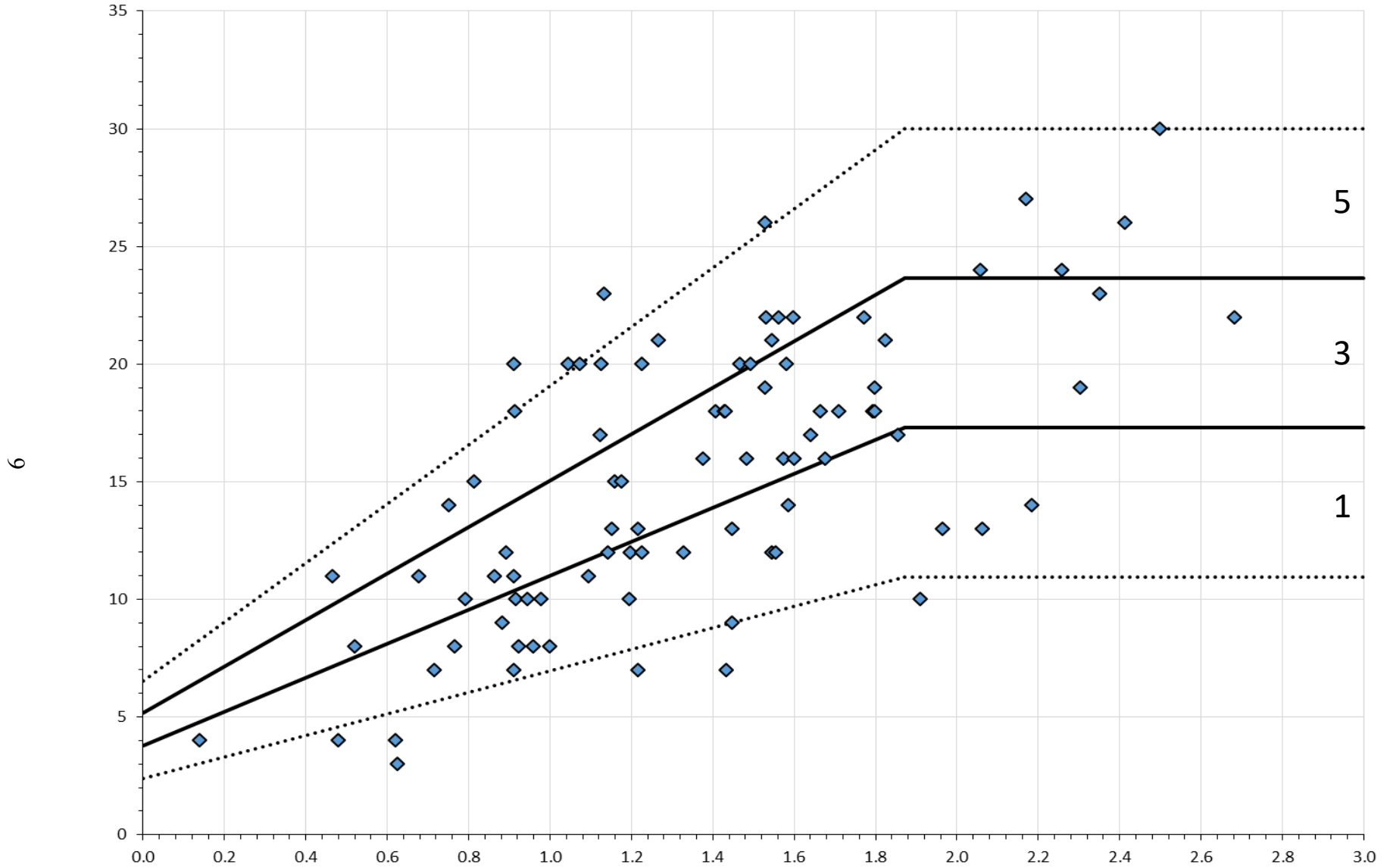
^b used at sites with an upstream drainage basin area ≥ 15 square miles

References

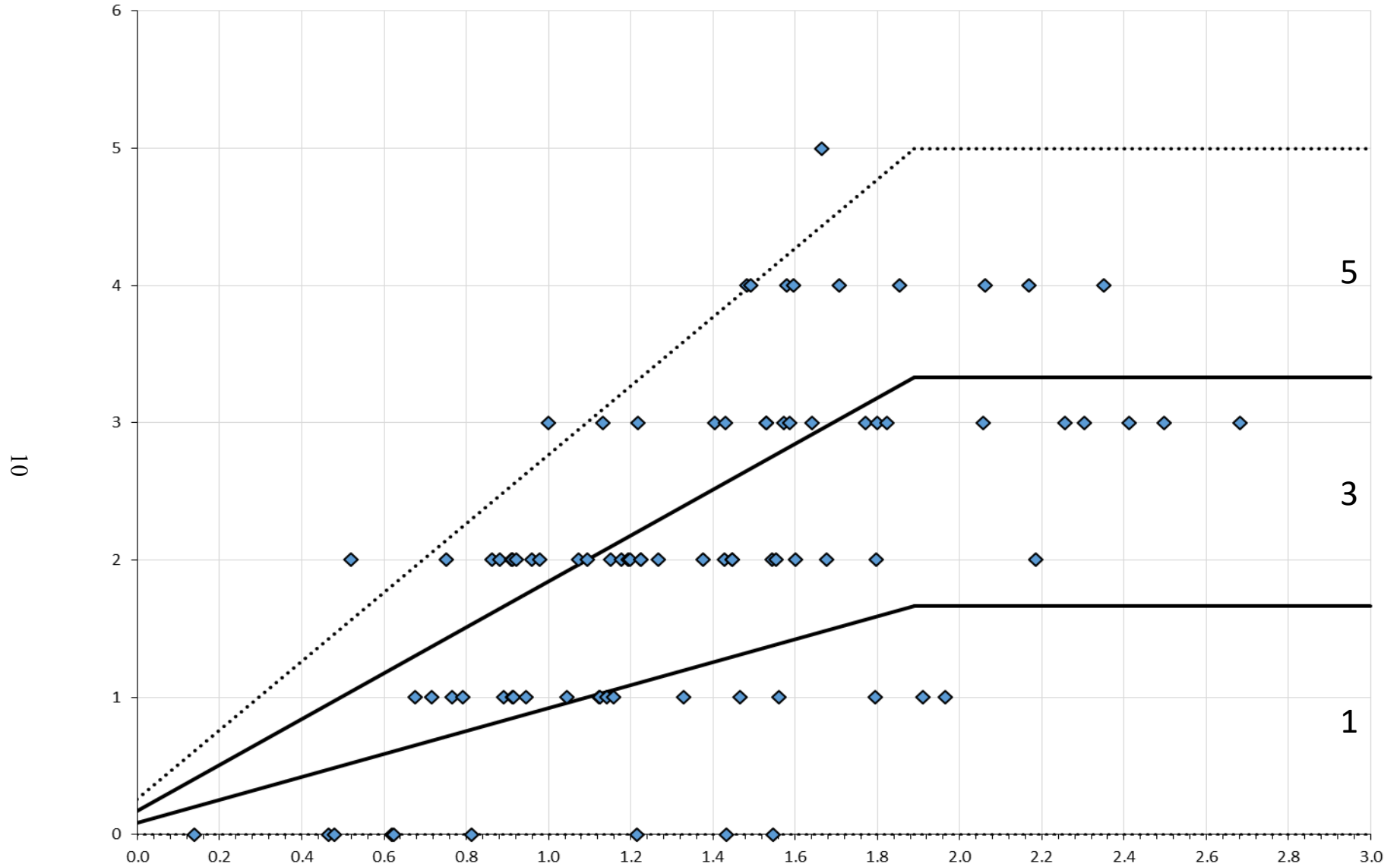
- Georgia Department of Natural Resources, Wildlife Resources Division. 1999. Protected Animals of Georgia. Nongame Wildlife – Natural Heritage Section, Forsyth, Georgia.
- Griffith, G.E., J.M. Omernik, J.A. Comstock, S. Lawrence, and T. Foster. 2001. Level III and IV Ecoregions of Georgia, (color poster with map, descriptive text, summary tables, and photographs). Reston, Virginia, U.S. Geological Survey.
- United States Census Bureau. 2000. 2000 Census of Population and Housing. United States Census Bureau, Washington, D.C.

Appendix 1

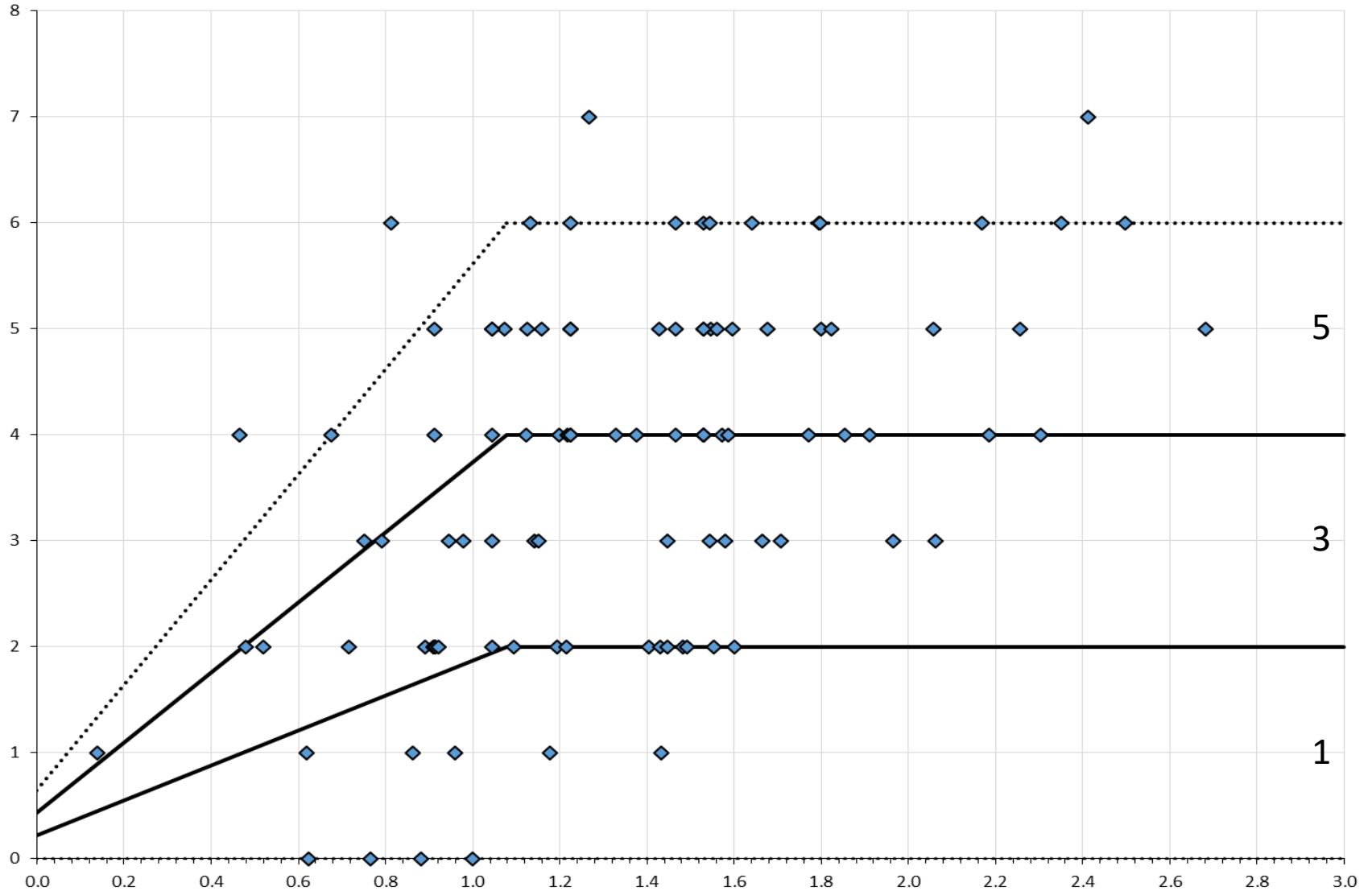
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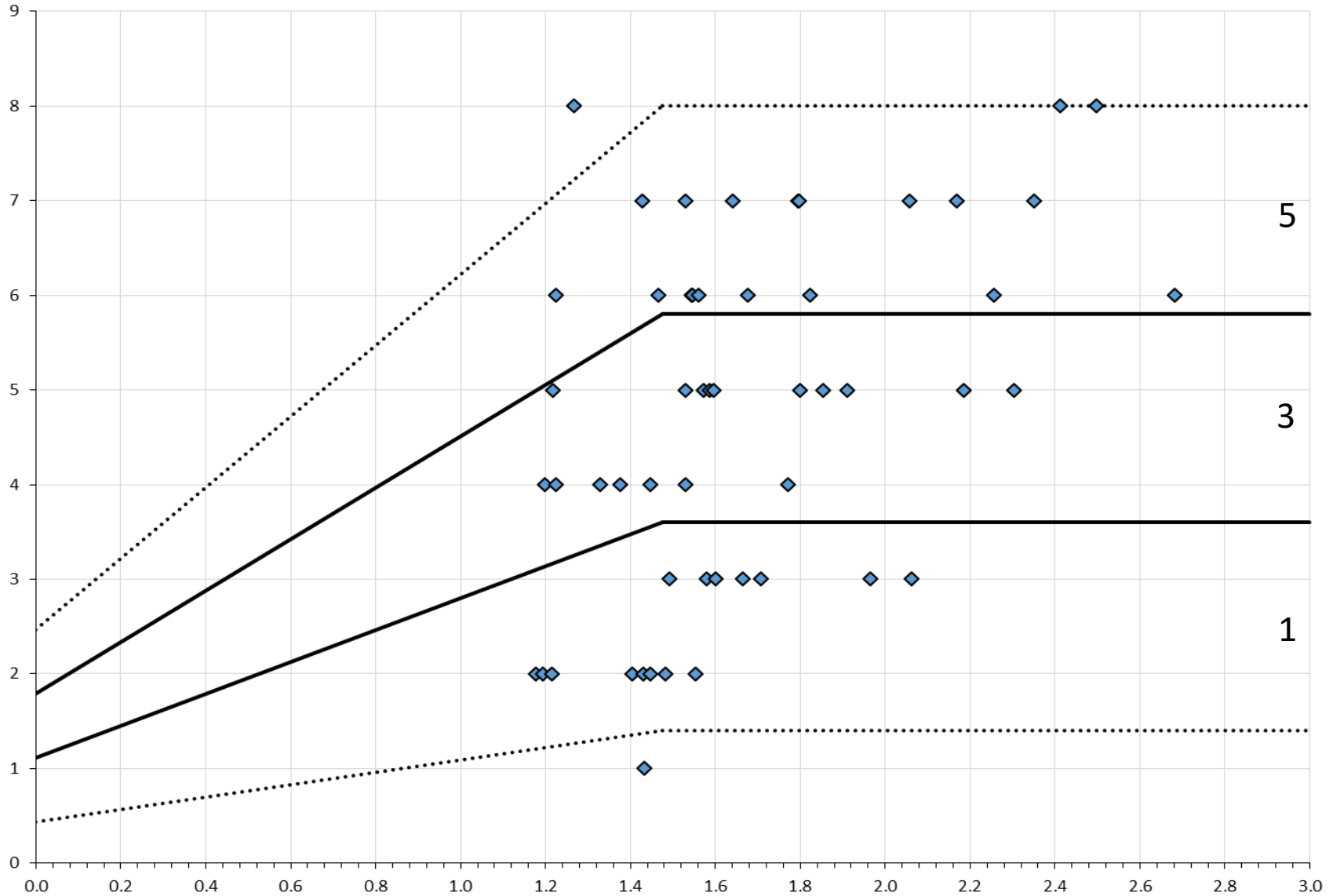
ACF1 – SEP. Total number of native species in the Southeastern Plains ecoregion of the Apalachicola drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



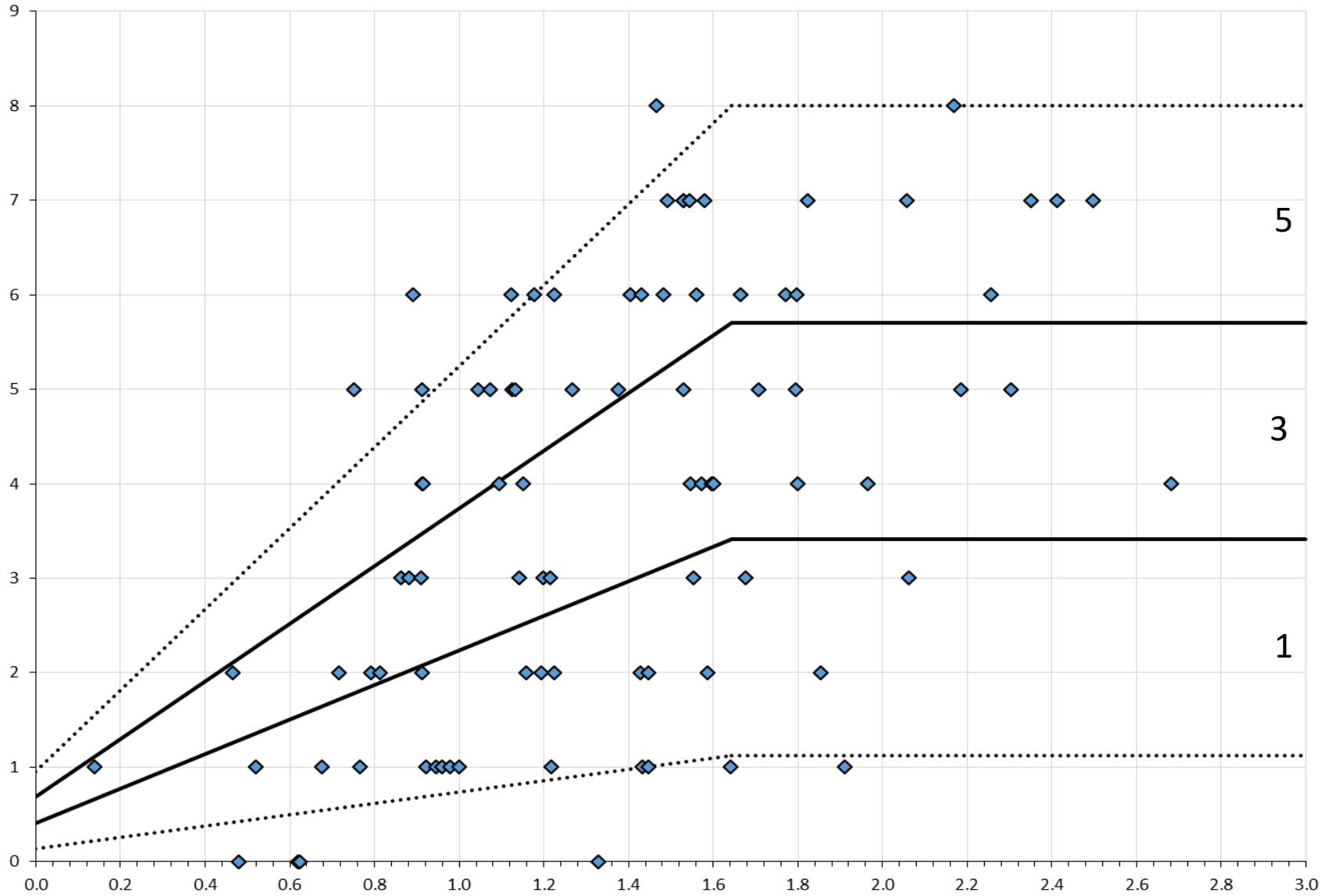
ACF2 – SEP. Number of benthic invertivore species in the Southeastern Plains ecoregion of the Apalachicola drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



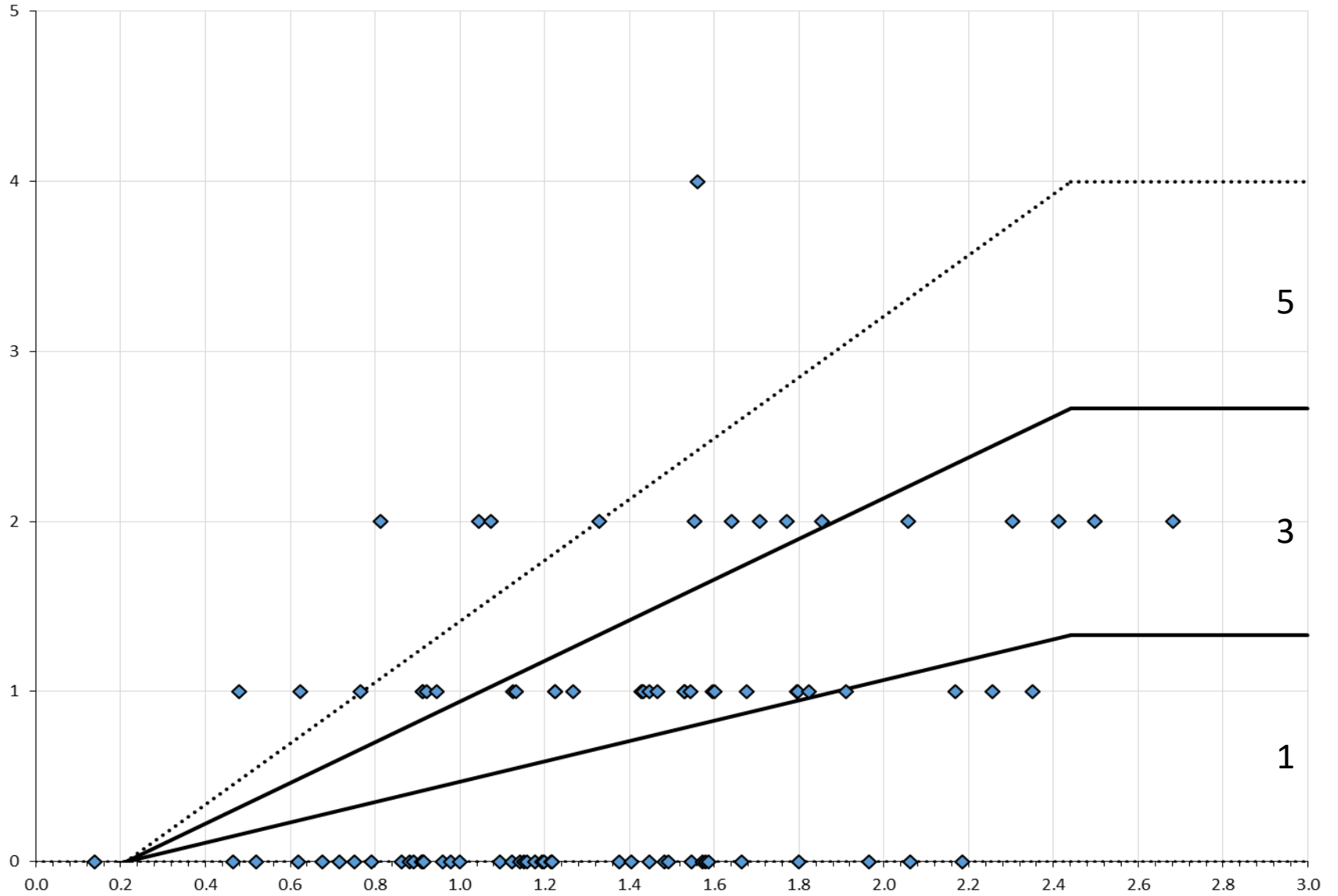
ACF3a – SEP. Number of native sunfish species in headwater streams (<15 square mile drainage basin area) in the Southeastern Plains ecoregion of the Apalachicola drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



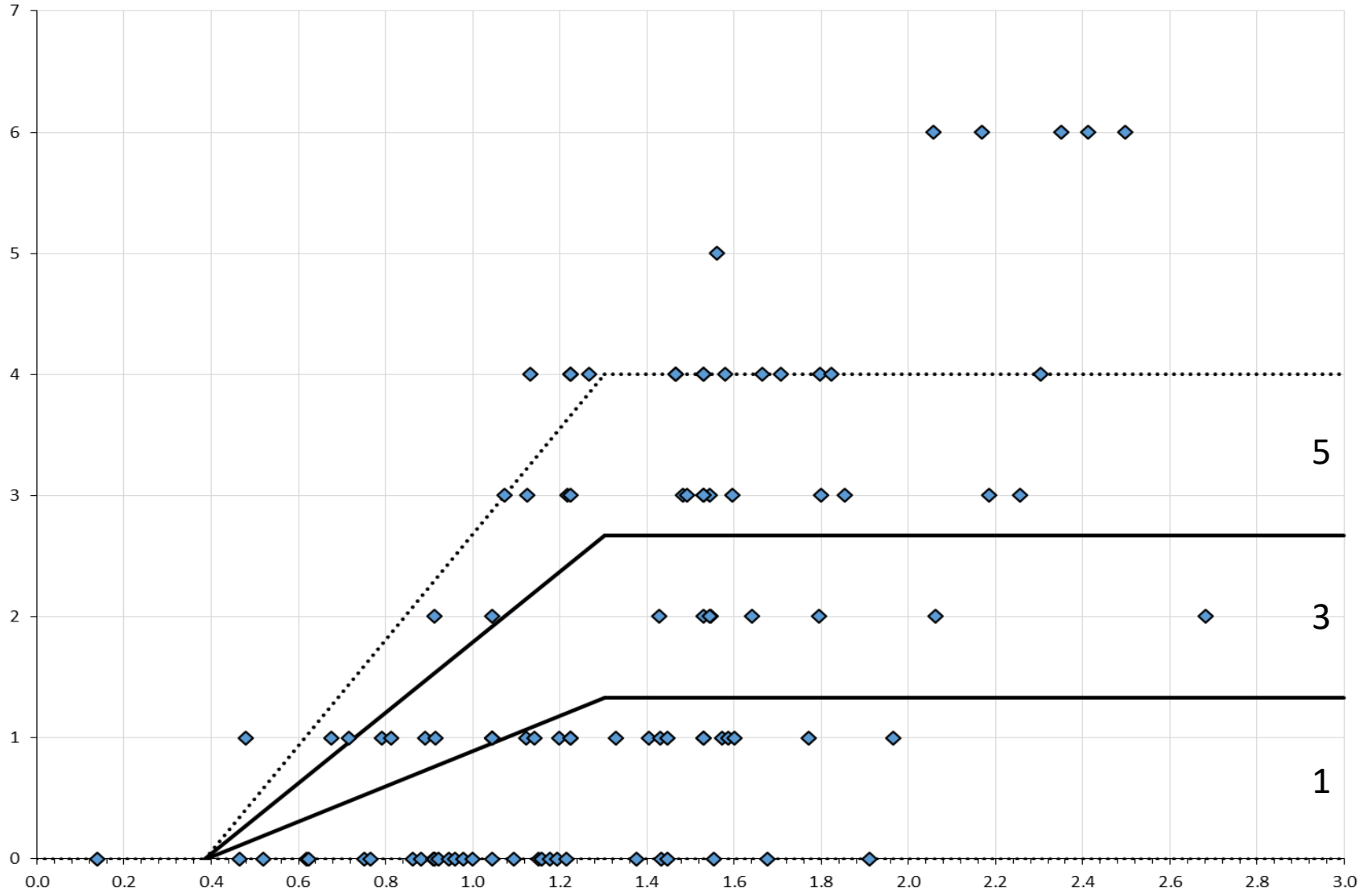
ACF3b – SEP. Number of native centrarchid species in the Southeastern Plains ecoregion of the Apalachicola drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



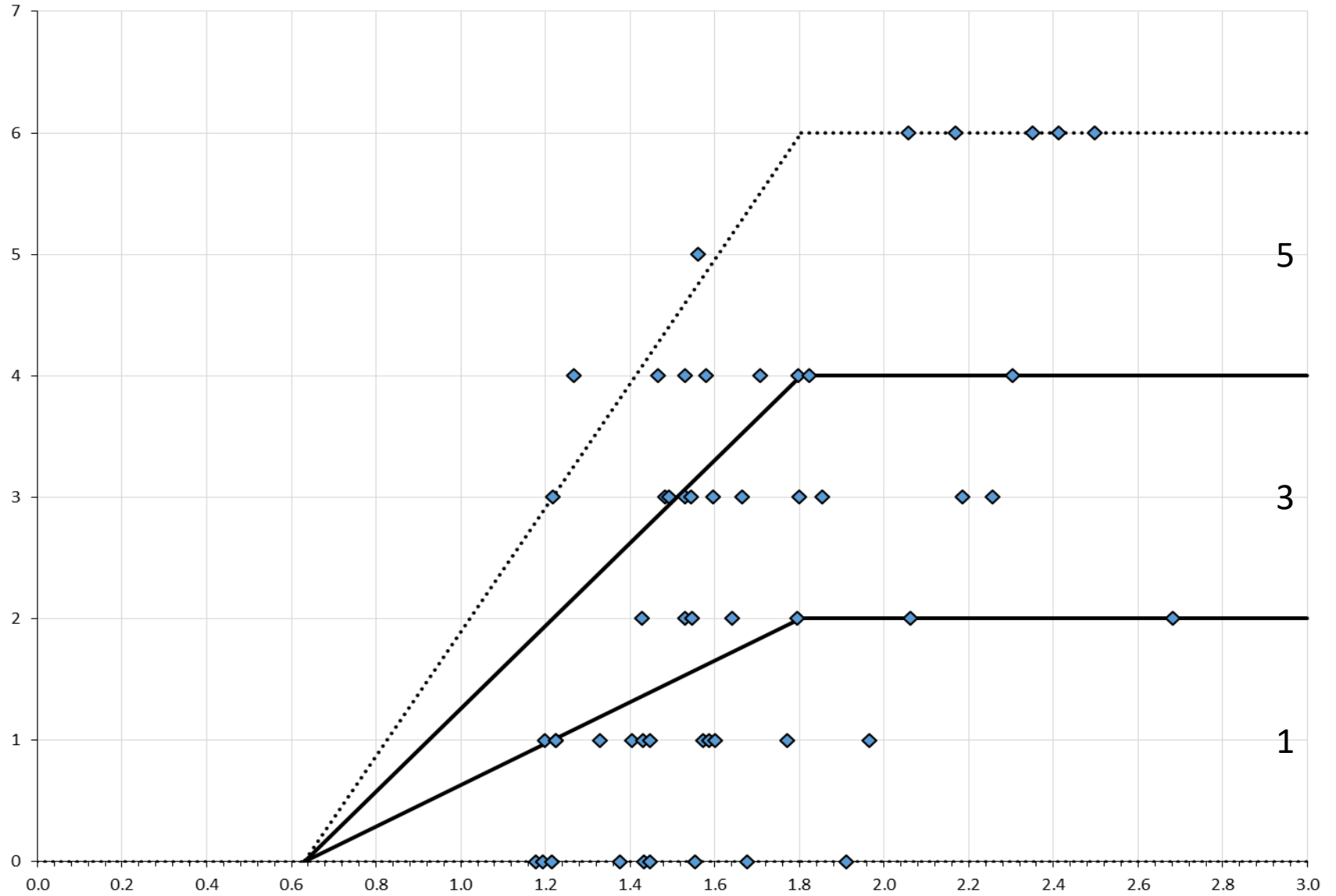
ACF4 – SEP. Number of native insectivorous cyprinid species in the Southeastern Plains ecoregion of the Apalachicola drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



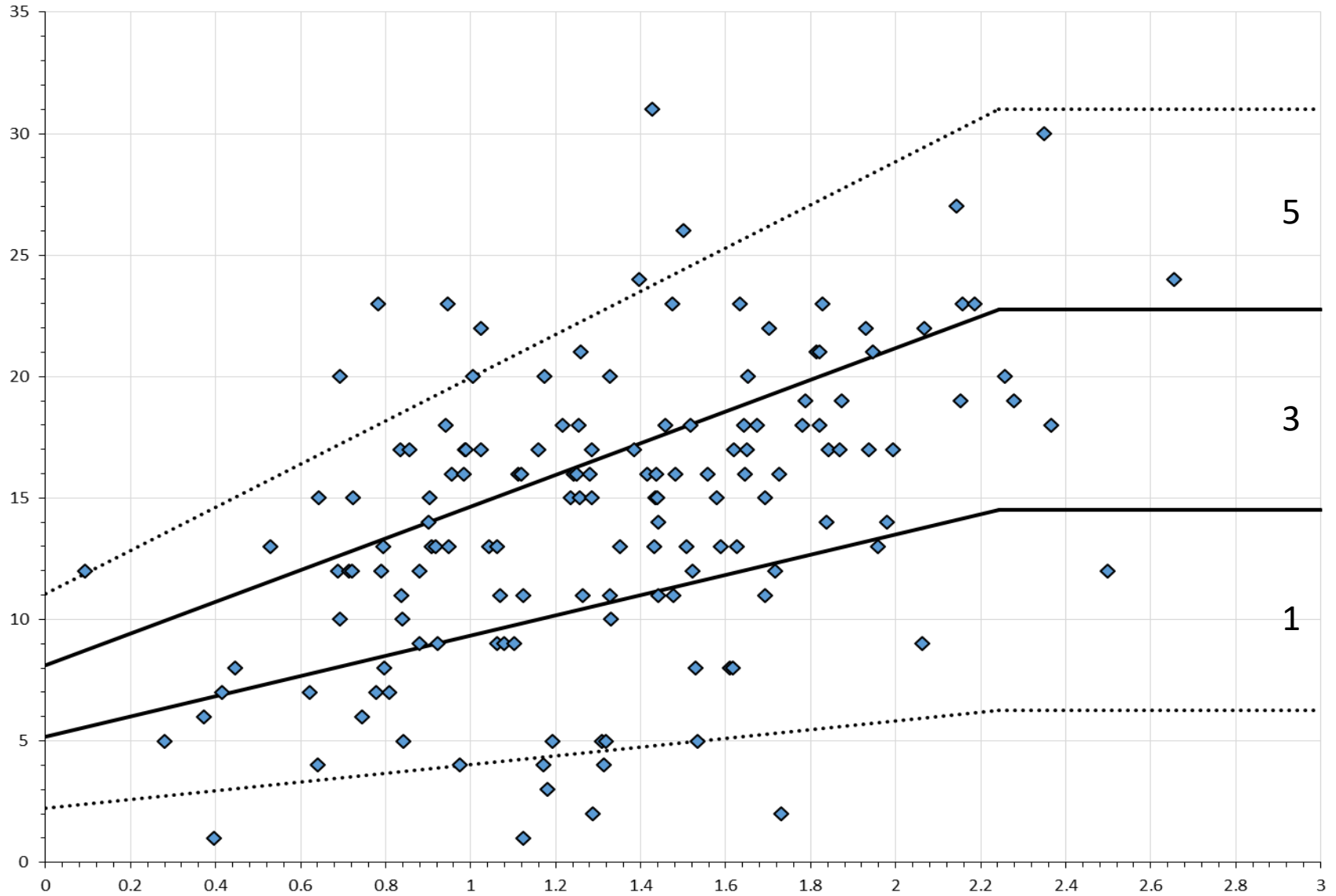
ACF5 – SEP. Number of native round-bodied-sucker species in the Southeastern Plains ecoregion of the Apalachicola drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



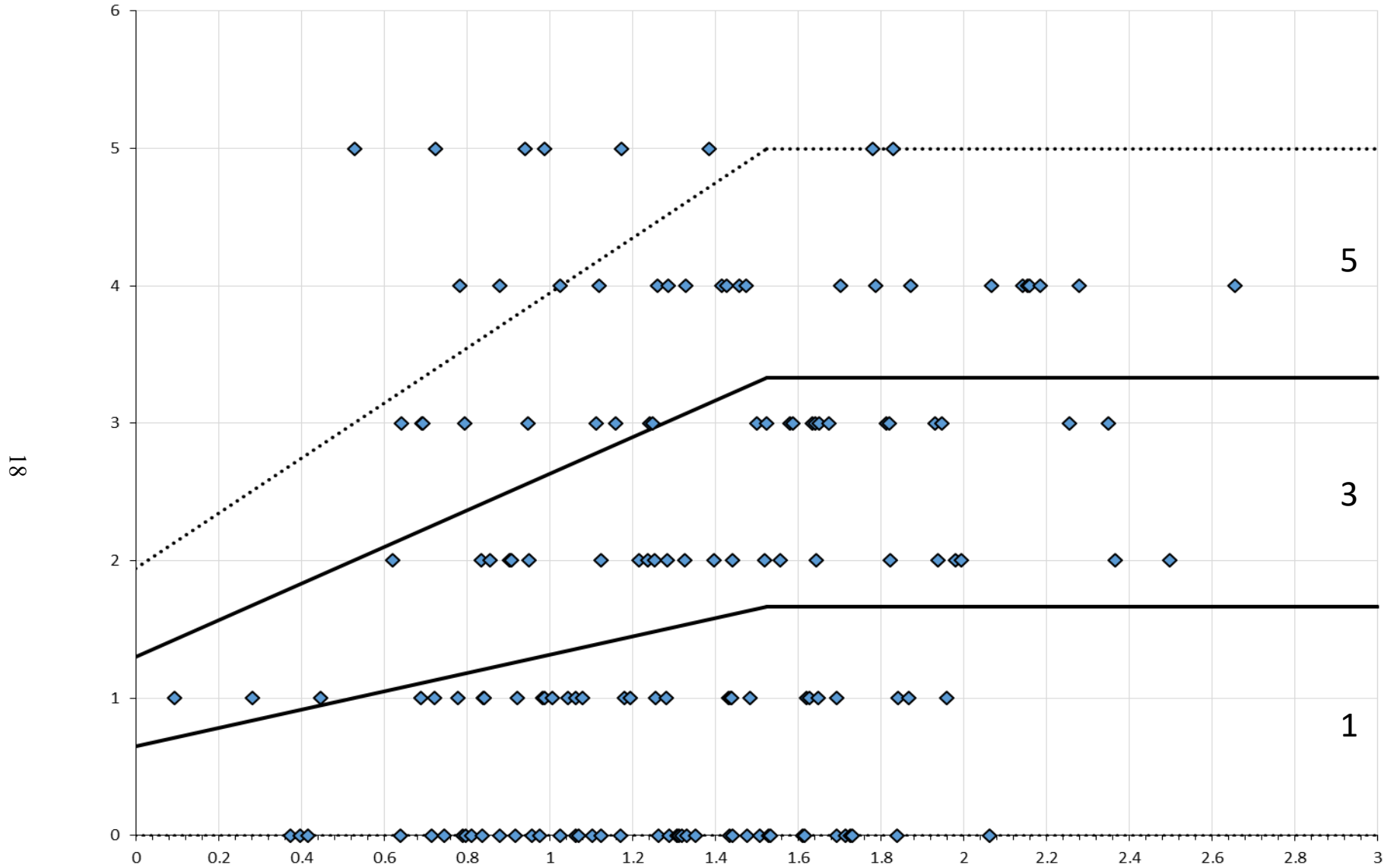
ACF6a – SEP. Total number of species ranked as sensitive at headwater sites (<15 square miles drainage basin area) in the Southeastern Plains ecoregion of the Apalachicola drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



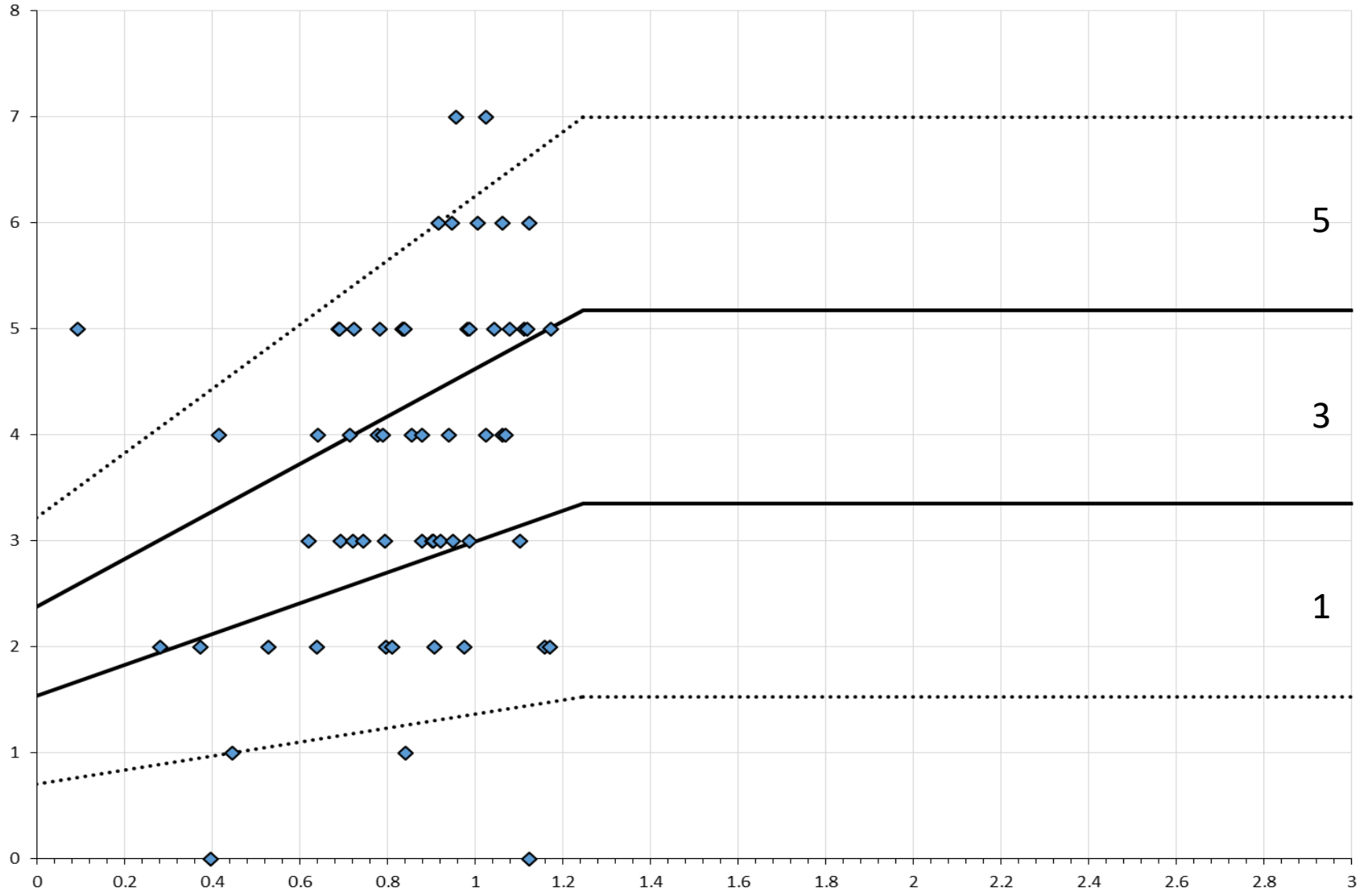
ACF6b – SEP. Number of species ranked as intolerants in the Southeastern Plains ecoregion of the Apalachicola drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



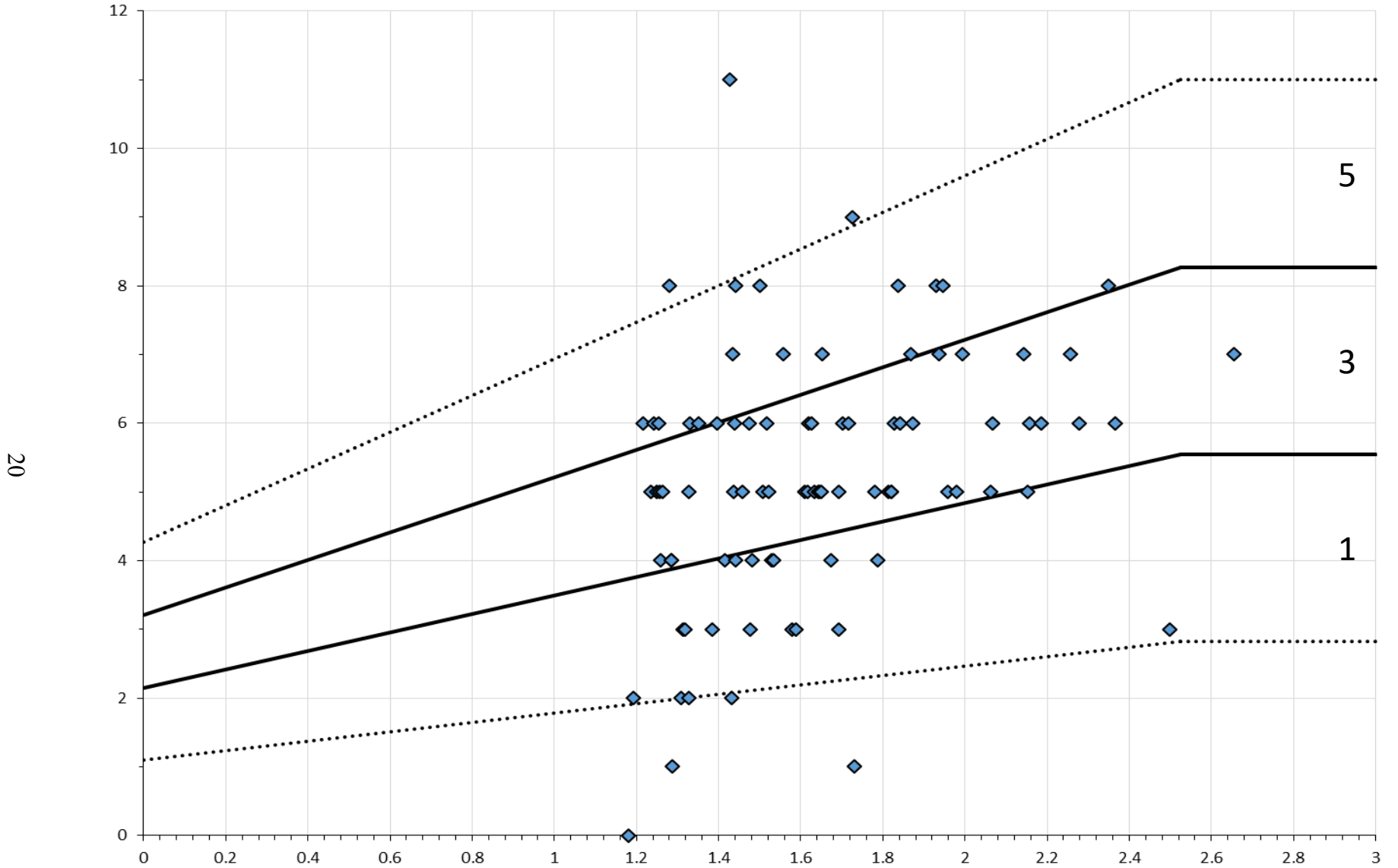
AS1 – SEP. Total number of native species in the Southeastern Plains ecoregion of the Atlantic Slope drainage basins plotted against the log (base 10) transformed value of the drainage basin area (square miles).



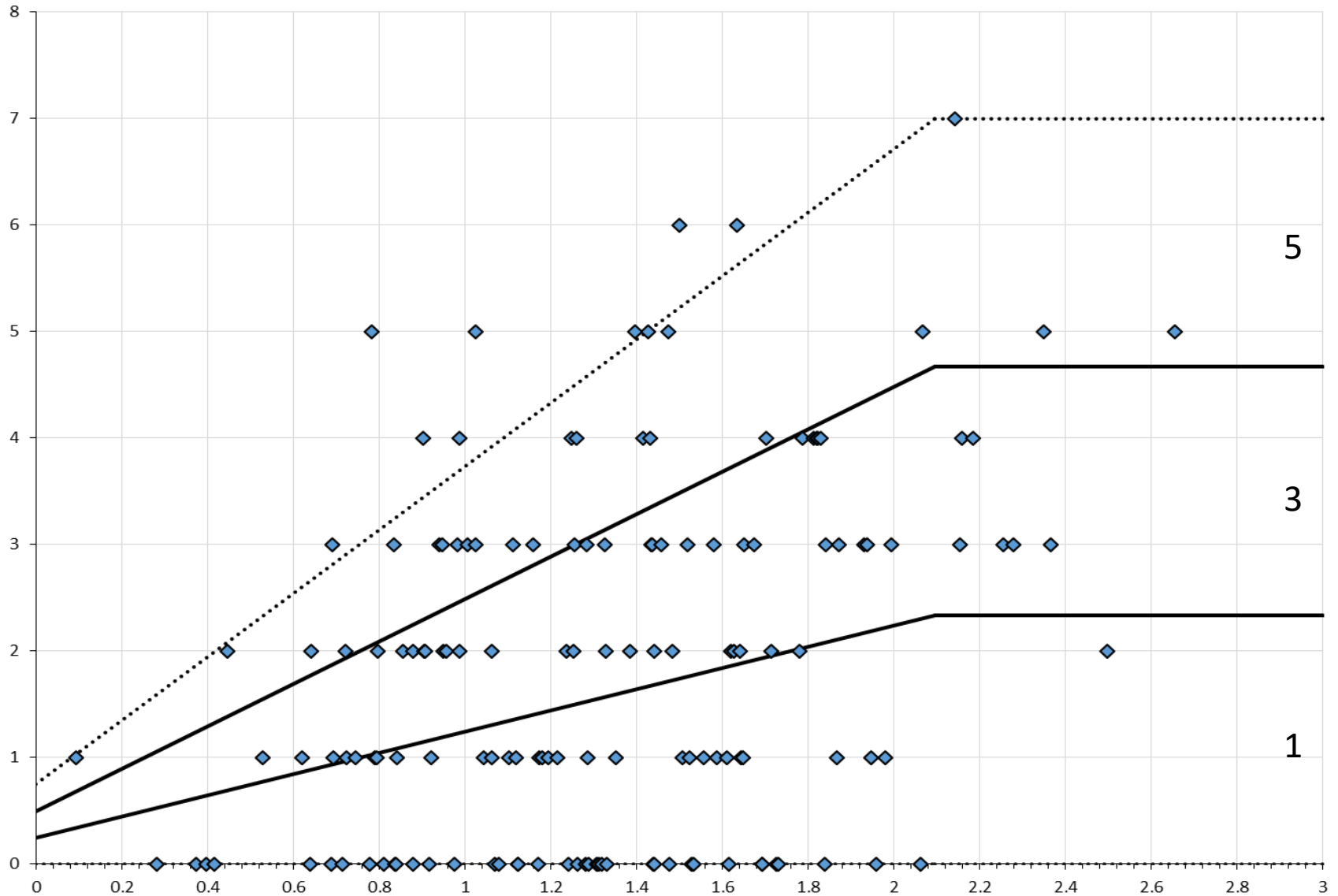
AS2 – SEP. Number of benthic invertivore species in the Southeastern Plains ecoregion of the Atlantic Slope drainage basins plotted against the log (base 10) transformed value of the drainage basin area (square miles).



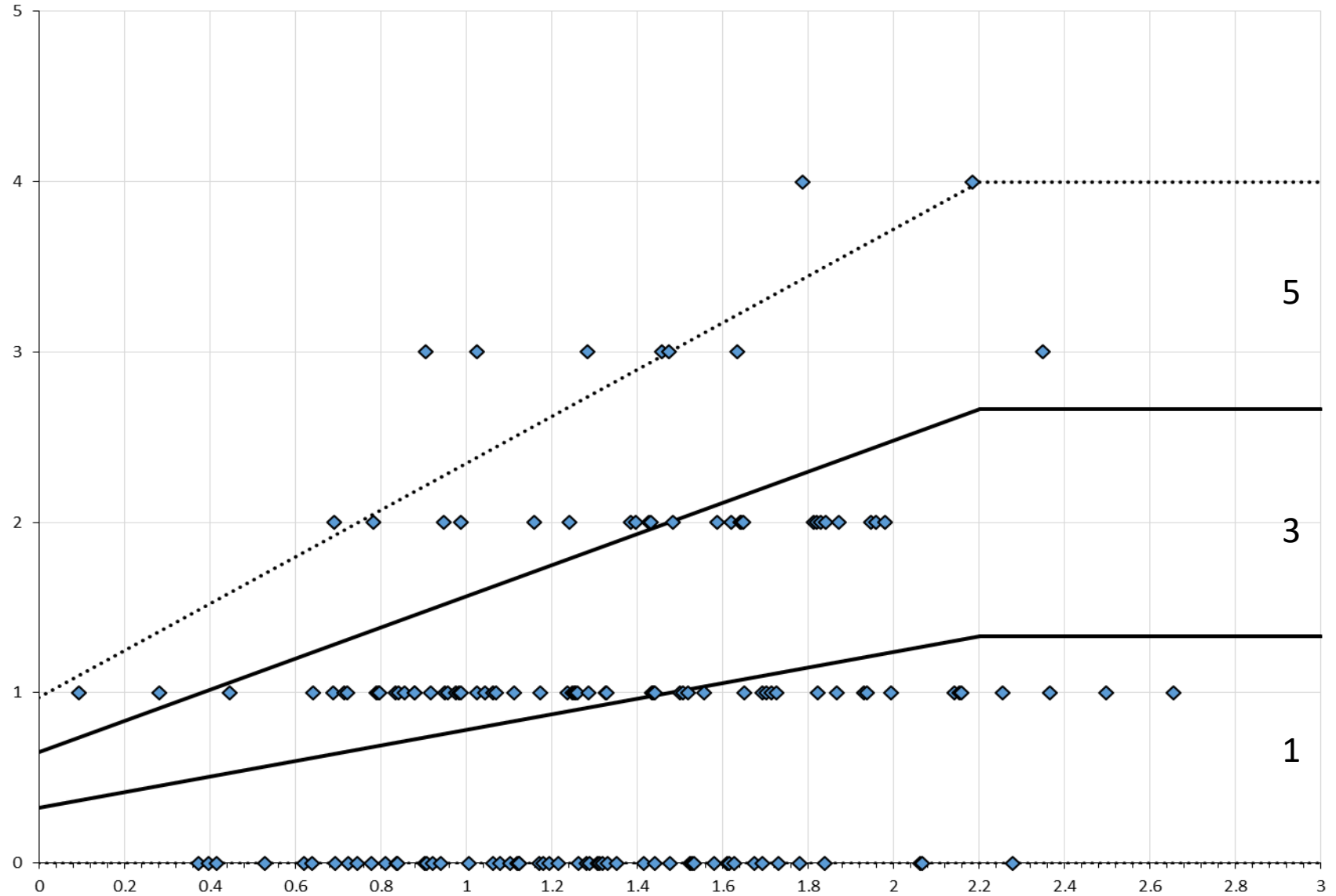
AS3a - SEP. Number of native sunfish species in headwater streams (<15 square miles drainage basin area) in the Southeastern Plains ecoregion of the Atlantic Slope drainage basins plotted against the log (base 10) transformed value of the drainage basin area (square miles).



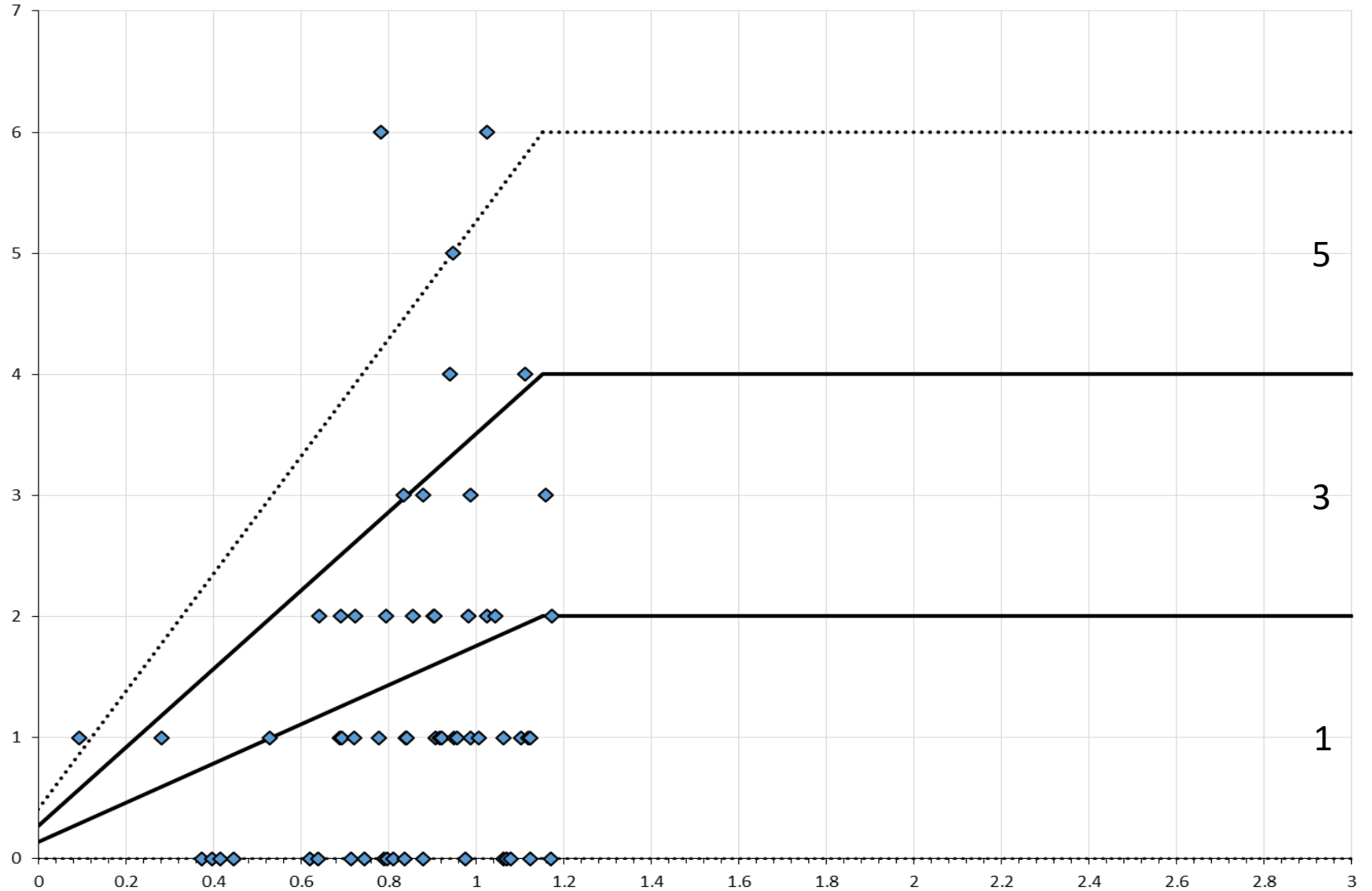
AS3b - SEP. Number of native centrarchid species in the Southeastern Plains ecoregion of the Atlantic Slope drainage basins plotted against the log (base 10) transformed value of the drainage basin area (square miles).



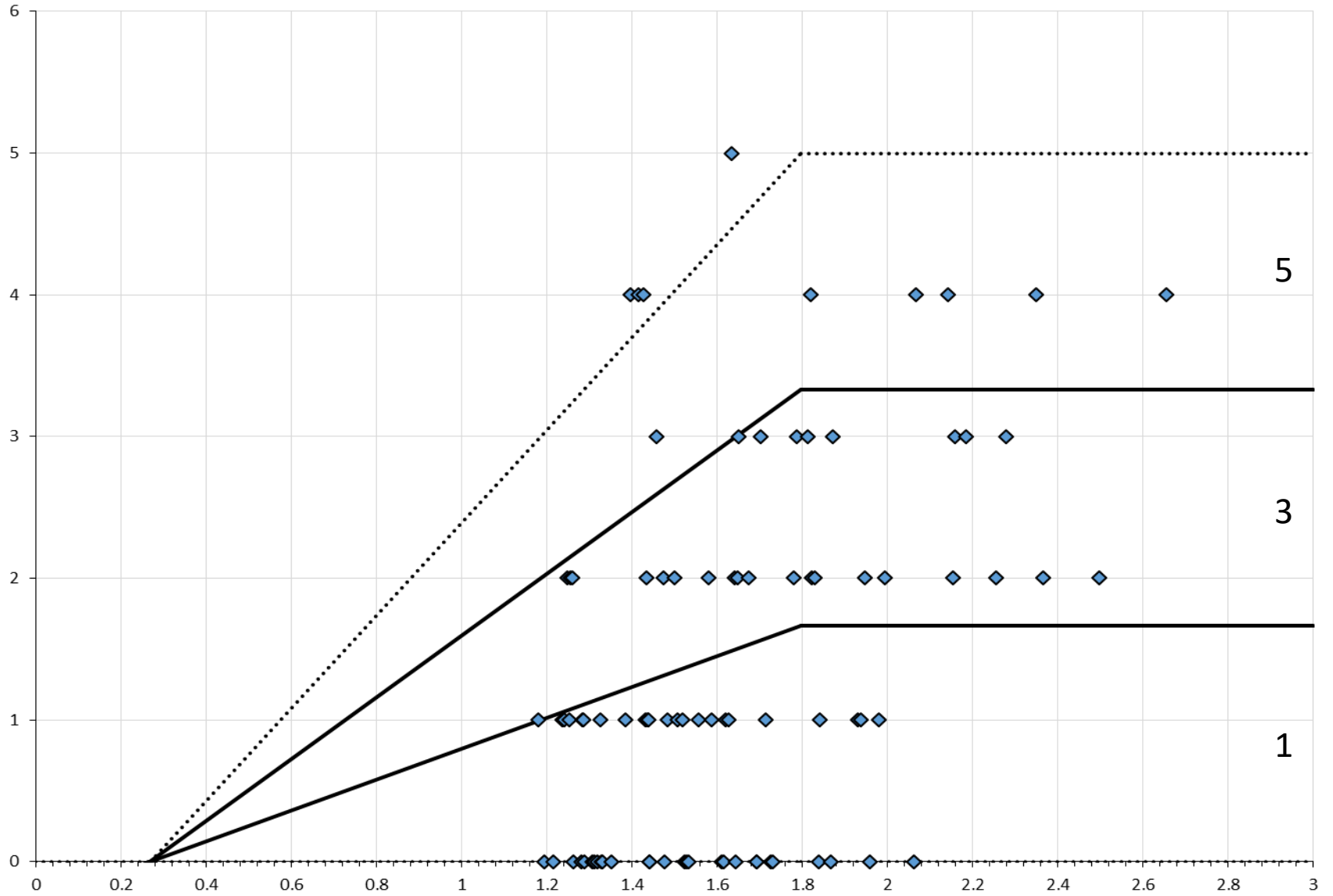
AS4 – SEP. Number of native insectivorous cyprinid species in the Southeastern Plains ecoregion of the Atlantic Slope drainage basins plotted against the log (base 10) transformed value of the drainage basin area (square miles).



AS5 – SEP. Number of native round-bodied sucker species in the Southeastern Plains ecoregion of the Atlantic Slope drainage basins plotted against the log (base 10) transformed value of the drainage basin area (square miles).



AS6a - SEP. Total number of species ranked as sensitive at headwater sites (<15 square miles drainage basin area) in the Southeastern Plains ecoregion of the Atlantic Slope drainage basins plotted against the log (base 10) transformed value of the drainage basin area (square miles).



AS6b - SEP. Number of species ranked as intolerants in the Southeastern Plains ecoregion of the Atlantic Slope drainage basins plotted against the log (base 10) transformed value of the drainage basin area (square miles).

Fish list for the Apalachicola and Atlantic Slope drainage basins in the Southeastern Plains ecoregion of Georgia.

Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Petromyzontidae				
Southern Brook Lamprey* <i>Ichthyomyzon gagei</i>		HB		CHT, FLI
Sea Lamprey <i>Petromyzon marinus</i>		PR		ALT, OCM, OCO, OGE, SAV
Lepisosteidae				
Florida Gar* <i>Lepisosteus platyrhincus</i>		CR		ALT, OCM, OCO, OGE, SAV
Longnose Gar* <i>Lepisosteus osseus</i>		CR		CHT, FLI, ALT, OCM, OCO, OGE, SAV
Spotted Gar* <i>Lepisosteus oculatus</i>		CR		CHT, FLI
Amiidae				
Bowfin* <i>Amia calva</i>		CR		CHT, FLI, ALT, OCM, OCO, OGE, SAV
Anguillidae				
American Eel* <i>Anguilla rostrata</i>		CR		CHT, FLI, ALT, OCM, OCO, OGE, SAV
Clupeidae				
Alabama Shad <i>Alosa alabamae</i>		OM		CHT, FLI
Skipjack Herring <i>Alosa chrysochloris</i>		CR		CHT
American Shad <i>Alosa sapidissima</i>		IN		ALT, OCM, OCO, OGE, SAV
Gizzard Shad <i>Dorosoma cepedianum</i>		OM		CHT, FLI, ALT, OCM, OCO, OGE, SAV

Fish list for the Apalachicola and Atlantic Slope drainage basins in the Southeastern Plains ecoregion of Georgia.

Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Threadfin Shad <i>Dorosoma petenense</i>		OM		CHT, FLI, ALT**, OCM**, OCO**, SAV**
Cyprinidae Bluefin Stoneroller <i>Campostoma pauciradii</i>		HB		CHT, FLI
Goldfish <i>Carassius auratus</i>		OM		EXOTIC
Grass Carp <i>Ctenopharyngodon idella</i>		HB		EXOTIC
Ocmulgee Shiner* <i>Cyprinella callisema</i>	INT	IC	SMM	OCM, OCO, OGE
Bluestripe Shiner <i>Cyprinella callitaenia</i>		IC	SMM	CHT, FLI
Bannerfin Shiner* <i>Cyprinella leedsi</i>		IC	SMM	ALT, OCM, OCO, OGE, SAV
Whitefin Shiner <i>Cyprinella nivea</i>		IC	SMM	SAV
Blacktail Shiner* <i>Cyprinella venusta</i>		IC		CHT, FLI
Common Carp <i>Cyprinus carpio</i>		GE		EXOTIC

Fish List for the Apalachicola and Atlantic Slope Drainage Basins in the Southeastern Plains Ecoregion of Georgia.

Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Eastern Silvery Minnow* <i>Hybognathus regius</i>	INT	HB		ALT, OCM, OCO, OGE, SAV
Rosyface Chub* <i>Hybopsis rubrifrons</i>	HWI	IC	SMM	OCM, OCO, OGE, SAV
Clear Chub* <i>Hybopsis winchelli</i>	INT	IC	SMM	CHT, FLI
Bandfin Shiner* <i>Luxilus zonistius</i>		IC		CHT, FLI
Blacktip Shiner* <i>Lythrurus atrapiculus</i>	INT	IC		CHT, FLI
Bluehead Chub* <i>Nocomis leptocephalus</i>		OM		CHT, FLI, OCM, OCO, OGE, SAV
Golden Shiner* <i>Notemigonus crysoleucas</i>		GE		CHT, FLI, ALT, OCM, OCO, OGE, SAV
Longjaw Minnow* <i>Notropis amplamala</i>		IC	SMM	CHT, FLI, OCM**, OCO**
Ironcolor Shiner* <i>Notropis chalybaeus</i>	INT	IC		FLI, ALT, OCM, OCO, OGE, SAV
Dusky Shiner* <i>Notropis cummingsae</i>		IC		CHT, ALT, OCM, OCO, OGE, SAV
Redeye Chub* <i>Notropis harperi</i>	INT	IC	SMM	CHT, FLI, OCM, OCO
Spottail Shiner* <i>Notropis hudsonius</i>		IC	SMM	FLI**, OCM, OCO, OGE, SAV
Highscale Shiner <i>Notropis hypsilepis</i>	HWI	IC	SMM	CHT, FLI

Fish List for the Apalachicola and Atlantic Slope Drainage Basins in the Southeastern Plains Ecoregion of Georgia.

Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Longnose Shiner* <i>Notropis longirostris</i>		IC	SMM	CHT, FLI
Yellowfin Shiner* <i>Notropis lutipinnis</i>		IC		FLI, OCM, OCO, OGE, SAV
Tailight Shiner* <i>Notropis maculatus</i>	INT	IC	SMM	CHT, FLI, ALT, OCM, OCO, OGE, SAV
Coastal Shiner* <i>Notropis petersoni</i>	INT	IC		CHT, FLI, ALT, OCM, OCO, OGE, SAV
Weed Shiner* <i>Notropis texanus</i>		IC		CHT, FLI, OCM**, OCO**
Pugnose Minnow* <i>Opsopoeodus emiliae</i>	INT	IC		CHT, FLI, ALT, OCM, OCO, OGE, SAV
Broadstripe Shiner* <i>Pteronotropis euryzonus</i>		IC		CHT
Apalachee Shiner* <i>Pteronotropis grandipinnis</i>		IC		CHT, FLI
Lowland Shiner* <i>Pteronotropis stonei</i>		IC		ALT, OCM, OCO, OGE, SAV
Bluenose Shiner <i>Pteronotropis welaka</i>		IC	SMM	CHT, FLI
Creek Chub* <i>Semotilus atromaculatus</i>		GE		OGE, SAV
Dixie Chub* <i>Semotilus thoreauianus</i>		GE		CHT, FLI
Catostomidae Quillback <i>Carpoides cyprinus</i>		OM		CHT

Fish List for the Apalachicola and Atlantic Slope Drainage Basins in the Southeastern Plains Ecoregion of Georgia.

Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Western Creek Chubsucker* <i>Erimyzon claviformis</i>		IN	RBS	CHT, FLI
Eastern Creek Chubsucker* <i>Erimyzon oblongus</i>		IN	RBS	ALT, OCM, OCO, OGE, SAV
Lake Chubsucker* <i>Erimyzon sucetta</i>	INT	IN	RBS	CHT, FLI, ALT, OCM, OCO, OGE, SAV
Northern Hogsucker* <i>Hypentelium nigricans</i>		IN	RBS	SAV
Spotted Sucker* <i>Minytrema melanops</i>		IN	RBS	CHT, FLI, ALT, OCM, OCO, OGE, SAV
Notchlip Redhorse* <i>Moxostoma collapsum</i>		IN	RBS	ALT, OCM, OCO, OGE, SAV
Greater Jumprock* <i>Scartomyzon lachneri</i>		IN	RBS	CHT, FLI
Robust Redhorse <i>Moxostoma robustum</i>		IN	RBS	ALT, OCM, OCO, OGE, SAV
Striped Jumprock* <i>Scartomyzon rupiscartes</i>		IN	RBS	OCM, OCO
Apalachicola Redhorse* <i>Moxostoma</i> sp.	INT	IN	RBS	CHT, FLI
Ictaluridae				
Snail Bullhead* <i>Ameiurus brunneus</i>		GE		CHT, FLI, ALT, OCM, OCO, OGE, SAV
White Catfish <i>Ameiurus catus</i>		GE		CHT, FLI, ALT, OCM, OCO, OGE, SAV

Fish List for the Apalachicola and Atlantic Slope Drainage Basins in the Southeastern Plains Ecoregion of Georgia.

Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Yellow Bullhead* <i>Ameiurus natalis</i>			GE	CHT, FLI, ALT, OCM, OCO, OGE, SAV
Brown Bullhead* <i>Ameiurus nebulosus</i>		GE		CHT, FLI, ALT, OCM, OCO, OGE, SAV
Flat Bullhead* <i>Ameiurus platycephalus</i>		GE		ALT, OCM, OCO, OGE, SAV
Spotted Bullhead <i>Ameiurus serracanthus</i>		IN		CHT, FLI
Blue Catfish <i>Ictalurus furcatus</i>		CR		CHT**, FLI**, ALT**, OCM**, OCO**
Channel Catfish* <i>Ictalurus punctatus</i>		GE		CHT, FLI, ALT, OCM, OCO, OGE, SAV
Tadpole Madtom* <i>Noturus gyrinus</i>	HWI	IN	BI	CHT, FLI, ALT, OCM, OCO, OGE, SAV
Margined Madtom* <i>Noturus insignis</i>		IN	BI	SAV
Speckled Madtom* <i>Noturus leptacanthus</i>		IN	BI	CHT, FLI, ALT, OCM, OCO, OGE, SAV
Flathead Catfish* <i>Pylodictis olivaris</i>		CR		CHT**, FLI**, ALT**, OCM**, OCO**, OGE**, SAV**
Esocidae Redfin Pickerel* <i>Esox americanus</i>		CR		CHT, FLI, ALT, OCM, OCO, OGE, SAV
Chain Pickerel* <i>Esox niger</i>		CR		CHT, FLI, ALT, OCM, OCO, OGE, SAV
Umbridae Eastern Mudminnow <i>Umbra pygmaea*</i>		IN		ALT, OGE, SAV

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Aphredoderidae Pirate Perch* <i>Aphredoderus sayanus</i>		IN		CHT, FLI, ALT, OCM, OCO, OGE, SAV
Amblyopsidae Swampfish <i>Clologaster cornuta</i>		IN		ALT, OCM, OCO, OGE, SAV
Fundulidae Banded Topminnow <i>Fundulus cingulatus</i>		IN		CHT, FLI
Golden Topminnow* <i>Fundulus chrysotus</i>		OM		CHT, FLI, ALT, OCM, OCO, OGE, SAV
Russetfin Topminnow* <i>Fundulus escambiae</i>		IN		CHT, FLI
Lined Topminnow* <i>Fundulus lineolatus</i>		OM		ALT, OCM, OCO, OGE, SAV
Blackspotted Topminnow* <i>Fundulus olivaceus</i>		IN		CHT
Pygmy Killifish <i>Leptolucania ommata</i>		IN		CHT, FLI, ALT
Bluefin Killifish <i>Lucania goodei</i>				FLI, OGE
Poeciliidae Mosquitofish* <i>Gambusia sp.</i>		OM		CHT, FLI, ALT, OCM, OCO, OGE, SAV
Least Killifish* <i>Heterandria formosa</i>		OM		CHT, FLI, ALT, OCM, OCO, OGE, SAV

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Antheridae Brook Silversides* <i>Labidesthes sicculus</i>		IN		CHT, FLI, ALT, OCM, OCO, OGE, SAV
Percichthyidae White Perch <i>Morone americana</i>		CR		SAV**
White Bass <i>Morone chrysops</i>		CR		CHT**, FLI**, SAV**
Striped Bass* <i>Morone saxatilis</i>		CR		CHT, FLI, ALT, OCM, OCO, OGE, SAV
Elassomatidae Everglades Pygmy Sunfish* <i>Elassoma evergladei</i>		IN		FLI, ALT, OCM, OCO, OGE, SAV
Gulf Coast Pygmy Sunfish <i>Elassoma gilberti</i>		IN		FLI
Bluebarred Pygmy Sunfish <i>Elassoma okatie</i>		IN		SAV
Okefenokee Pygmy Sunfish <i>Elassoma okefenokee</i>		IN		ALT, OCM, OCO
Banded Pygmy Sunfish* <i>Elassoma zonatum</i>		IN		CHT, FLI, ALT, OCM, OCO, OGE, SAV
Centrarchidae Mud Sunfish* <i>Acantharchus pomotis</i>		IN	SF	ALT, OCM, OCO, OGE, SAV
Shadow Bass* <i>Ambloplites ariommus</i>	INT	CR	SF	CHT, FLI
Flier* <i>Centrarchus macropterus</i>		IN	SF	CHT, FLI, ALT, OCM, OCO, OGE, SAV

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Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Blackbanded Sunfish <i>Enneacanthus chaetodon</i>	INT	IN	SF	SAV
Bluespotted Sunfish* <i>Enneacanthus gloriosus</i>		IN	SF	CHT, FLI, ALT, OCM, OCO, OGE, SAV
Banded Sunfish* <i>Enneacanthus obesus</i>		IN	SF	ALT, OCM, OCO, OGE, SAV
Redbreast Sunfish* <i>Lepomis auritus</i>		IN	SF	CHT, FLI, ALT, OCM, OCO, OGE, SAV
Green Sunfish* <i>Lepomis cyanellus</i>		GE		CHT**, FLI**, ALT**, OCM**, OCO**, OGE**, SAV**
Warmouth* <i>Lepomis gulosus</i>		CR	SF	CHT, FLI, ALT, OCM, OCO, OGE, SAV
Orangespotted Sunfish <i>Lepomis humilus</i>				CHT**, FLI**
Bluegill* <i>Lepomis macrochirus</i>		IN	SF	CHT, FLI, ALT, OCM, OCO, OGE, SAV
Dollar Sunfish* <i>Lepomis marginatus</i>		IN	SF	CHT, FLI, ALT, OCM, OCO, OGE, SAV
Longear Sunfish* <i>Lepomis megalotis</i>		IN		CHT**, FLI**, OCM**, OCO**, OGE**
Redear Sunfish* <i>Lepomis microlophus</i>		IN	SF	CHT, FLI, ALT, OCM, OCO, OGE, SAV
Spotted Sunfish* <i>Lepomis punctatus</i>		IN	SF	CHT, FLI, ALT, OCM, OCO, SAV
Shoal Bass* <i>Micropterus cataractae</i>	INT	CR	CENT	CHT, FLI, OCM**, OCO**

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Alabama Bass* <i>Micropterus henshalli</i>		CR		CHT**, FLI**, OCO**, OCM**, SAV**
Spotted Bass* <i>Micropterus punctulatus</i>		CR		CHT**, FLI**
Largemouth Bass* <i>Micropterus salmoides</i>		CR	CENT	CHT, FLI, ALT, OCM, OCO, OGE, SAV
White Crappie <i>Pomoxis annularis</i>		CR		CHT**, FLI**, ALT**, OCM**, OCO**, SAV**
Black Crappie* <i>Pomoxis nigromaculatus</i>		CR	CENT	CHT, FLI, ALT, OCM, OCO, OGE, SAV
Percidae				
Brown Darter* <i>Etheostoma edwini</i>	INT	IN	BI	CHT, FLI
Savannah Darter* <i>Etheostoma fricksium</i>		IN	BI	SAV
Swamp Darter* <i>Etheostoma fusiforme</i>		IN	BI	CHT, FLI, ALT, OCM, OCO, OGE, SAV
Christmas Darter* <i>Etheostoma hopkinsi</i>	HWI	IN	BI	ALT, OCM, OCO, OGE, SAV
Turquoise Darter* <i>Etheostoma inscriptum</i>	INT	IN	BI	OGE, SAV
Tessellated Darter* <i>Etheostoma olmstedi</i>	INT	IN	BI	ALT, OCM, OCO, OGE, SAV
Goldstripe Darter* <i>Etheostoma parvipinne</i>		IN	BI	CHT, FLI, OCM, OCO
Sawcheek Darter* <i>Etheostoma serrifer</i>		IN	BI	ALT, OCM, OCO, OGE, SAV
Gulf Darter* <i>Etheostoma swaini</i>	INT	IN	BI	CHT, FLI

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Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Halloween Darter <i>Percina crypta</i>		IN	BI	FLI
Blackbanded Darter* <i>Percina nigrofasciata</i>		IN	BI	CHT, FLI, ALT, OCM, OCO, OGE, SAV
Yellow Perch* <i>Perca flavescens</i>		CR		EXOTIC

* = collected by Georgia DNR Stream Survey Team in the Southeastern Plains Ecoregion

Water Quality Tolerance: **HWI** = headwater intolerant; **INT** = intolerant

Feeding Guild: **CR** = top carnivore; **GE** = generalist; **HB** = herbivore; **IC** = insectivorous cyprinid; **IN** = insectivore/invertivore, **PR** = parasitic

Species Category: **BI** = benthic insectivore species; **CENT** = centrarchid species; **RBS** = round-bodied sucker species; **SF** = sunfish species; **SMM** = subterminal mouth minnow species

Drainage Basin: **ALT** = Altamaha; **CHT** = Chattahoochee; **FLI** = Flint; **OCM** = Ocmulgee; **OCO** = Oconee; **OGE** = Ogeechee; **SAV** = Savannah

EXOTIC = introduced to Georgia

** = species introduced to the indicated drainage basin