

Part II:
**Scoring Criteria for the Index of Biotic Integrity to Monitor Fish
Communities in Wadeable Streams in the Piedmont Ecoregion of
Georgia**

Georgia Department of Natural Resources
Wildlife Resources Division
Fisheries Management Section

2020

Table of Contents

Introduction.....	Pg. 1
Map of Piedmont Ecoregion.....	Pg. 3
Table 1. State Listed Fish in the Piedmont Ecoregion.....	Pg. 4
Table 2. IBI Metrics and Scoring Criteria.....	Pg. 5
References.....	Pg. 8
Appendix I.....	Pg. 9
Apalachicola Basin Group (ACF) MSR Graphs.....	Pg. 10
Alabama Basin Group (ACT) MSR Graphs.....	Pg. 18
Atlantic Slope Basins Group (AS) MSR Graphs.....	Pg. 26
Piedmont Ecoregion Fish List.....	Pg. 34

Introduction

The Piedmont ecoregion is one of six Level III ecoregions found in Georgia (Part I, Figure 1). The Piedmont ecoregion covers most of the north central portion of Georgia, between the Southeastern Plains ecoregion to the south and the Ridge and Valley and Blue Ridge Mountains ecoregions to the north. It is the second largest ecoregion in Georgia, covering over 17,000 square miles (U.S. Census Bureau 2000) and includes all or portions of 65 counties (Figure 1).

The biotic index developed and used by GAWRD is based on the Level III ecoregion delineations (Griffith *et al.* 2001). The metrics and scoring criteria adapted to the Piedmont ecoregion were developed from biomonitoring samples collected in the eight major drainage basins located in the Piedmont ecoregion. These major drainage basins include the Chattahoochee, Coosa, Flint, Ocmulgee, Oconee, Ogeechee, Savannah, and Tallapoosa. Based on similarities in species richness and composition, the eight major drainage basins were aligned into three basin groups. The Alabama Drainage Basin (ACT) includes the Coosa and Tallapoosa drainage basins; the Apalachicola Drainage Basin (ACF) includes the Chattahoochee and Flint drainage basins; and the Atlantic Slope Drainage Basin (AS) include the Ocmulgee, Oconee, Ogeechee, and Savannah drainage basins.

Between 1998 and 2018, a total of 769 biomonitoring samples have been collected by GAWRD in the Piedmont ecoregion. Out of these 769 samples, the (ACT) is the most species rich, with a total of 71 native species collected. Sixty-five native species have been collected in the (AS) and 63 native species have been collected in the (ACF).

A total of 23 state listed species have been collected in the Piedmont ecoregion (Table 1). The state listed fish collected in the Piedmont ecoregion are ranked as endangered (E), threatened (T), or rare (R) based on the Endangered Wildlife Act of 1973 (GAWRD, Wildlife Conservation Section; <http://georgiabiodiversity.org/>, 2019).

Based on the IBI integrity classes (Part I, Table 3), 30 sites scored in the excellent class, 113 scored in the good class, 202 scored in the fair class, 139 scored in the poor class, and 158 scored in the very poor class. IBI scores in the Piedmont ecoregion ranged from a maximum of 56 to a minimum of 10. Based on the IBI scoring criteria, 46.3% of the streams sampled in the Piedmont ecoregion scored in the poor and very poor integrity class ($[297/642] * 100 = 46.3$). Major impacts to streams include the effects of erosion and sedimentation, impoundments, point

source pollution, and urban/suburban development. The Piedmont ecoregion is the most densely populated area in Georgia, averaging nearly 316 individuals per square mile (United States Census Bureau 2000). Approximately 63% of the total population of Georgia lives in the Piedmont ecoregion, an area covering only 29.5% of the entire state. Most of the major metropolitan areas in Georgia are in the Piedmont ecoregion, including Atlanta, Gainesville, Athens, and portions of Columbus, Macon, and Augusta.

Table 2 shows the scoring criteria for the IBI metrics in the Piedmont ecoregion. The Maximum Species Richness (MSR) graphs for each basin group within the Piedmont ecoregion are included in (Appx. 1). Figures ACF1 – PDM through ACF6b - PDM depict the (MSR) graphs used to score the species richness metrics (metrics 1- 6b) in the (ACF). Figures ACT1 - PDM through ACT6b - PDM depict the (MSR) graphs used to score the species richness metrics in the (ACT). Figures AS1 - PDM through AS6b - PDM depict the (MSR) graphs used to score the species richness metrics in the (AS). The fish list for the Piedmont ecoregion showing water quality tolerance rankings, feeding guilds, and species categories used in calculating the IBI score are also included in (Appx. 1).

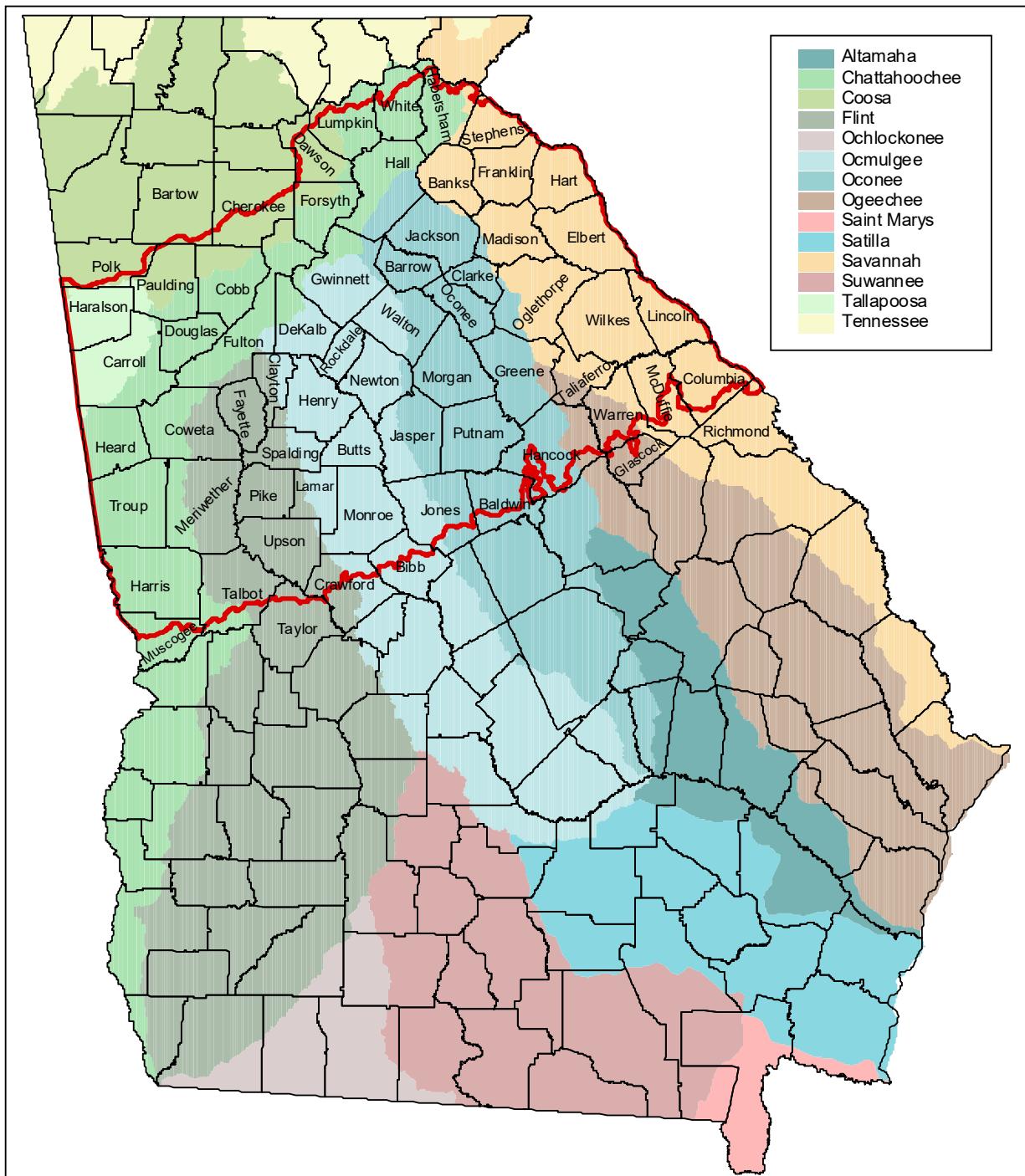


Figure 1. Level III Piedmont ecoregion (outlined in bold red) in Georgia. Major drainage basins include the Coosa, Tallapoosa, Chattahoochee, Flint, Ocmulgee, Oconee, Ogeechee, and Savannah.

Table 1. State listed fish found in the Piedmont ecoregion of Georgia (GAWRD, Wildlife Conservation Section, <http://georgiabiodiversity.org/> 2019).

Species	State	Federal	Basin
	Status	Status	
Atlantic Sturgeon (<i>Acipenser oxyrinchus oxyrinchus</i>)	E	E	OCM/OCO/OGE/SAV
Spotted Bullhead (<i>Ameiurus serracanthus</i>)	R	None	CHT
Bluestripe Shiner (<i>Cyprinella callitaenia</i>) *	R	None	CHT, FLI
Altamaha Shiner (<i>Cyprinella xaenura</i>) *	T	None	OCM, OCO
Holiday Darter (<i>Etheostoma brevirostrum</i>) *	E	None	COO
Lipstick Darter (<i>Etheostoma chuckwachatte</i>)*	E	None	TAL
Etowah Darter (<i>Etheostoma etowahae</i>) *	E	E	COO
Goldstripe Darter (<i>Etheostoma parvipinne</i>) *	R	None	OCM
Rock Darter (<i>Etheostoma rupestre</i>)	R	None	COO
Cherokee Darter (<i>Etheostoma scotti</i>) *	T	T	COO
Tallapoosa Darter (<i>Etheostoma tallapoosae</i>) *	R	None	TAL
Stippled Stuffish (<i>Fundulus bifax</i>)	E	None	TAL
Lined Chub (<i>Hybopsis lineapunctata</i>) *	R	None	COO, TAL
Coosa Chub (<i>Macrhybopsis etnieri</i>)	R	None	COO
Robust Redhorse (<i>Moxostoma robustum</i>)	E	None	OCM/OCO/OGE/SAV
Highscale Shiner (<i>Notropis hypsilepis</i>) *	R	None	CHT, FLI
Sandbar Shiner (<i>Notropis scepticus</i>) *	R	None	SAV
Frecklebelly Madtom (<i>Noturus munitus</i>)	E	None	COO
Amber Darter (<i>Percina antesella</i>)	E	E	COO
Halloween Darter (<i>Percina crypta</i>) *	T	None	CHT, FLI
Bridled Darter (<i>Percina kusha</i>) *	E	None	COO
Freckled Darter (<i>Percina lenticula</i>)	E	None	COO
Muscadine Darter (<i>Percina smithvanizi</i>) *	R	None	TAL

* = collected by Georgia DNR Stream Survey Team

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

Basin: CHT = Chattahoochee; COO = Coosa; OCM = Ocmulgee; OCO = Oconee;

SAV = Savannah; TAL = Tallapoosa

Table 2. Index of Biotic Integrity metrics for wadeable streams in the Piedmont ecoregion of Georgia. ACF includes the Chattahoochee and Flint drainage basins, ACT includes the Coosa and Tallapoosa drainage basins, and AS includes the Ocmulgee, Oconee, Ogeechee, and Savannah drainage basins.

Metric		Basin Group	Scoring Criteria
<u>Species Richness Metrics</u>		<u>5/3 Breaks</u>	<u>3/1 Breaks</u>
1. Number of native species	ACF	$y = 9.33x + 6.69$ (2.34, 28.5)	$y = 6.57x + 4.71$ (2.34, 20.1)
	ACT	$y = 9.27x + 8.49$ (1.88, 26.0)	$y = 6.76x + 6.19$ (1.88, 18.9)
	AS	$y = 9.93x + 5.14$ (1.74, 22.5)	$y = 7.04x + 3.64$ (1.74, 15.9)
2. Number of benthic invertivore species	ACF	$y = 1.10x + 1.07$ (1.45, 2.7)	$y = 0.55x + 0.53$ (1.45, 1.3)
	ACT	$y = 1.97x + 1.91$ (1.74, 5.3)	$y = 0.99x + 0.96$ (1.74, 2.7)
	AS	$y = 2.41x + 0.35$ (1.52, 4.0)	$y = 1.21x + 0.17$ (1.52, 2.0)
3a. Number of native sunfish species ^a	ACF	$y = 1.47x + 1.94$ (1.19, 3.7)	$y = 0.95x + 1.26$ (1.19, 2.4)
	ACT	$y = 2.02x + 0.63$ (1.01, 2.7)	$y = 1.01x + 0.31$ (1.01, 1.3)
	AS	$y = 1.14x + 1.50$ (1.62, 3.3)	$y = 0.57x + 0.75$ (1.62, 1.7)
3b. Number of native centrarchid species ^b	ACF	$y = 2.97x + 1.91$ (1.57, 6.6)	$y = 1.86x + 1.20$ (1.57, 4.1)
	ACT	$y = 3.20x + 1.47$ (1.67, 6.8)	$y = 2.17x + 1.00$ (1.67, 4.6)
	AS	$y = 2.59x + 1.25$ (1.44, 5.0)	$y = 1.55x + 0.75$ (1.44, 3.0)
4. Number of native insectivorous cyprinid species	ACF	$y = 2.78 x + 0.96$ (1.57, 5.3)	$y = 1.39x + 0.48$ (1.57, 2.7)
	ACT	$y = 1.75x + 1.38$ (1.88, 4.7)	$y = 0.87x + 0.69$ (1.88, 2.3)
	AS	$y = 2.36x + 0.76$ (1.56, 4.4)	$y = 1.53x + 0.49$ (1.56, 2.9)
5. Number of native round-bodied sucker species	ACF	$y = 1.61x + 0.67$ (1.66, 3.3)	$y = 0.80x + 0.33$ (1.66, 1.7)
	ACT	$y = 1.37x + 0.85$ (1.62, 3.1)	$y = 0.95x + 0.59$ (1.62, 2.1)

	AS	$y = 1.70x + 0.51 (2.05, 4.0)$	$y = 0.85x + 0.26 (2.05, 2.0)$
6a. Number of sensitive species ^a	ACF	$y = 0.72x + 0.65 (2.79, 2.7)$	$y = 0.36x + 0.33 (2.79, 1.3)$
	ACT	$y = 3.06x + 0.10 (1.28, 4.0)$	$y = 1.53x + 0.05 (1.28, 2.0)$
	AS	$y = 2.28x + 0.74 (1.14, 3.3)$	$y = 1.14x + 0.37 (1.14, 1.7)$
6b. Number of intolerant species ^b	ACF	$y = 1.58x - 0.19 (2.23, 3.3)$	$y = 0.79x - 0.09 (2.23, 1.7)$
	ACT	$y = 2.86x - 0.37 (1.29, 3.3)$	$y = 1.43x - 0.18 (1.29, 1.7)$
	AS	$y = 2.18x - 0.51 (2.07, 4.0)$	$y = 1.09x - 0.26 (2.07, 2.0)$

		<u>Species Composition Metrics</u>	5	3	1
7.	Evenness	ACF	≥ 75.3	$75.3 - \geq 63.3$	< 63.3
		ACT	≥ 78.4	$78.4 - \geq 68.4$	< 68.4
		AS	≥ 71.9	$71.9 - \geq 58.6$	< 58.6
8.	% of individuals as <i>Lepomis</i> species	ACF	≤ 26.4	$26.4 - \leq 52.4$	> 52.4
		ACT	≤ 25.8	$25.8 - \leq 51.2$	> 51.2
		AS	≤ 22.1	$22.1 - \leq 44.3$	> 44.3
9.	% of individuals as insectivorous cyprinids	ACF	≥ 47.6	$47.6 - \geq 23.8$	< 23.8
		ACT	≥ 31.8	$31.8 - \geq 15.9$	< 15.9
		AS	≥ 47.7	$47.7 - \geq 25.7$	< 25.7
10a.	% of individuals as generalist feeders and herbivores ^a	ACF	≤ 29.9	$29.9 - \leq 53.7$	> 53.7
		ACT	≤ 30.0	$30.0 - \geq 51.3$	> 51.3
		AS	≤ 31.4	$31.4 - \leq 53.4$	> 53.4

<u>Species Composition Metrics</u>		<u>5</u>	<u>3</u>	<u>1</u>
10b. % of individuals as top carnivores ^b	ACF	$\geq 3.4 - \leq 8.4$	$\geq 1.7 - < 3.4$ $> 8.4 - \leq 10.1$	< 1.7 > 10.1
	ACT	$\geq 3.0 - \leq 7.7$	$\geq 1.5 - < 3.0$ $> 7.7 - \leq 9.2$	< 1.5 > 9.2
	AS	$\geq 2.2 - \leq 5.5$	$\geq 1.1 - < 2.2$ $> 5.5 - \leq 6.6$	< 1.1 > 6.6
11. % of individuals as benthic fluvial specialist	ACF	≥ 34.1	$34.1 - \geq 17.1$	< 17.1
	ACT	≥ 35.7	$35.7 - \geq 20.6$	< 20.6
	AS	≥ 28.3	$28.3 - \geq 14.2$	< 14.2
12. Number of individuals per 200 meters	ACF	≥ 681.7	$681.7 - \geq 351.9$	< 351.9
	ACT	≥ 538.4	$538.4 - \geq 301.4$	< 301.4
	AS	≥ 748.2	$748.2 - \geq 396.2$	< 396.2
13. % of individuals with external anomalies	ACF/ACT/AS	> 1.0 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

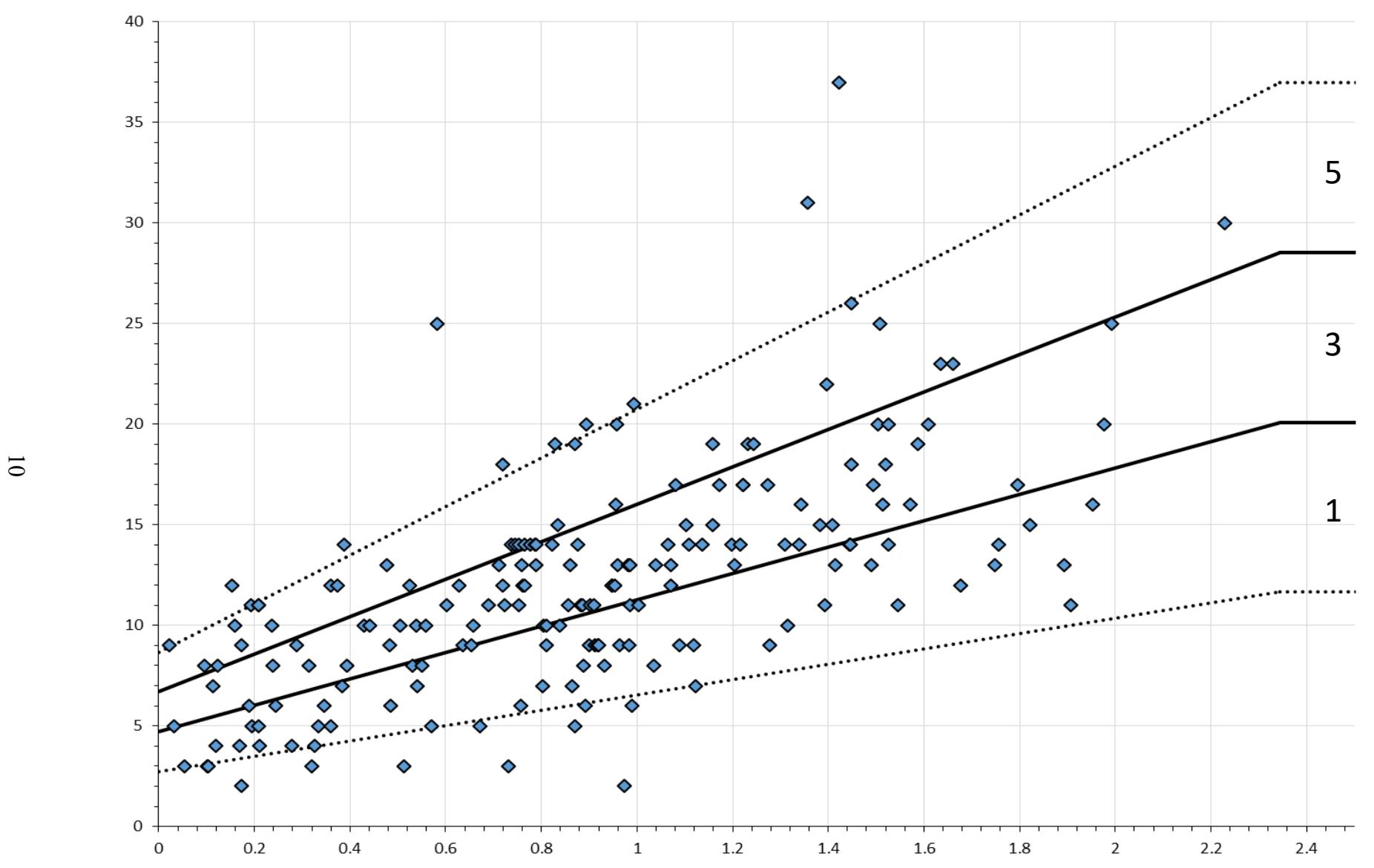
Georgia Department of Natural Resources, Wildlife Resources Division. 1999. Protected Animals of Georgia. Nongame Wildlife – Natural Heritage Section, Forsyth, Georgia.

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.

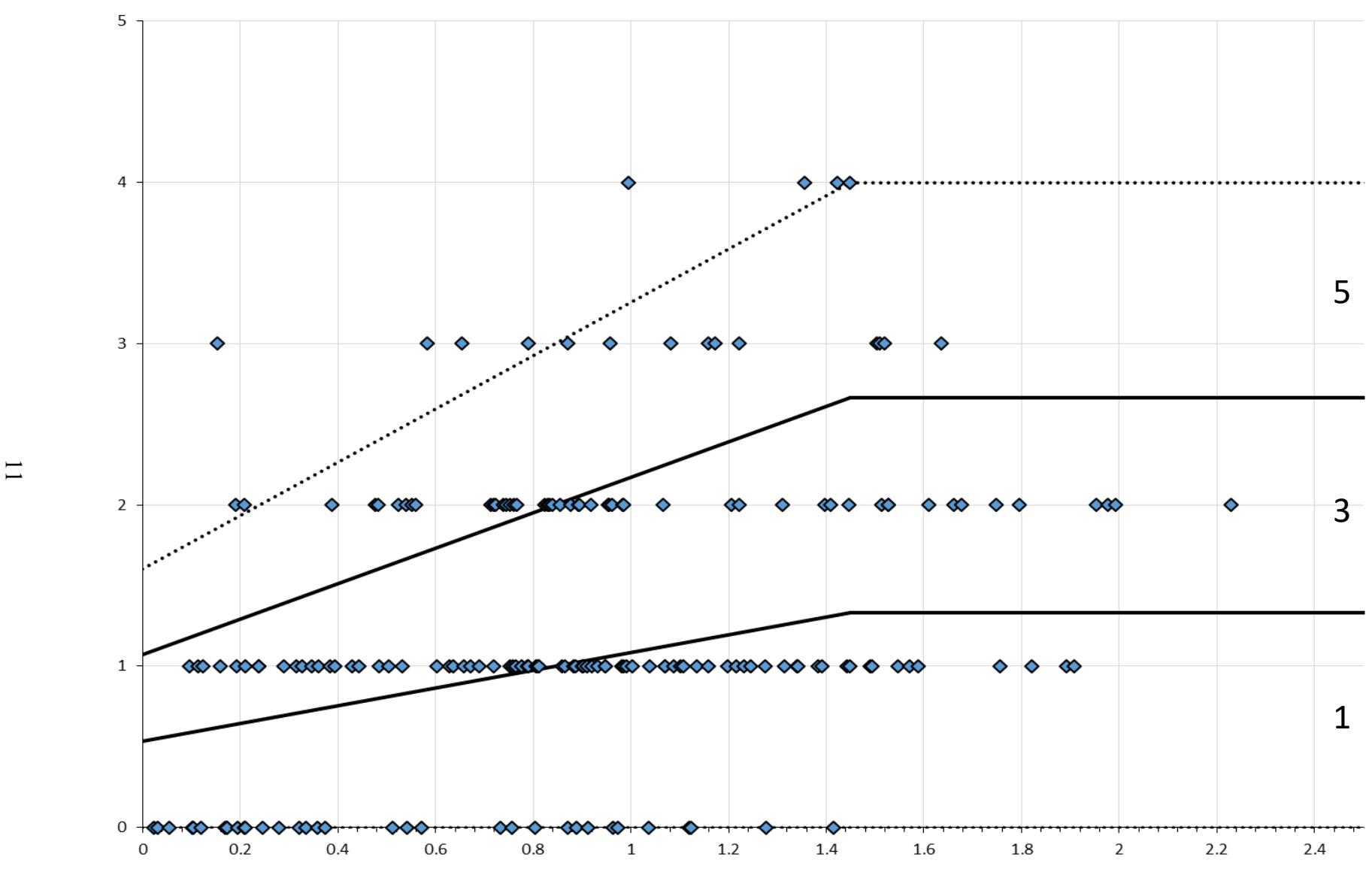
United States Census Bureau. 2000. 2000 Census of Population and Housing. United States Census Bureau, Washington, D.C.

Appendix 1

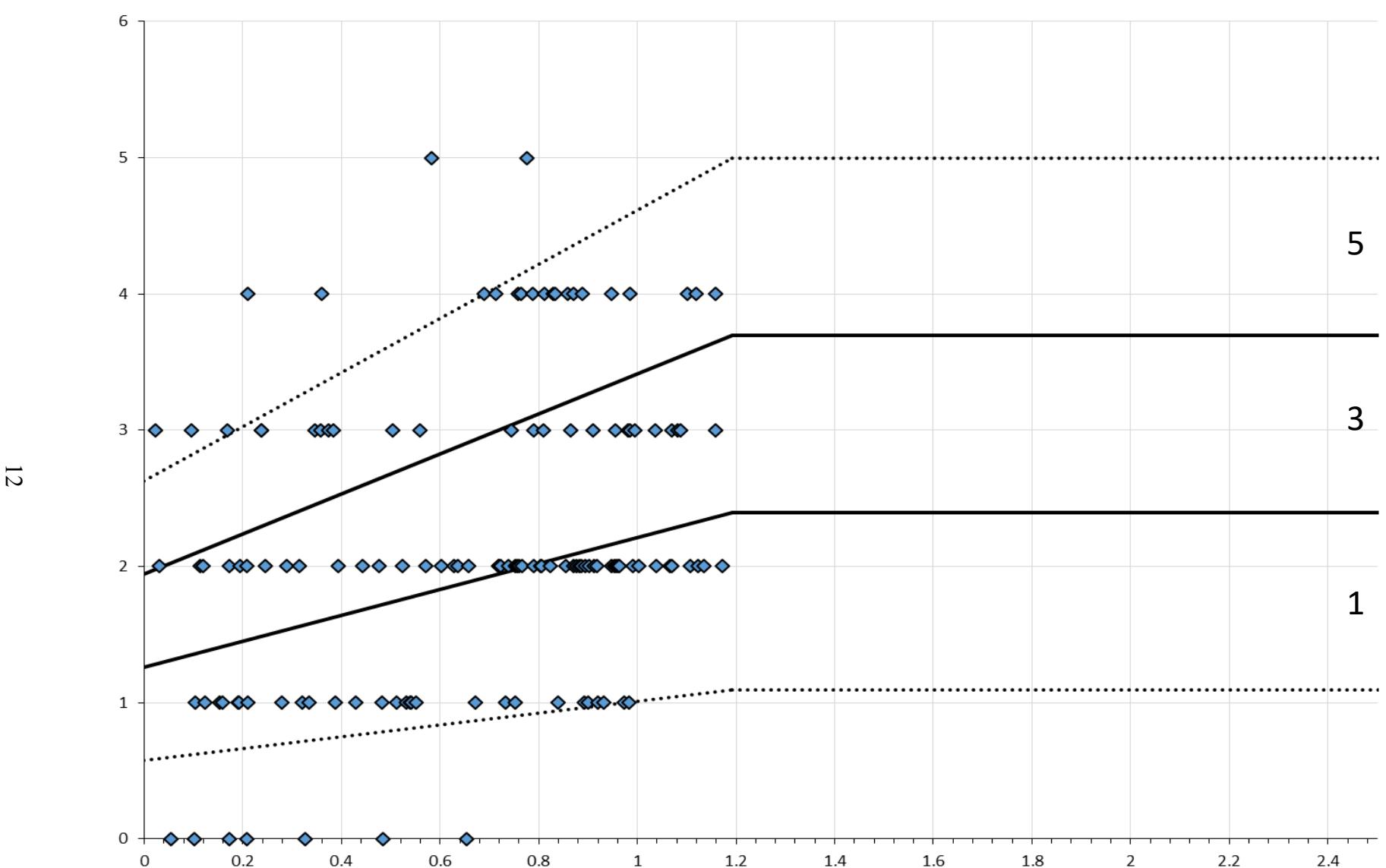
Apalachicola Basin Group (ACF) MSR Graphs.....	Pg. 10
Alabama Basin Group (ACT) MSR Graphs.....	Pg. 18
Atlantic Slope Basins Group (AS) MSR Graphs.....	Pg. 26
Piedmont Ecoregion Fish List.....	Pg. 34



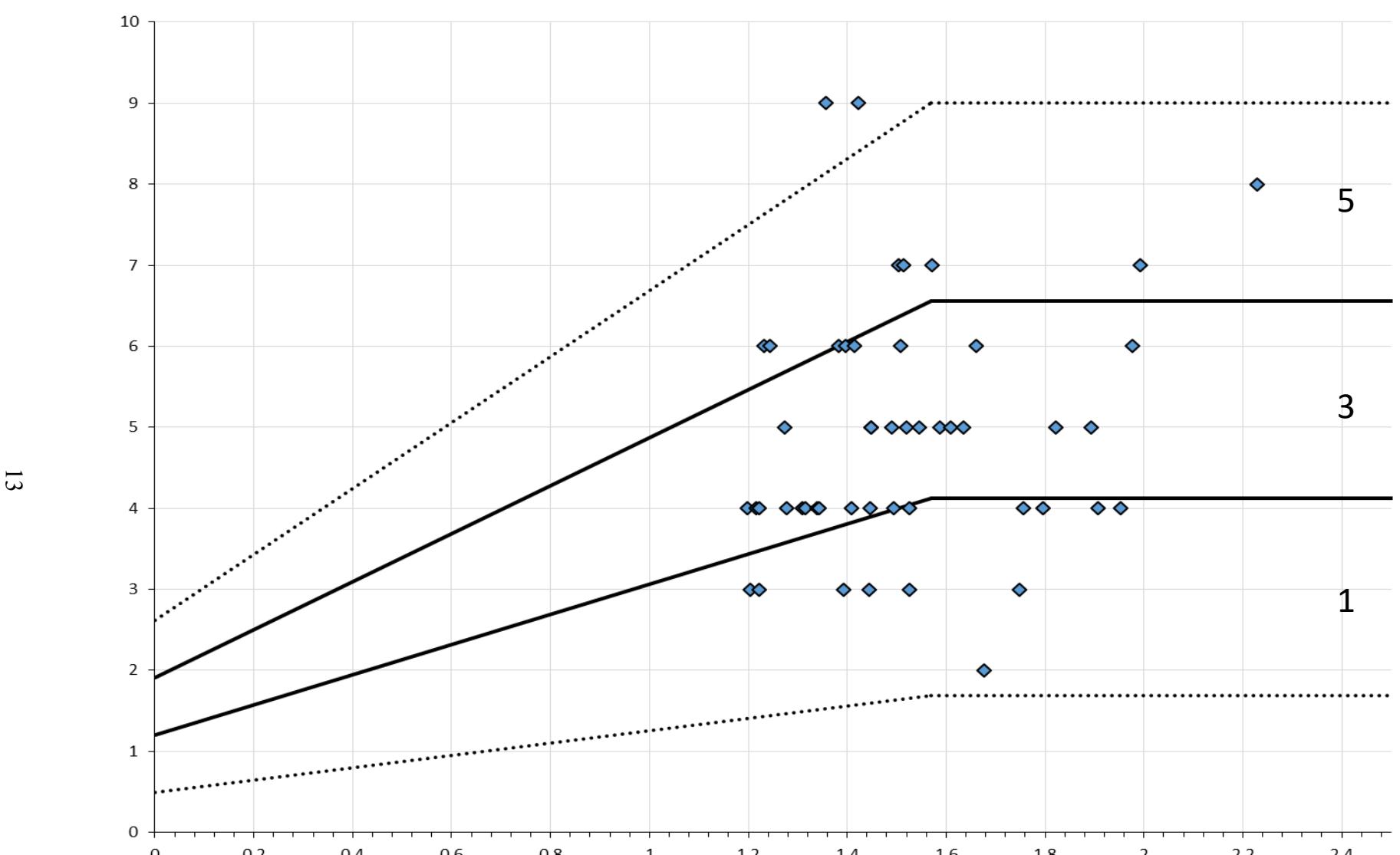
ACF 1 – PDM. Total number of native species in the Piedmont ecoregion of the Apalachicola drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



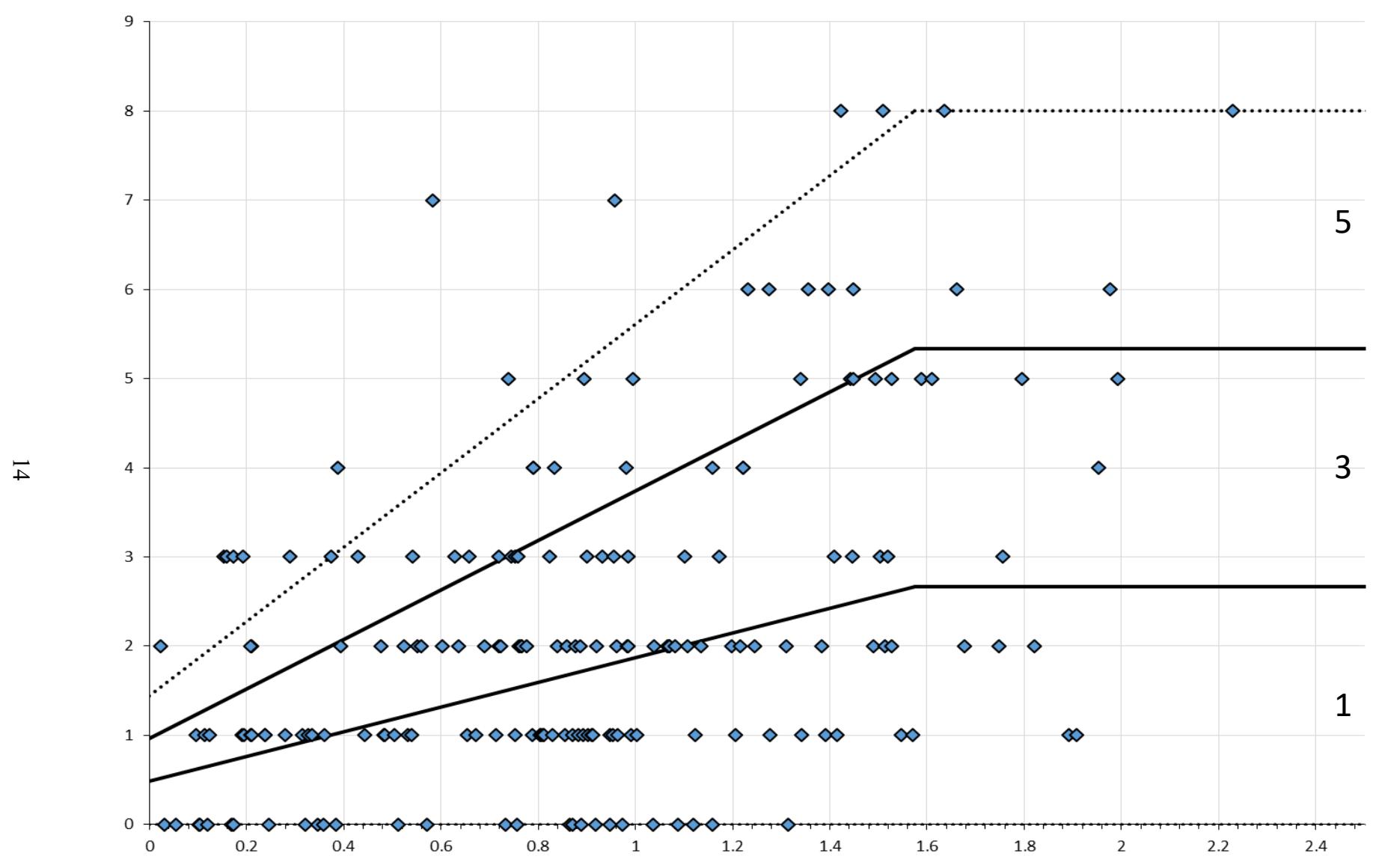
ACF2 – PDM. Number of benthic invertivore species in the Piedmont ecoregion of the Apalachicola drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).

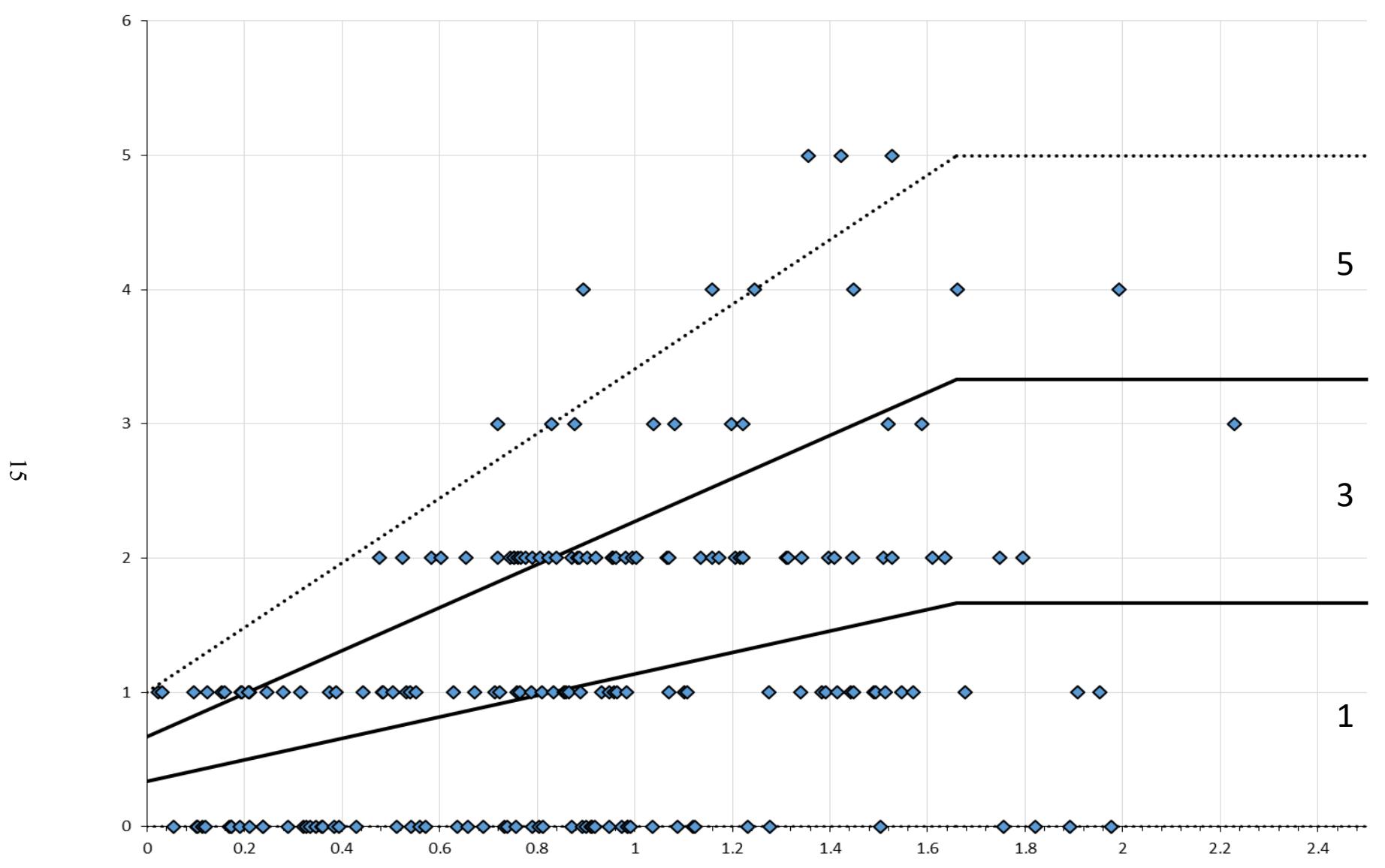


ACF3a – PDM. Number of native sunfish species in headwater streams (<15 square miles drainage basin area) in the Piedmont ecoregion of the Apalachicola drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).

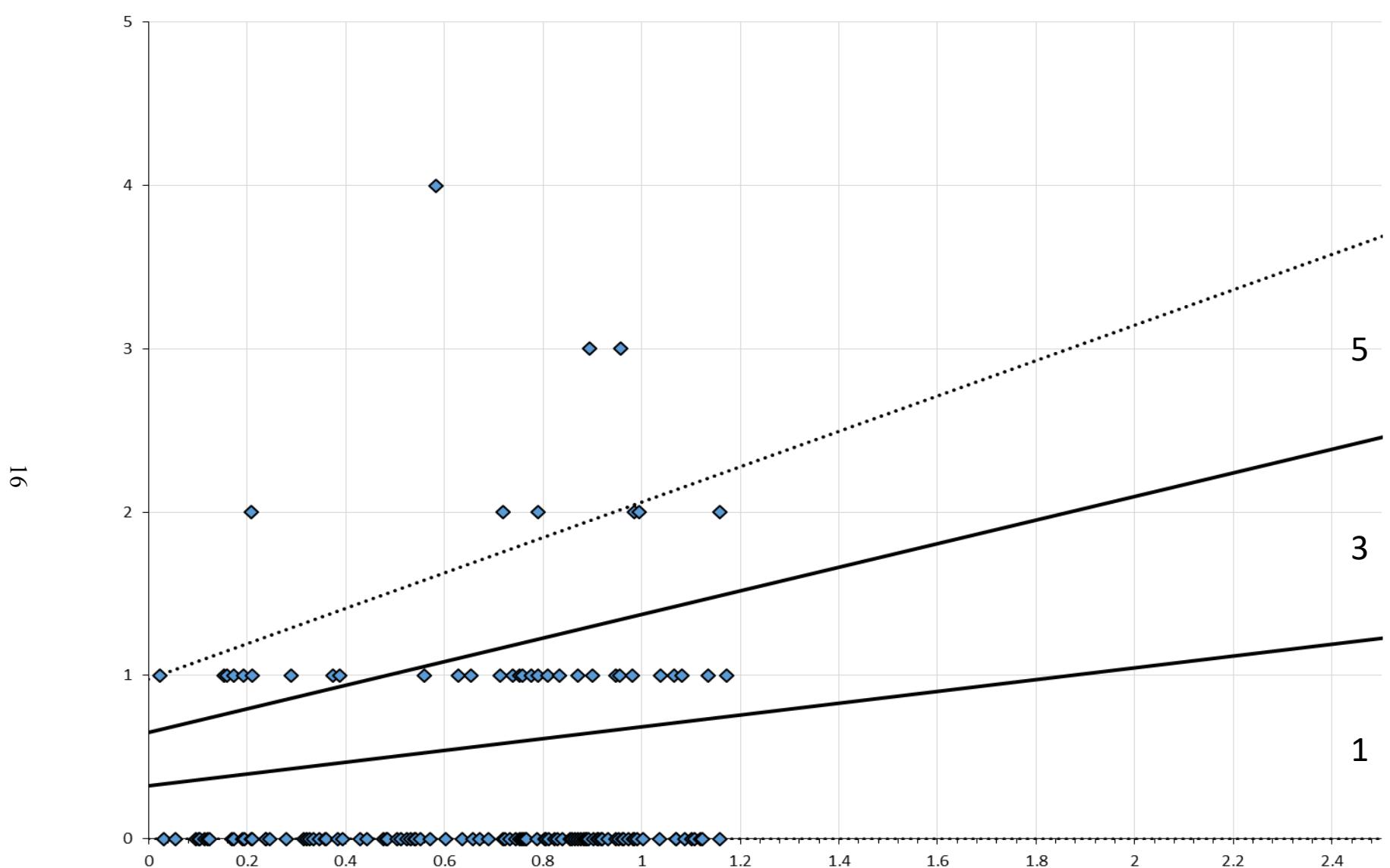


ACF3b – PDM. Number of native centrarchid species in the Piedmont ecoregion of the Apalachicola drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).

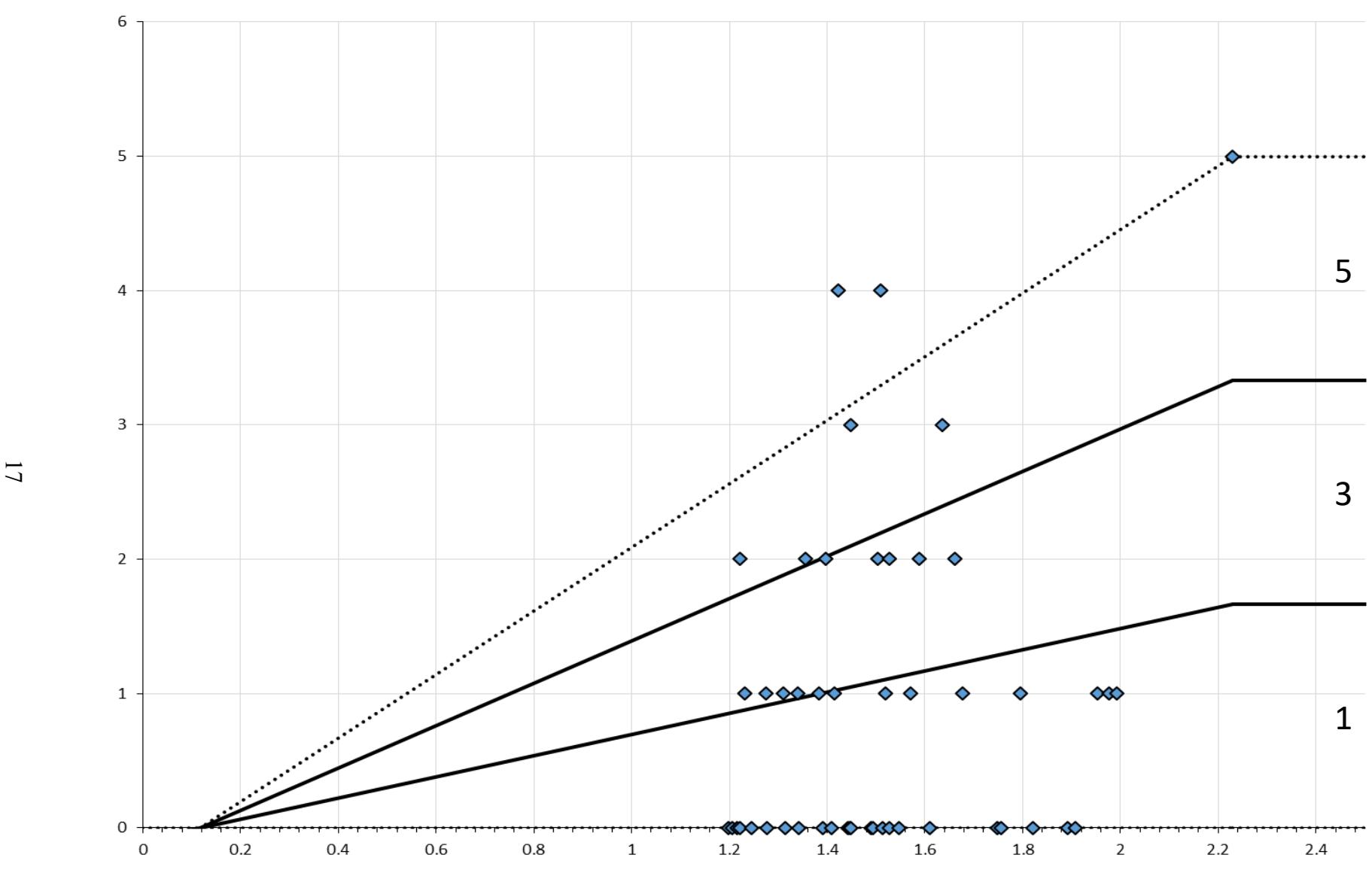




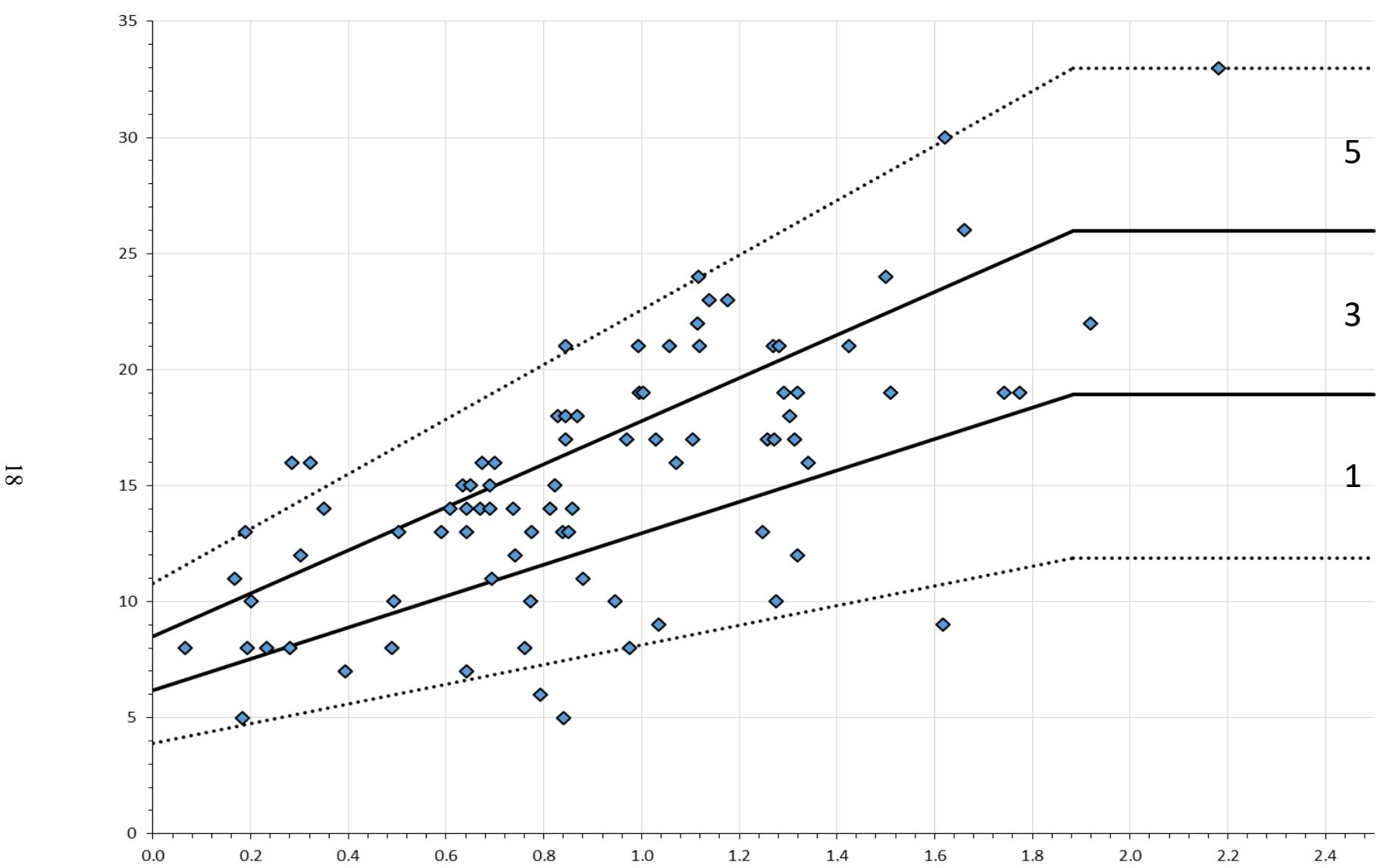
ACF5 – PDM. Number of native round-bodied sucker species in the Piedmont ecoregion of the Apalachicola drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



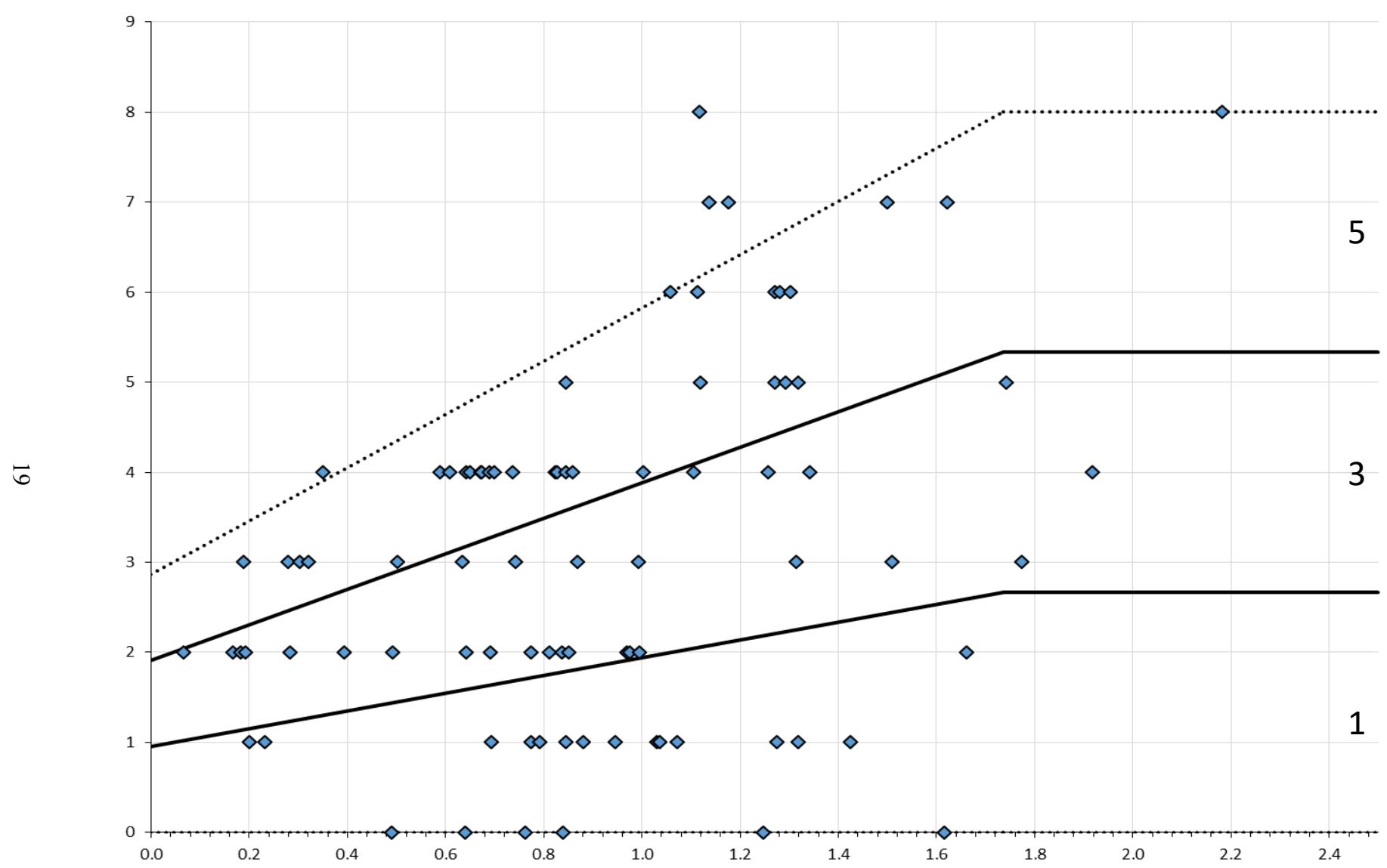
ACF6a – PDM. Total number of species ranked as sensitive at headwater sites (<15 square miles drainage basin area) in the Piedmont ecoregion of the Apalachicola drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



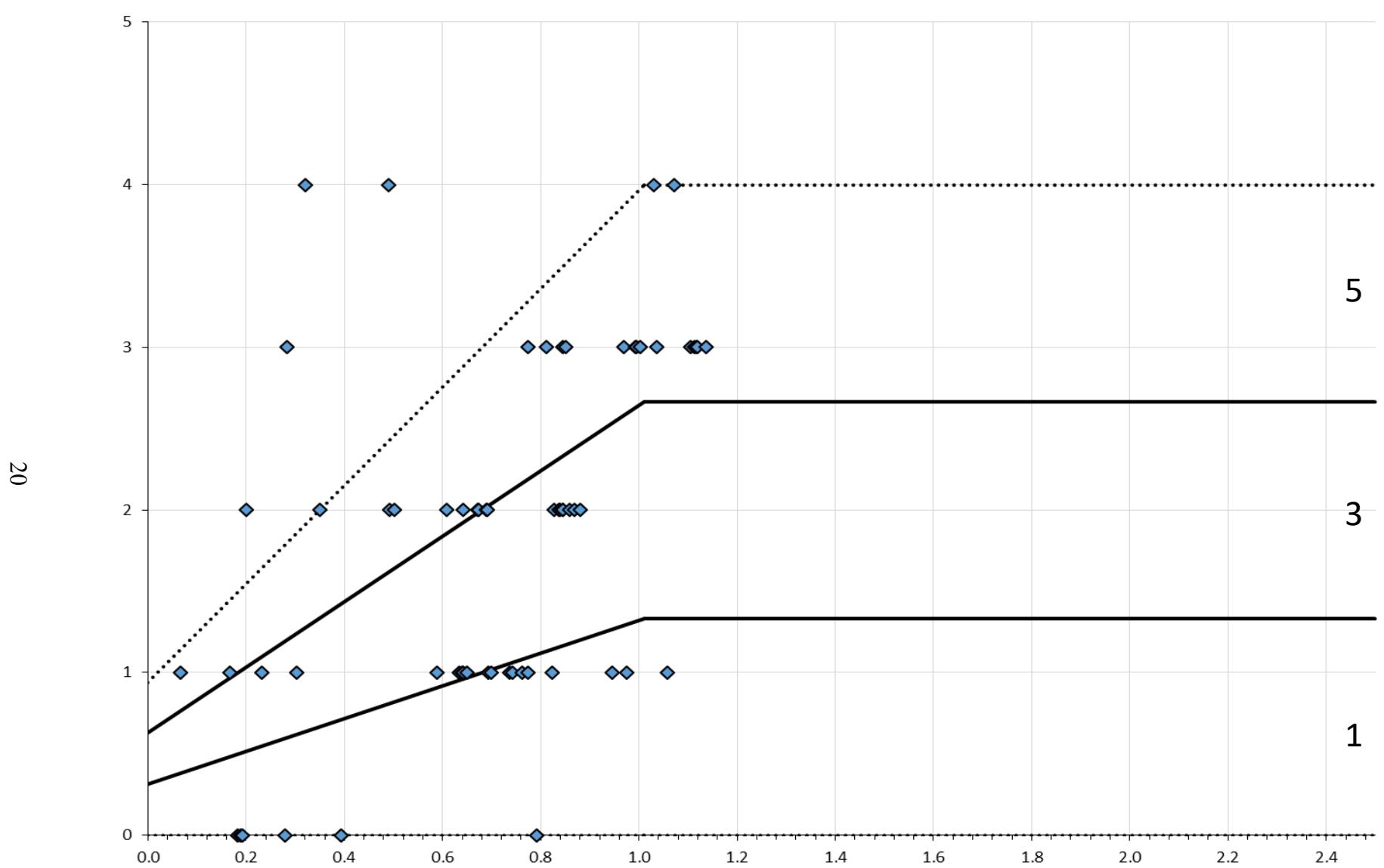
ACF6b – PDM. Number of species ranked as intolerant in the Piedmont ecoregion of the Apalachicola drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



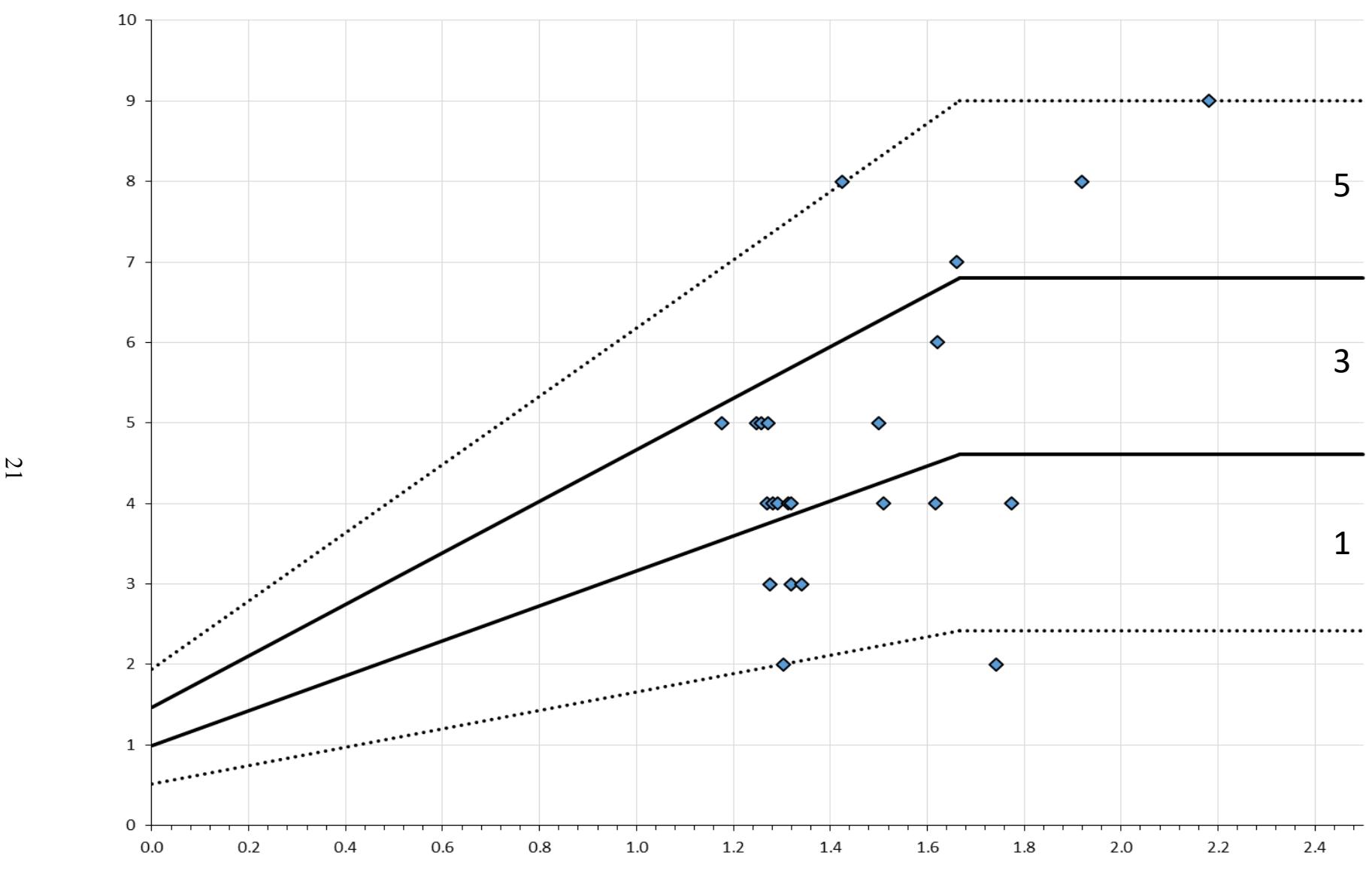
ACT1 – PDM. Total number of native species in the Piedmont ecoregion of the Alabama drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



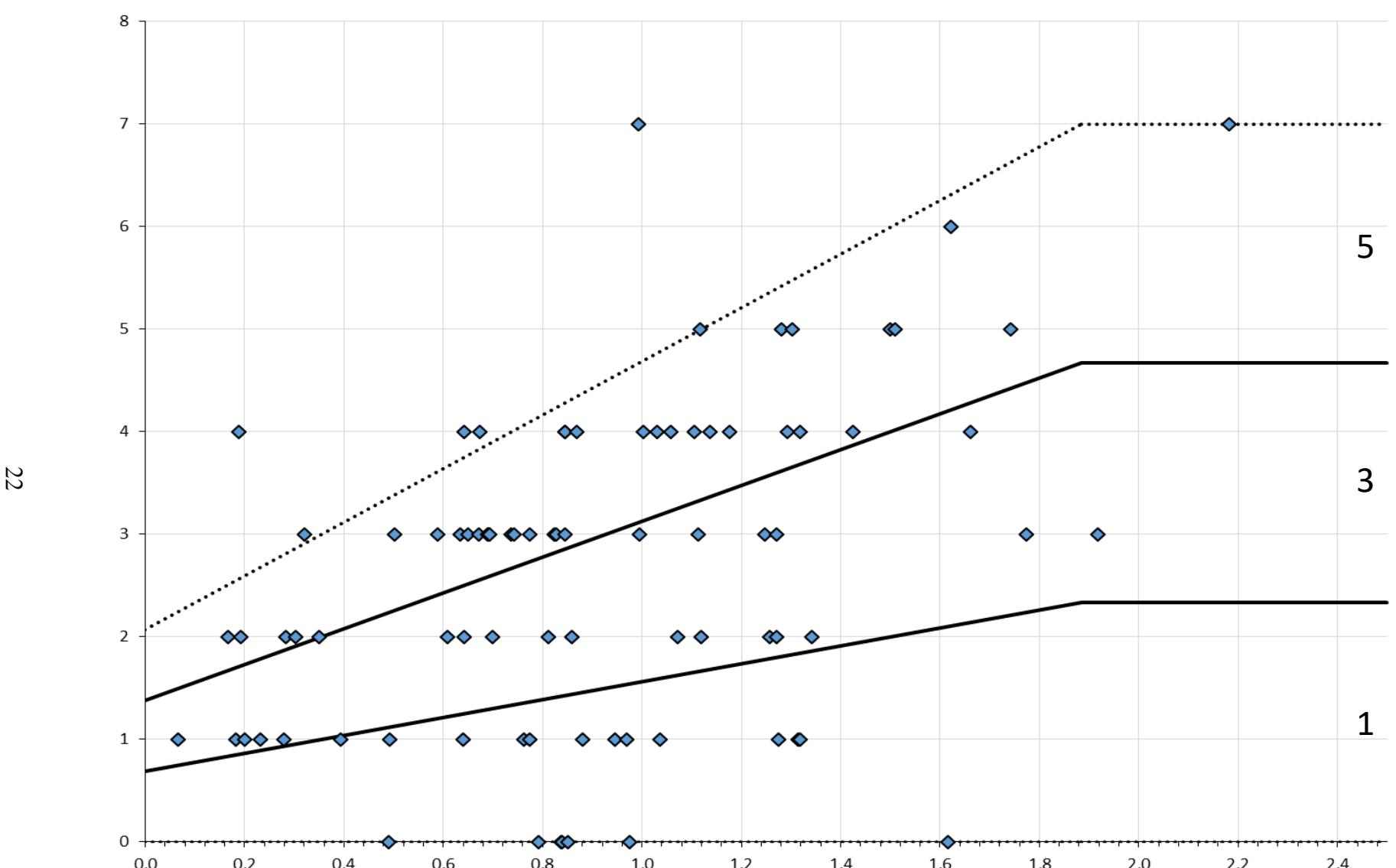
ACT2 – PDM. Number of benthic invertivore species in the Piedmont ecoregion of the Alabama drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



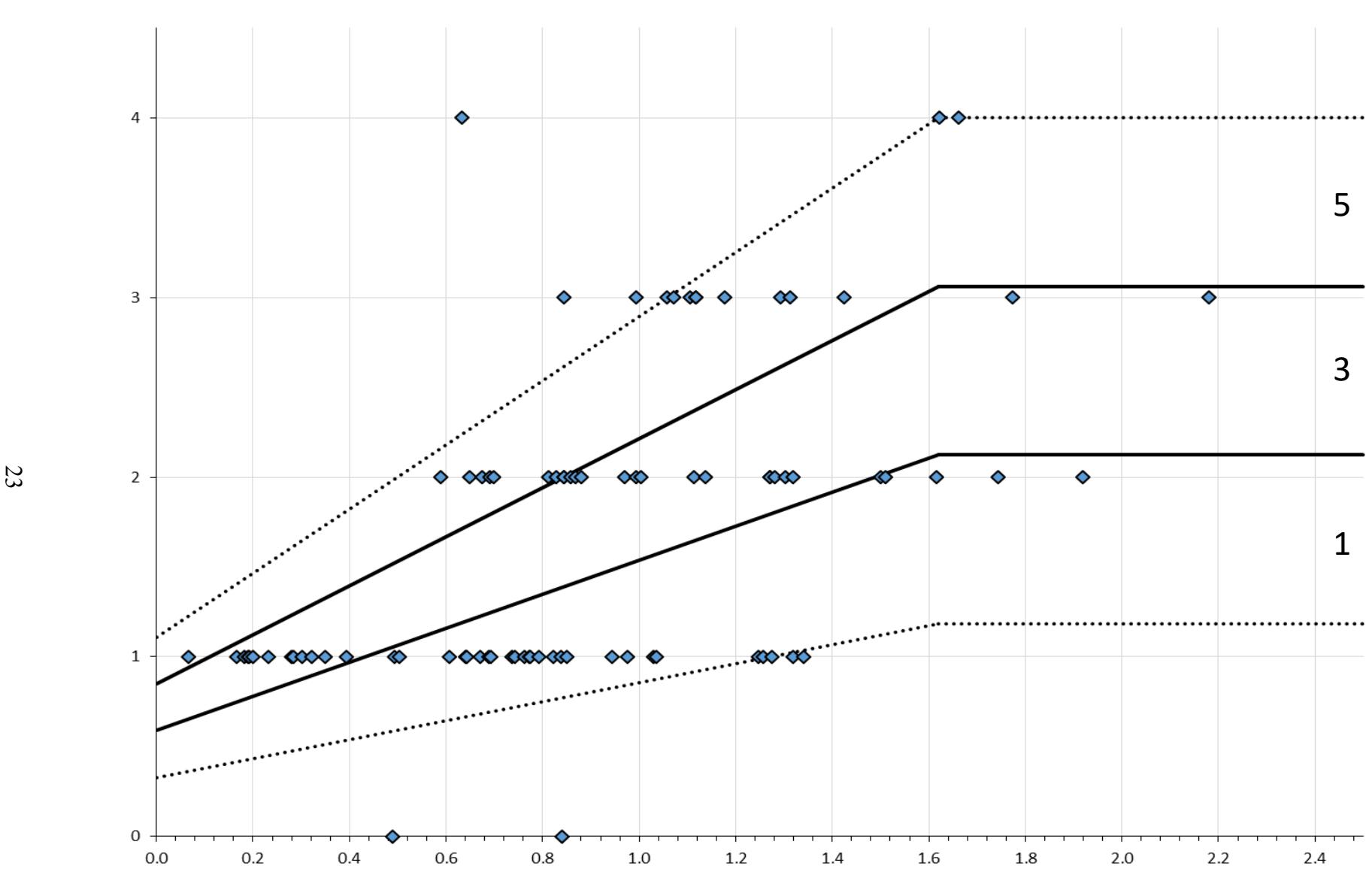
ACT3a – PDM. Number of native sunfish species in headwater streams (<15 square miles drainage basin area) in the Piedmont ecoregion of the Alabama drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



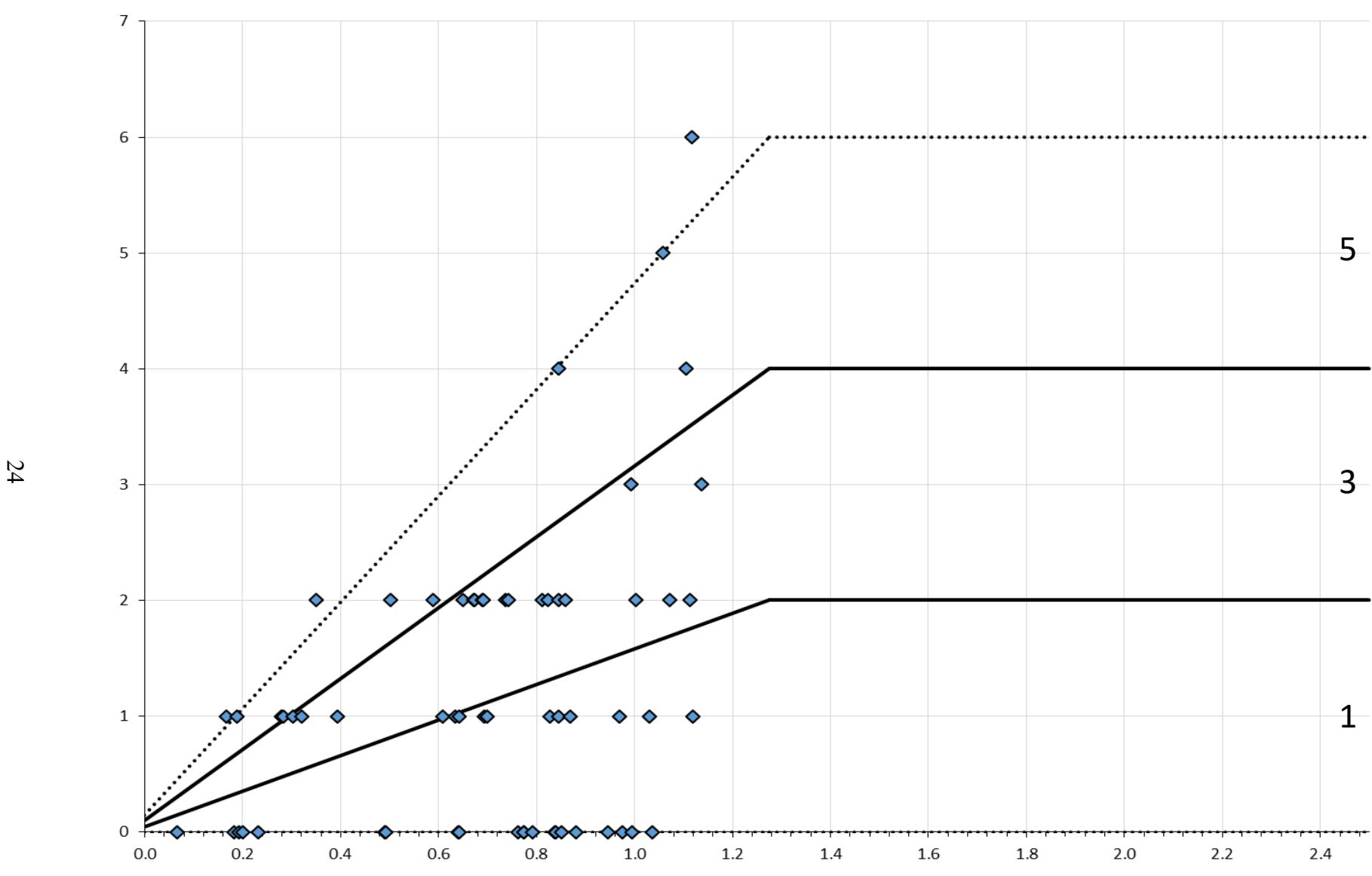
ACT3b – PDM. Number of native centrarchid species in the Piedmont ecoregion of the Alabama drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



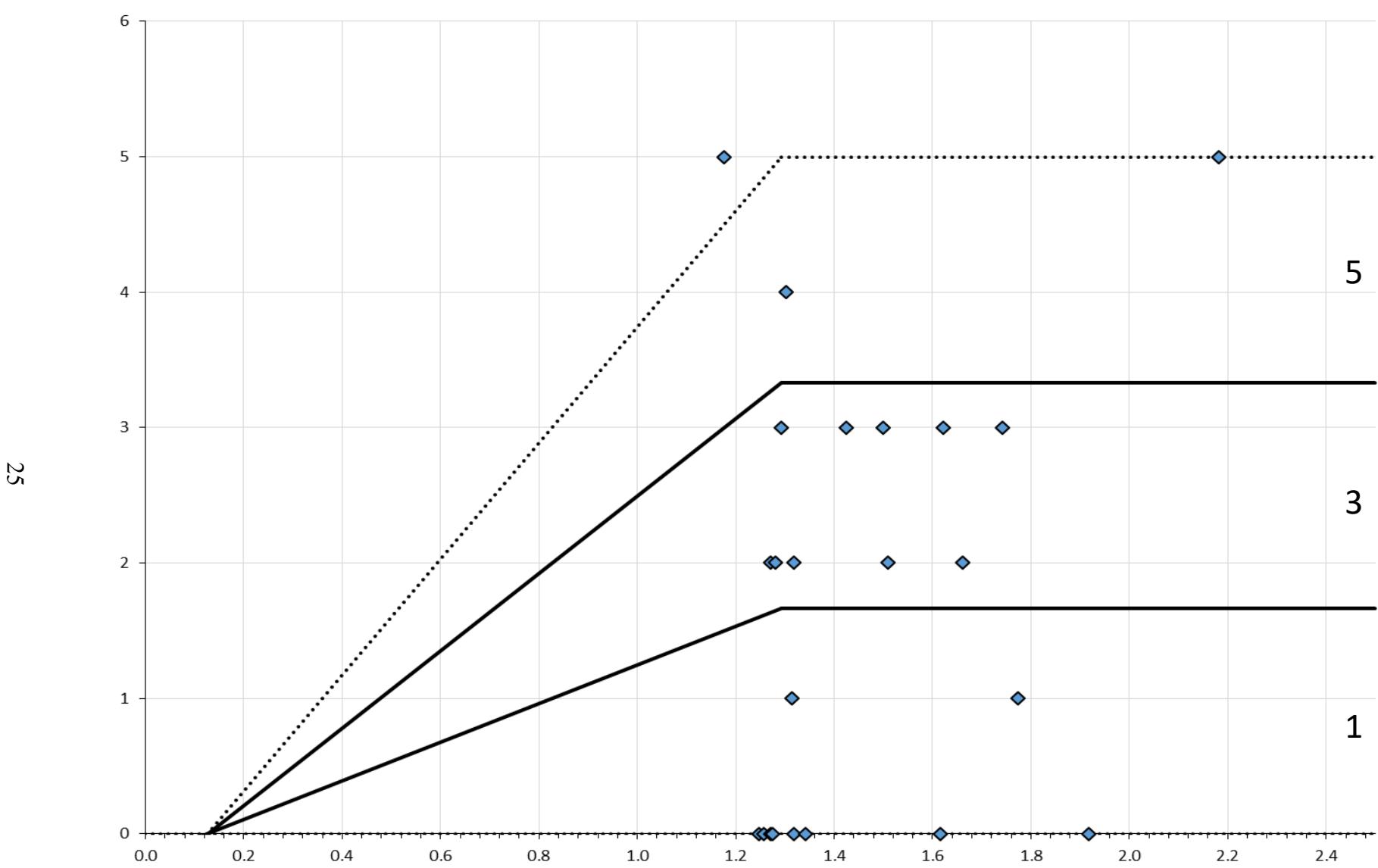
ACT4 – PDM. Number of native insectivorous cyprinid species in the Piedmont ecoregion of the Alabama drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



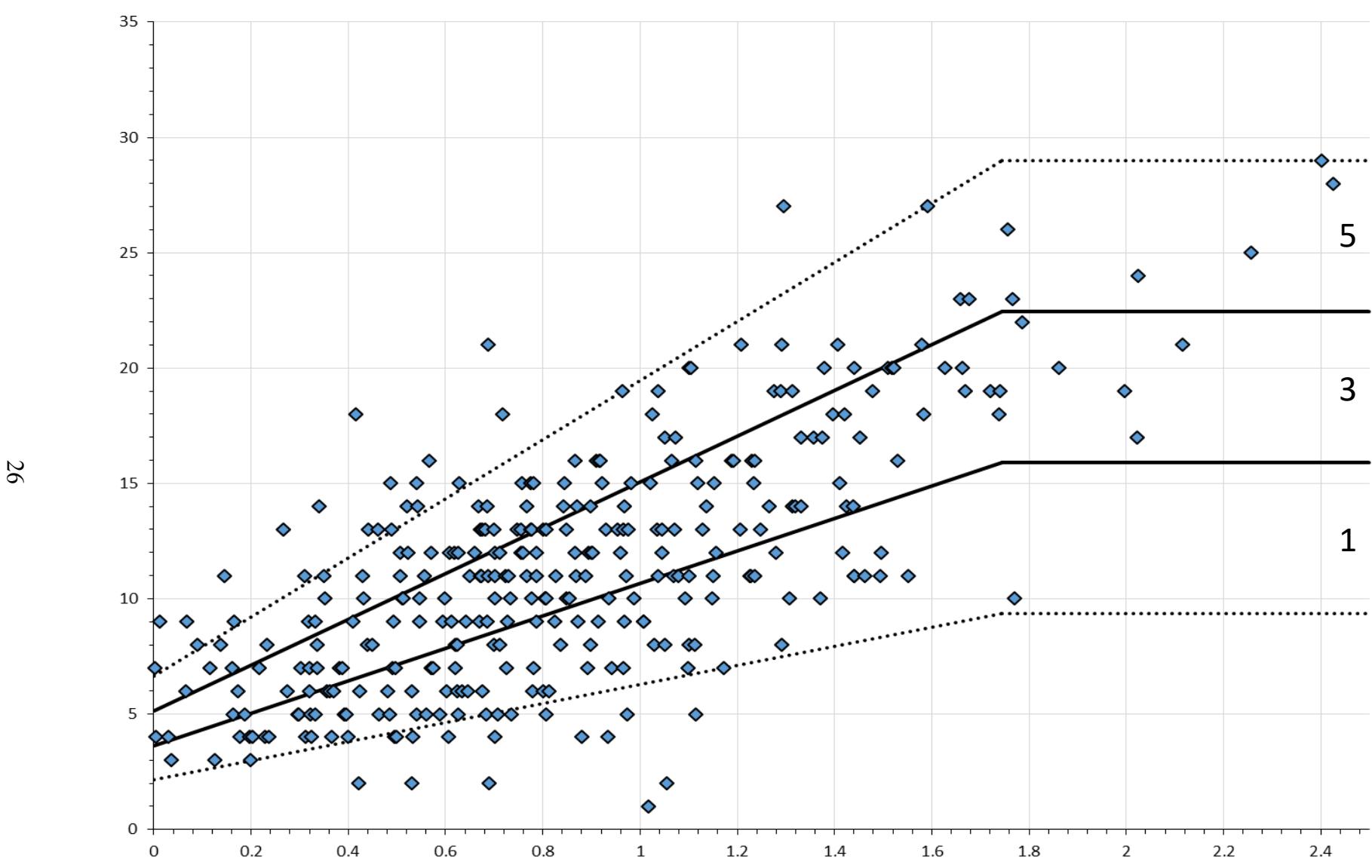
ACT5 – PDM. Number of native round-bodied sucker species in the Piedmont ecoregion of the Alabama drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



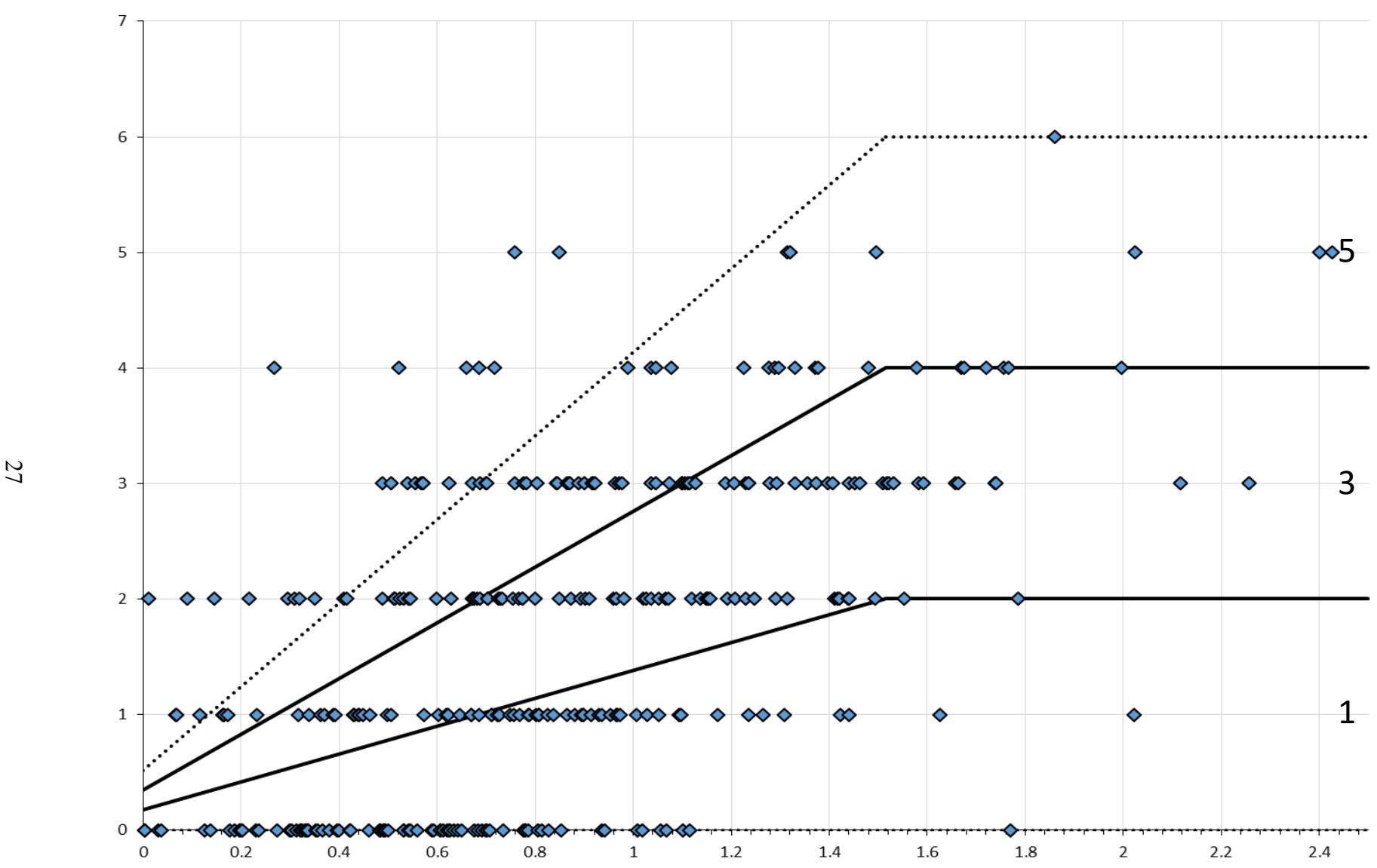
ACT6a – PDM. Total number of species ranked as sensitive at headwater sites (<15 square miles drainage basin area) in the Piedmont ecoregion of the Alabama drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



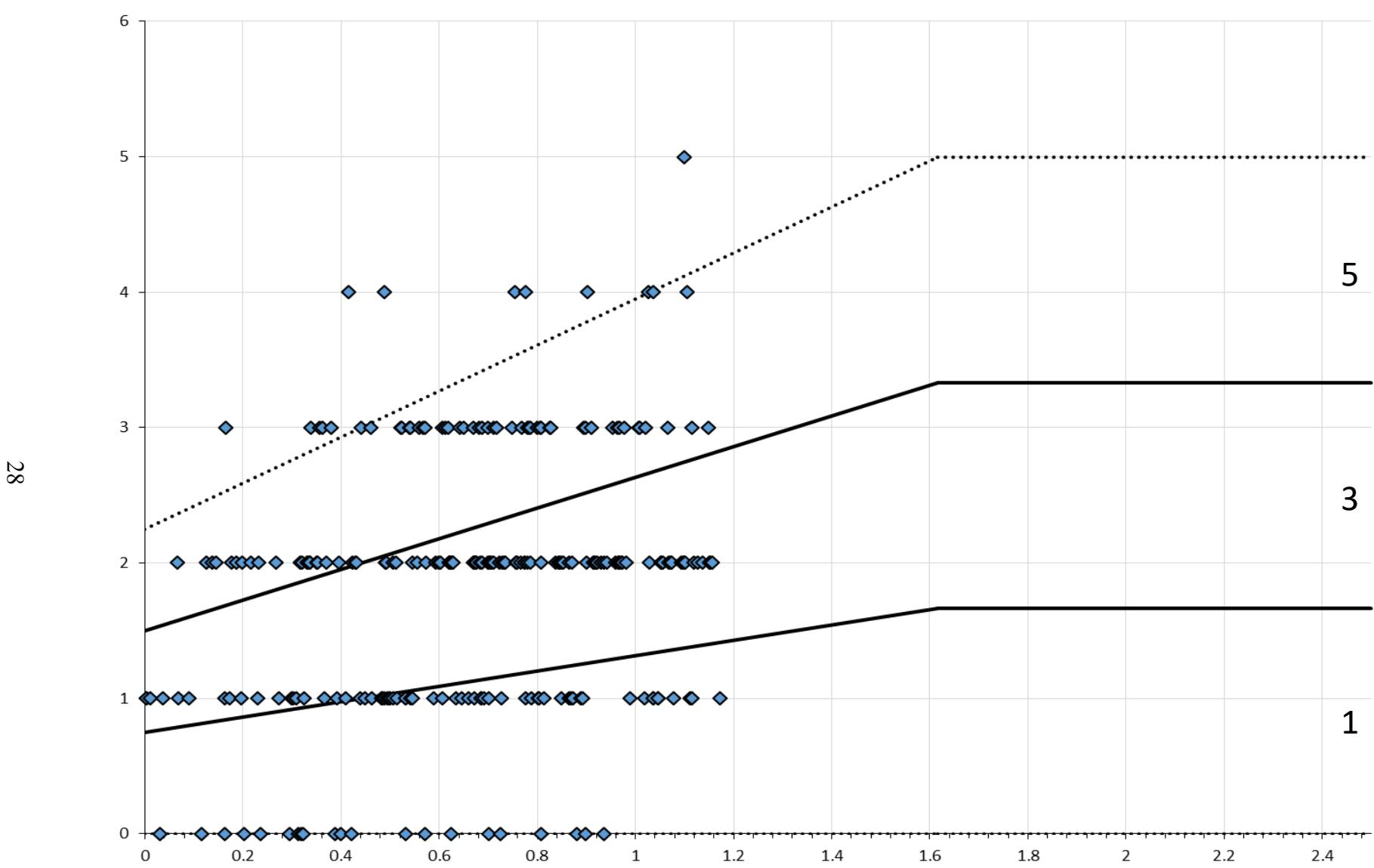
ACT6b – PDM. Number of species ranked as intolerant in the Piedmont ecoregion of the Alabama drainage basin plotted against the log (base 10) transformed value of the drainage basin area (square miles).



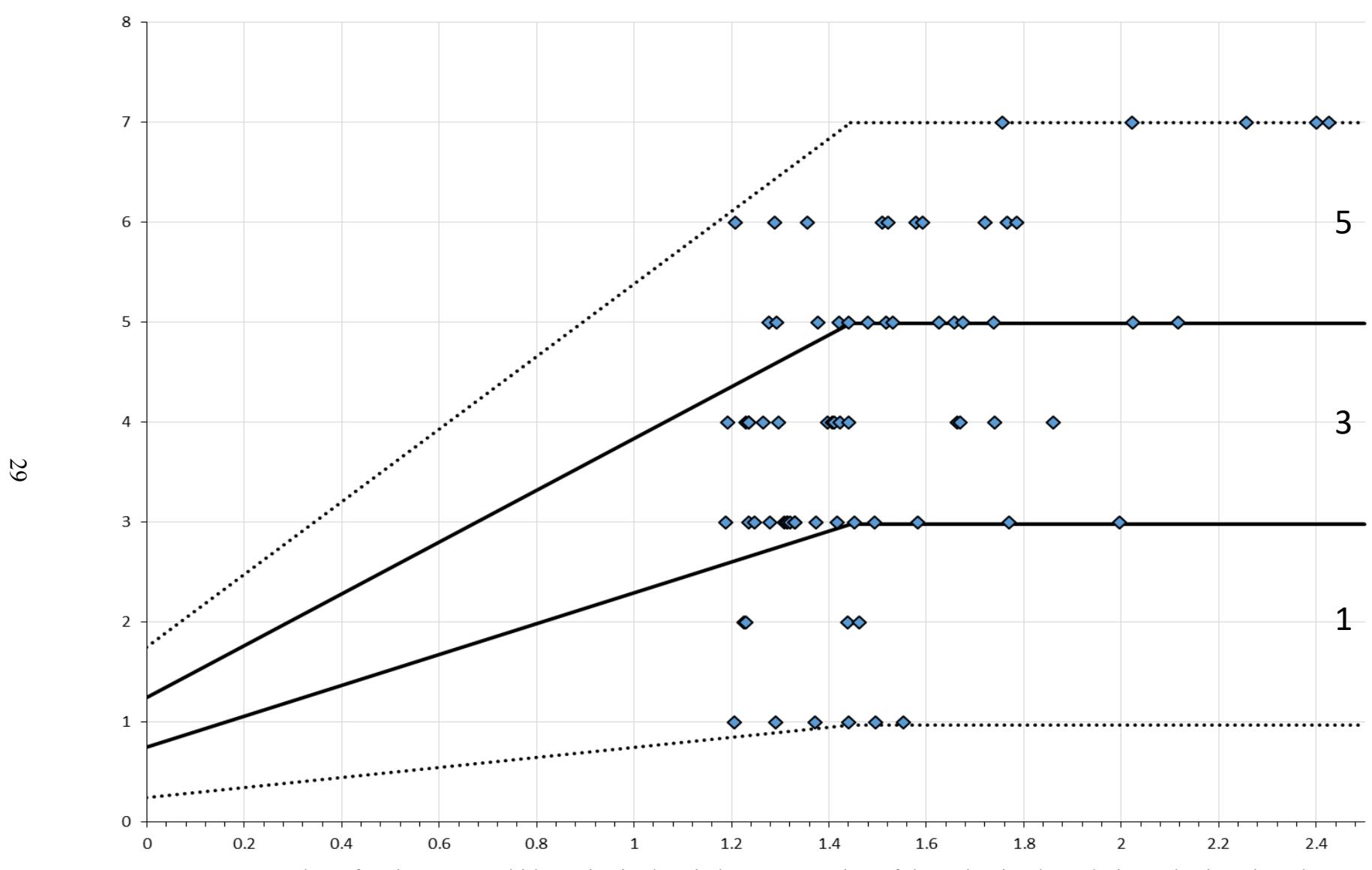
AS1 – PDM. Total number of native species in the Piedmont ecoregion of the Atlantic Slope drainage basins plotted against the log (base 10) transformed value of the drainage basin area (square miles).



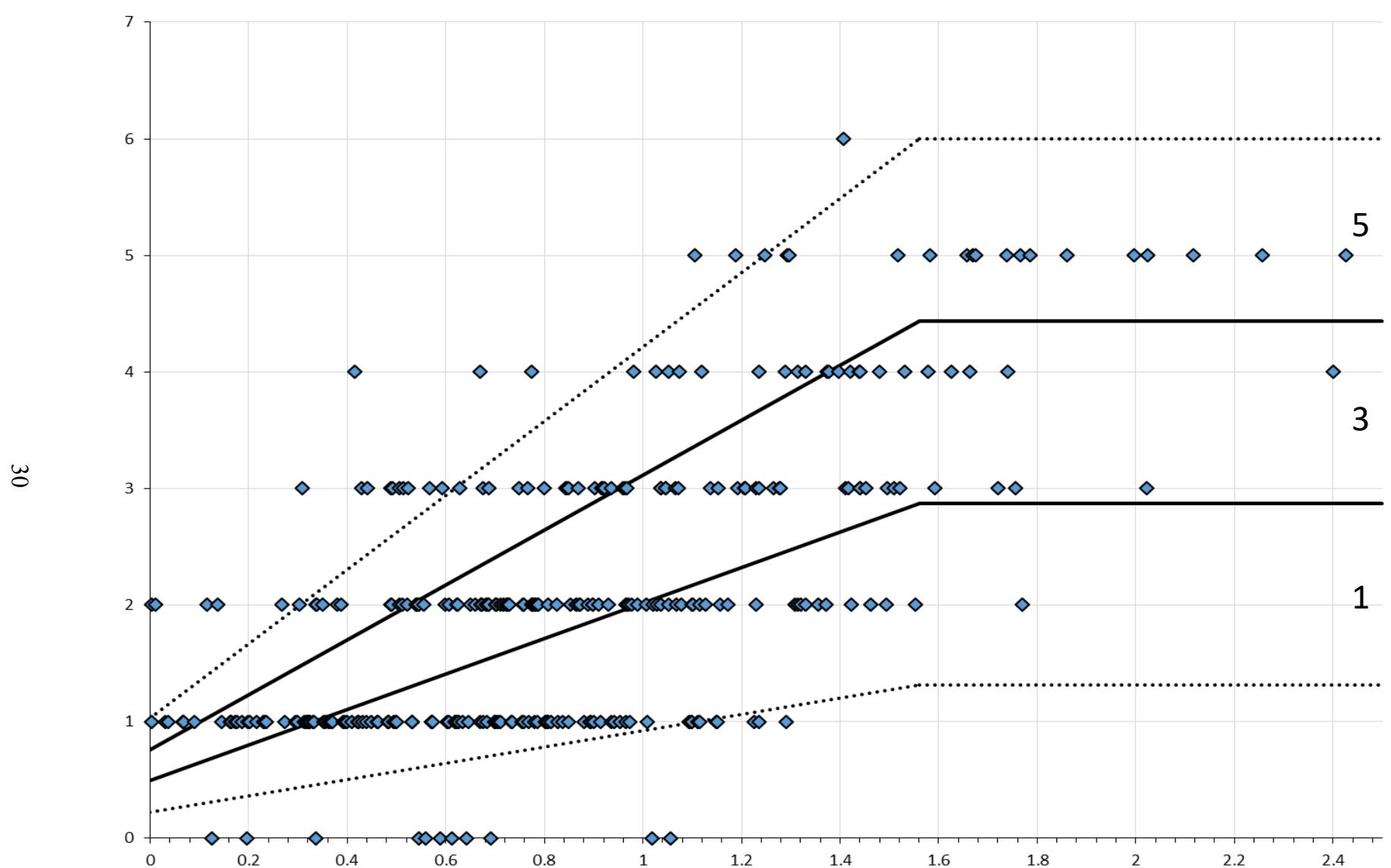
AS2 – PDM. Number of benthic invertivore species in the Piedmont ecoregion of the Atlantic Slope drainage basins plotted against the log (base 10) transformed value of the drainage basin area (square miles).



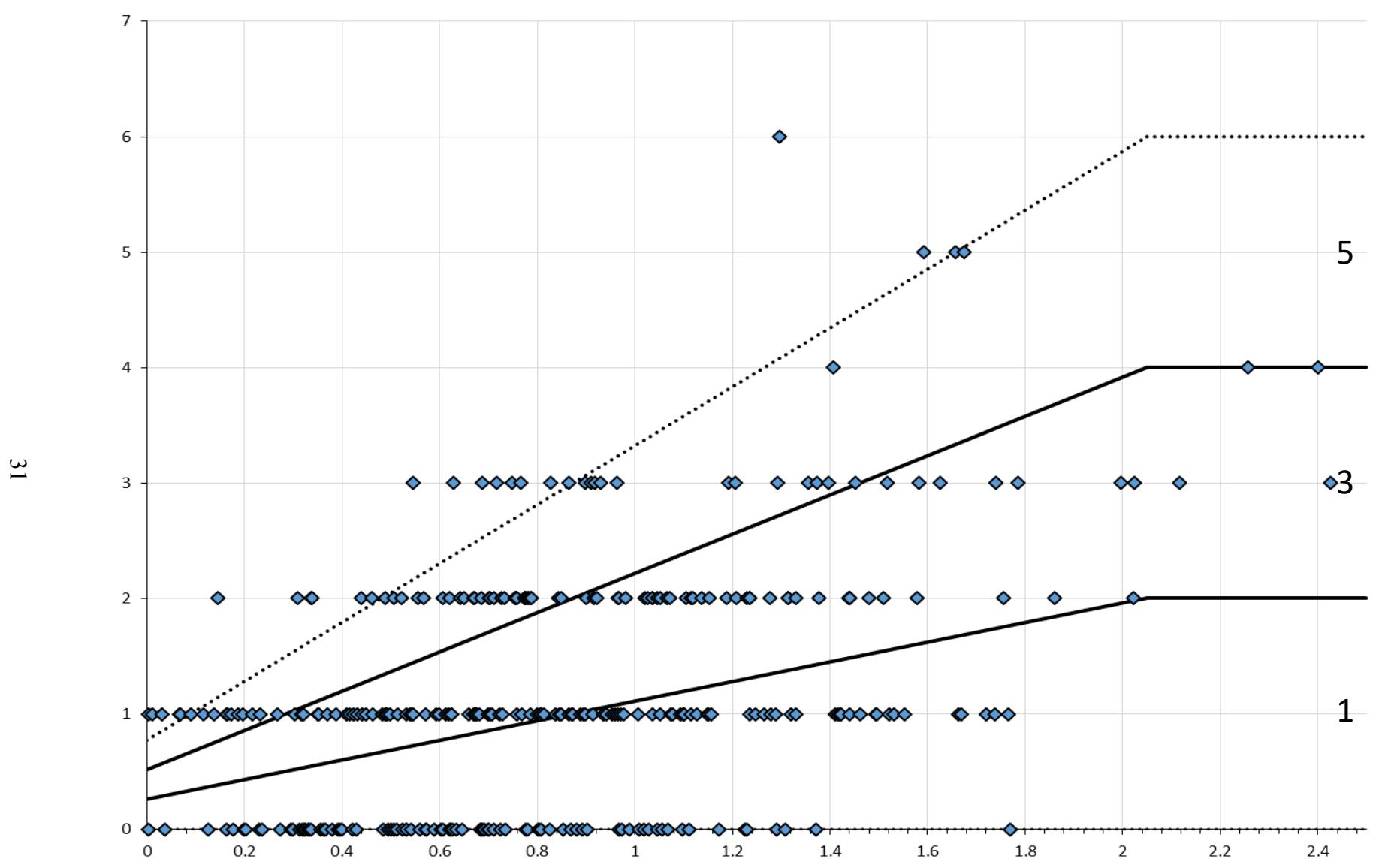
AS3a – PDM. Number of native sunfish species in headwater streams (<15 square miles drainage basin area) in the Piedmont ecoregion of the Atlantic Slope drainage basins plotted against the log (base 10) transformed value of the drainage basin area (square miles).



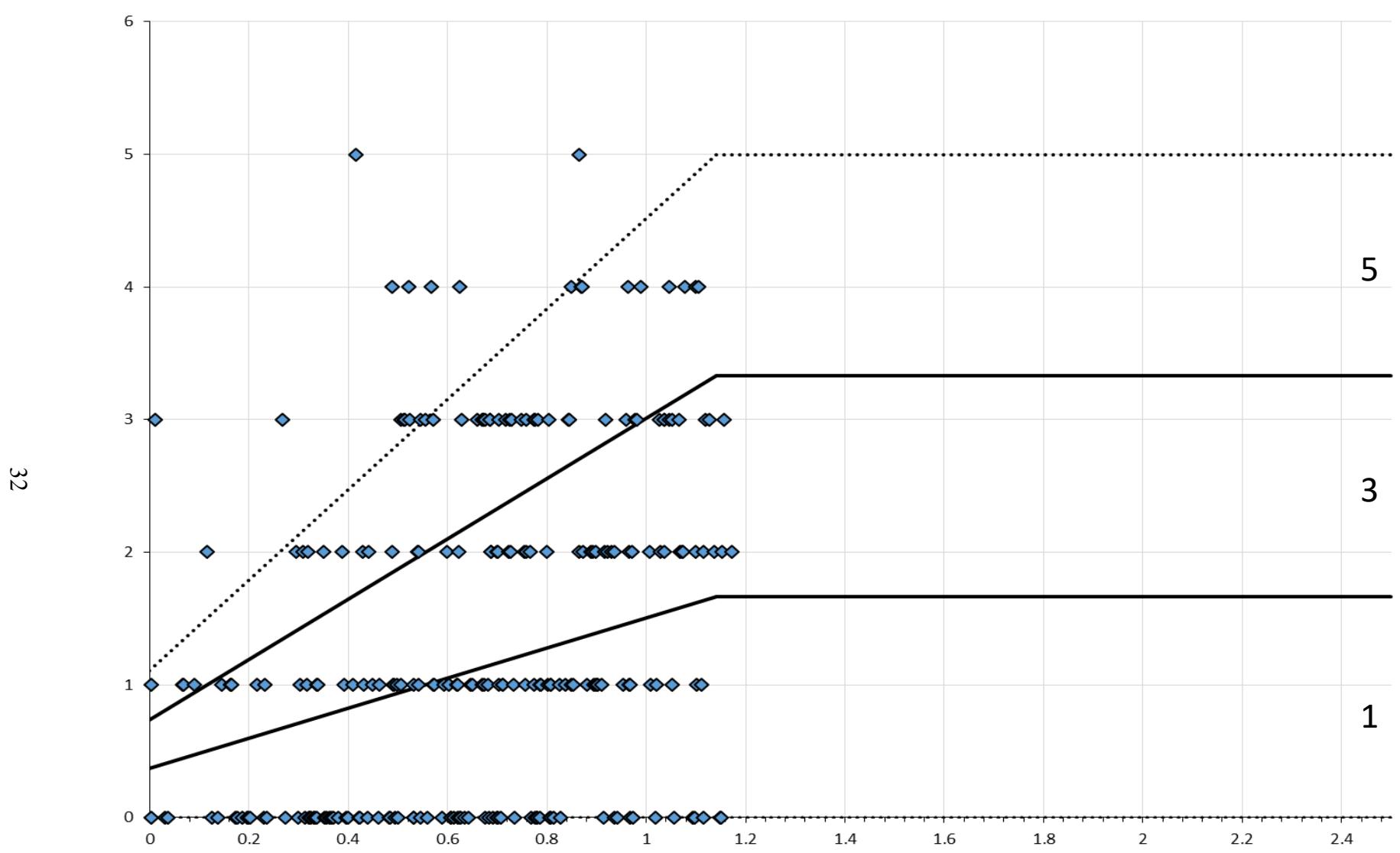
AS3b – PDM. Number of native centrarchid species in the Piedmont ecoregion of the Atlantic Slope drainage basins plotted against the log (base 10) transformed value of the drainage basin area (square miles).



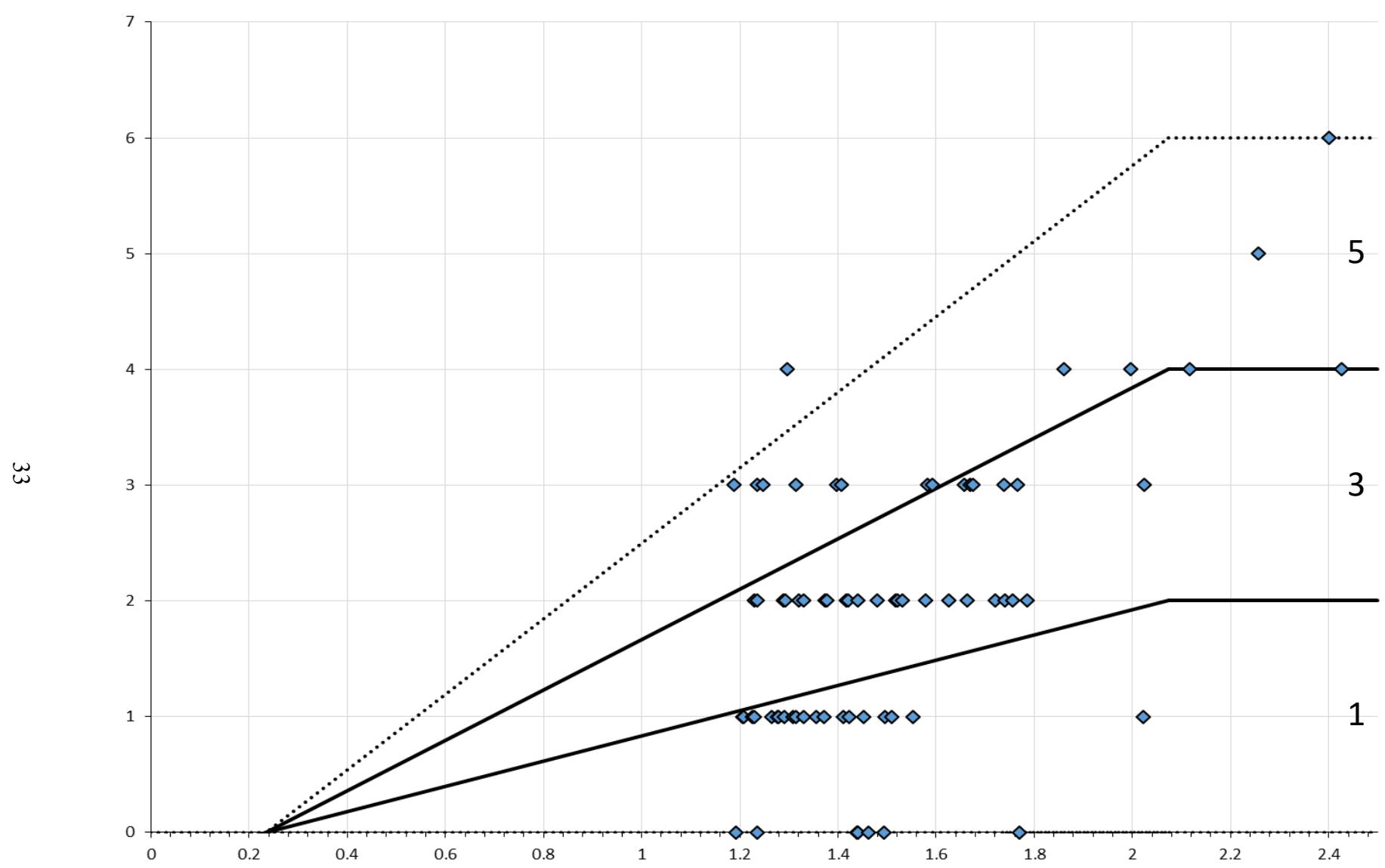
AS4 – PDM. Number of native insectivorous cyprinid species in the Piedmont ecoregion of the Atlantic Slope drainage basins plotted against the log (base 10) transformed value of the drainage basin (square miles).



AS5 – PDM. Total number of native round-bodied sucker species in the Piedmont ecoregion of the Atlantic Slope drainage basins plotted against the log (base 10) transformed value of the drainage basin area (square miles).



AS6a – PDM. Total number of species ranked as sensitive in headwater streams (< 15 square miles drainage basin area) in the Piedmont ecoregion of the Atlantic Slope drainage basins plotted against the log (base 10) transformed value of the drainage basin area (square miles).



AS6b - PDM. Number of species ranked as intolerant in the Piedmont 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 Piedmont Ecoregion of Georgia. (Updated December 2019)

Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Petromyzontidae				
Chestnut Lamprey* <i>Ichthyomyzon castaneus</i>		PR		COO
Southern Brook Lamprey* <i>Ichthyomyzon gagei</i>		HB		CHT, COO, FLI, TAL
Least Brook Lamprey <i>Lampetra aepyptera</i>	INT	HB		COO
Lepisosteidae				
Longnose Gar* <i>Lepisosteus osseus</i>		CR		CHT, COO, FLI, OCM, OCO, OGE, SAV
Amiidae				
Bowfin* <i>Amia calva</i>		CR		CHT, FLI, OCM, OCO, OGE, SAV, TAL
Anguillidae				
American Eel* <i>Anguilla rostrata</i>		CR		CHT, FLI, OCM, OCO, OGE, SAV
Clupeidae				
Blueback Herring <i>Alosa aestivalis</i>		IN		CHT**, OCM, OCO, SAV
American shad <i>Alosa sapidissima</i>		IN		OCM, OCO, OGE, SAV
Gizzard Shad* <i>Dorosoma cepedianum</i>		OM		CHT, COO, FLI, OCM, OCO, OGE, SAV, TAL
Threadfin Shad <i>Dorosoma petenense</i>		OM		CHT, COO, FLI, OCM**, OCO**, SAV**

Fish List for the Piedmont Ecoregion of Georgia.

Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Cyprinidae				
Largescale Stoneroller* <i>Campostoma oligolepis</i>		HB		COO, TAL
Bluefin Stoneroller* <i>Campostoma pauciradii</i>		HB		CHT, FLI, OCM, OCO, SAV**, TAL**
Goldfish <i>Carassius auratus</i>		OM		EXOTIC
Rosyside Dace <i>Clinostomus funduloides</i>		IC		SAV
Grass Carp <i>Ctenopharyngodon idella</i>		HB		EXOTIC
Ocmulgee Shiner* <i>Cyprinella callisema</i>	INT	IC	SMM	OCM, OCO, OGE
Alabama Shiner* <i>Cyprinella callistia</i>	INT	IC	SMM	COO, TAL
Bluestripe Shiner* <i>Cyprinella callitaenia</i>		IC	SMM	CHT, FLI
Tallapoosa Shiner* <i>Cyprinella gibbsi</i>		IC		TAL
Red Shiner* <i>Cyprinella lutrensis</i>		OM		EXOTIC
Whitefin Shiner* <i>Cyprinella nivea</i>		IC	SMM	SAV
Tricolor Shiner* <i>Cyprinella trichroistia</i>		IC		COO, TAL

Fish List for the Piedmont Ecoregion of Georgia.

Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Blacktail shiner* <i>Cyprinella venusta</i>		IC		CHT, COO, FLI, OCM**, TAL
Altamaha Shiner* <i>Cyprinella xaenura</i>	INT	IC		OCM, OCO
Common Carp* <i>Cyprinus carpio</i>		GE		EXOTIC
Eastern Silvery Minnow* <i>Hybognathus regius</i>	INT	HB		OCM, OCO, OGE, SAV
Lined Chub* <i>Hybopsis lineapunctata</i>	INT	IC	SMM	COO, TAL
Rosyface Chub* <i>Hybopsis rubrifrons</i>	HWI	IC	SMM	OCM, OCO, OGE, SAV
Clear Chub* <i>Hybopsis winchelli</i>	INT	IC	SMM	CHT, COO, FLI
Striped Shiner* <i>Luxilus chryscephalus</i>		IC		COO, TAL
Bandfin Shiner* <i>Luxilus zonistius</i>		IC		CHT, COO**, FLI, OCO, TAL**
Blacktip Shiner* <i>Lythrurus atrapiculus</i>	INT	IC		CHT, FLI
Pretty Shiner* <i>Lythrurus bellus</i>	INT	IC		TAL
Coosa Chub <i>Macrhybopsis etnieri</i>	INT	IC	SMM	COO, TAL
Bluehead Chub* <i>Nocomis leptocephalus</i>		OM		CHT, COO, FLI, OCM, OCO, OGE, SAV, TAL

Fish List for the Piedmont Ecoregion of Georgia.

Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
River Chub <i>Nocomis micropogon</i>		OM		COO**, SAV
Golden Shiner* <i>Notemigonus crysoleucas</i>		GE		CHT, COO, FLI, OCM, OCO, OGE, SAV, TAL
Longjaw Minnow* <i>Notropis amplamala</i>		IC	SMM	CHT, COO, FLI, OCM**, OCO**
Rough Shiner* <i>Notropis baileyi</i>		IC		CHT**
Rainbow Shiner* <i>Notropis chrosomus</i>	HWI	IC		COO
Dusky Shiner* <i>Notropis cummingsae</i>		IC		CHT, FLI, OCM, OCO, OGE, SAV
Spottail Shiner* <i>Notropis hudsonius</i>		IC	SMM	CHT**, FLI**, OCM, OCO, OGE, SAV
Hightscale Shiner* <i>Notropis hypsilepis</i>	HWI	IC	SMM	CHT, FLI
Tennessee Shiner <i>Notropis leuciodus</i>		IC		CHT**
Longnose Shiner* <i>Notropis longirostris</i>		IC	SMM	CHT, COO, FLI, OCM**, OCO**
Yellowfin Shiner* <i>Notropis lutipinnis</i>		IC		CHT, COO, FLI, OCM, OCO, OGE, SAV
Coastal Shiner* <i>Notropis petersoni</i>	INT	IC		CHT, FLI, OCM, OCO, OGE, SAV
Sandbar Shiner* <i>Notropis scepticus</i>		IC		SAV

Fish List for the Piedmont Ecoregion of Georgia.

Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Silverstripe Shiner* <i>Notropis stribus</i>		IC		COO, TAL
Weed shiner* <i>Notropis texanus</i>		IC		CHT, FLI, OCM**, TAL
Coosa Shiner* <i>Notropis xaeocephalus</i>		IC		CHT**, COO
Pugnose Minnow* <i>Opsopoeodus emiliae</i>	INT	IC		FLI
Riffle Minnow* <i>Phenacobius catostomus</i>	INT	IC	SMM	COO, TAL
Fathead Minnow <i>Pimephales promelas</i>		OM		EXOTIC
Bullhead Minnow* <i>Pimephales vigilax</i>		OM		COO, TAL
Lowland Shiner* <i>Pteronotropis stonei</i>		IC		OCM, OCO, OGE, SAV
Creek Chub* <i>Semotilus atromaculatus</i>		GE		CHT, COO, OCM, OCO, OGE, SAV, TAL
Dixie Chub* <i>Semotilus thoreauianus</i>		GE		CHT, FLI, TAL
Catostomidae				
White Sucker* <i>Catostomus commersoni</i>	IN	RBS		CHT**, OCM**
Western Creek Chubsucker* <i>Erimyzon claviformis</i>	IN	RBS		CHT, FLI
Eastern Creek Chubsucker* <i>Erimyzon oblongus</i>	IN	RBS		OCM, OCO, OGE, SAV

Fish List for the Piedmont Ecoregion of Georgia.

Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Lake Chubsucker* <i>Erimyzon suetta</i>	INT	IN	RBS	CHT, FLI, OCM, OCO, OGE, SAV
Alabama Hogsucker* <i>Hypentelium etowanum</i>		IN	RBS	CHT, COO, TAL
Northern Hogsucker* <i>Hypentelium nigricans</i>		IN	RBS	OCO, SAV
Spotted Sucker* <i>Minytrema melanops</i>		IN	RBS	CHT, COO, FLI, OCM, OCO, OGE, SAV
Notchlip Redhorse* <i>Moxostoma collapsum</i>	INT	IN	RBS	OCM, OCO, OGE, SAV
Black Redhorse* <i>Moxostoma duquesnei</i>	INT	IN	RBS	COO, TAL
Golden Redhorse* <i>Moxostoma erythrurum</i>		IN	RBS	COO, TAL
Greater Jumprock* <i>Moxostoma lachneri</i>		IN	RBS	CHT, FLI
Blacktail Redhorse* <i>Moxostoma poecilurum</i>		IN	RBS	COO, TAL
Robust Redhorse <i>Moxostoma robustum</i>		IN	RBS	OCM, OCO, OGE, SAV
Striped Jumprock* <i>Moxostoma rupiscartes</i>		IN	RBS	CHT, FLI, OCM, OCO, OGE, SAV
Apalachicola Redhorse* <i>Moxostoma sp.</i>	INT	IN	RBS	CHT, FLI
Brassy Jumprock* <i>Moxostoma sp.</i>	INT	IN	RBS	OCM, OCO, OGE, SAV

Fish List for the Piedmont Ecoregion of Georgia.

Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Ictaluridae				
Snail Bullhead* <i>Ameiurus brunneus</i>		GE		CHT, COO, FLI, OCM, OCO, OGE, SAV
White Catfish* <i>Ameiurus catus</i>		GE		CHT, FLI, OCM, OCO, OGE, SAV
Black Bullhead* <i>Ameiurus melas</i>		GE		CHT**, COO, TAL
Yellow Bullhead* <i>Ameiurus natalis</i>		GE		CHT, COO, FLI, OCM, OCO, OGE, SAV, TAL
Brown Bullhead* <i>Ameiurus nebulosus</i>		GE		CHT, COO, FLI, OCM, OCO, OGE, SAV, TAL
Flat Bullhead* <i>Ameiurus platycephalus</i>		GE		CHT**, OCM, OCO, OGE, SAV, TAL**
Blue Catfish <i>Ictalurus furcatus</i>		CR		CHT**, OCM**, OCO**, SAV**
Channel Catfish* <i>Ictalurus punctatus</i>		GE		CHT, COO, FLI, OCM, OCO, OGE, SAV, TAL
Black Madtom* <i>Noturus funebris</i>	HWI	IN	BI	CHT, TAL
Tadpole Madtom* <i>Noturus gyrinus</i>	HWI	IN	BI	OCM, OCO, OGE, SAV
Margined Madtom* <i>Noturus insignis</i>		IN	BI	OCM, OCO, OGE, SAV
Speckled Madtom* <i>Noturus leptacanthus</i>		IN	BI	CHT, COO, FLI, OCM, OCO, OGE, SAV, TAL
Frecklebelly Madtom <i>Noturus munitus</i>		IN	BI	COO
Flathead Catfish* <i>Pylodictis olivaris</i>		CR		CHT**, COO, FLI**, OCM**, OCM**, OGE**, SAV**

Fish List for the Piedmont Ecoregion of Georgia.

Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Esocidae				
Redfin Pickerel* <i>Esox americanus</i>		CR		CHT, FLI, OCM, OCO, OGE, SAV, TAL
Chain Pickerel* <i>Esox niger</i>				
Salmonidae				
Rainbow Trout* <i>Oncorhynchus mykiss</i>		CR		EXOTIC
Brown Trout* <i>Salmo trutta</i>		CR		EXOTIC
Aphredoderidae				
Pirate Perch* <i>Aphredoderus sayanus</i>		IN		CHT, FLI, OCM, OCO, OGE, SAV
Fundulidae				
Stippled Studfish <i>Fundulus bifax</i>		IN		TAL
Blackspotted Topminnow* <i>Fundulus olivaceus</i>		IN		CHT, COO, TAL
Southern Studfish* <i>Fundulusstellifer</i>		IN		CHT, COO
Poeciliidae				
Mosquitofish* <i>Gambusia sp.</i>		OM		CHT, COO, FLI, OCM, OCO, OGE, SAV, TAL
Atherinidae				
Brook Silversides* <i>Labidesthes sicculus</i>		IN		CHT, FLI, OCM, OCO, OGE, SAV

Fish List for the Piedmont Ecoregion of Georgia.

Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Cottidae				
Banded Sculpin* <i>Cottus carolinae</i>		GE	BI	COO
Percichthyidae				
White Perch <i>Morone americana</i>		CR		SAV**
White Bass* <i>Morone chrysops</i>		CR		CHT**, COO**, FLI**, OCM**, OCO**, SAV**
Striped Bass <i>Morone saxatalis</i>		CR		CHT, COO, FLI, OCM, OCO, OGE, SAV
Centrarchidae				
Shadow Bass* <i>Ambloplites ariommus</i>	INT	CR	SF	CHT, COO, FLI, TAL
Rock Bass* <i>Ambloplites rupestris</i>	INT	CR	SF	CHT**
Flier* <i>Centrarchus macropterus</i>		IN	SF	CHT, FLI, OCM, OCO, OGE, SAV
Redbreast Sunfish* <i>Lepomis auritus</i>		IN	SF	CHT, COO**, FLI, OCM, OCO, OGE, SAV, TAL**
Green Sunfish* <i>Lepomis cyanellus</i>		GE	SF	CHT**, COO, FLI**, OCM**, OCO**, OGE**, SAV**, TAL

Fish List for the Piedmont Ecoregion of Georgia.

Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Pumpkinseed* <i>Lepomis gibbosus</i>		IN	SF	SAV
Warmouth* <i>Lepomis gulosus</i>		CR	SF	CHT, COO, FLI, OCM, OCO, OGE, SAV, TAL
Bluegill* <i>Lepomis macrochirus</i>		IN	SF	CHT, COO, FLI, OCM, OCO, OGE, SAV, TAL
Dollar Sunfish* <i>Lepomis marginatus</i>		IN	SF	CHT, FLI, OCM, OCO, OGE, SAV
Longear Sunfish* <i>Lepomis megalotis</i>		IN	SF	CHT**, COO, OCM**, OCO**, OGE**, SAV**, TAL
Redear Sunfish* <i>Lepomis microlophus</i>		IN	SF	CHT, COO, FLI, OCM, OCO, OGE, SAV, TAL
Spotted Sunfish* <i>Lepomis punctatus</i>		IN	SF	CHT, COO, FLI, OCM, OCO, OGE, SAV, TAL
Shoal Bass* <i>Micropterus cataractae</i>	INT	CR	CENT	CHT, FLI, OCM**, OCO**
Chattahoochee Bass* <i>Micropterus chattahoochae</i>		CR	CENT	CHT
Redeye Bass* <i>Micropterus coosae</i>		CR	CENT	CHT**, COO
Smallmouth Bass <i>Micropterus dolomieu</i>	INT	CR	CENT	CHT**, SAV**
Alabama Bass* <i>Micropterus henshalli</i>		CR	CENT	CHT**, COO, FLI**, OCO**, OCM**, SAV**, TAL
Spotted Bass* <i>Micropterus punctulatus</i>		CR	CENT	CHT**, FLI**

Fish List for the Piedmont Ecoregion of Georgia.

Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Largemouth Bass* <i>Micropterus salmoides</i>		CR	CENT	CHT, COO, FLI, OCM, OCO, OGE, SAV, TAL
Tallapoosa Bass* <i>Micropterus tallapoosae</i>		CR	CENT	TAL
Altamaha Bass* <i>Micropterus sp.</i>		CR	CENT	OCM, OCO, OGE
Bartram's Bass* <i>Micropterus sp.</i>		CR	CENT	SAV
White Crappie* <i>Pomoxis annularis</i>		CR	CENT	CHT**, COO, FLI**, OCM**, OCO**, OGE**, SAV**
Black Crappie* <i>Pomoxis nigromaculatus</i>		CR	CENT	CHT, COO, FLI, OCM, OCO, OGE, SAV, TAL
Percidae				
Holiday Darter* <i>Etheostoma brevirostrum</i>	INT	IN	BI	COO
Lipstick Darter* <i>Etheostoma chuckwachatte</i>	INT	IN	BI	TAL
Coosa Darter* <i>Etheostoma coosae</i>		IN	BI	COO
Etowah Darter* <i>Etheostoma etowahae</i>	INT	IN	BI	COO
Swamp Darter* <i>Etheostoma fusiforme</i>		IN	BI	CHT, FLI, OCM, OCO, OGE, SAV
Christmas Darter* <i>Etheostoma hopkinsi</i>	HWI	IN	BI	OCM, OCO, OGE, SAV
Turquoise Darter* <i>Etheostoma inscriptum</i>	INT	IN	BI	OCM, OCO, OGE, SAV

Fish List for the Piedmont Ecoregion of Georgia.

Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Greenbreast Darter* <i>Etheostoma jordani</i>	INT	IN	BI	COO
Tessellated Darter* <i>Etheostoma olmstedi</i>	INT	IN	BI	OCM, OCO, OGE, SAV
Goldstripe Darter* <i>Etheostoma parvipinne</i>		IN	BI	CHT, FLI, OCM, OCO
Rock Darter <i>Etheostoma rupestre</i>		IN	BI	COO
Cherokee Darter* <i>Etheostoma scotti</i>		IN	BI	COO
Speckled Darter* <i>Etheostoma stigmaeum</i>		IN	BI	COO, TAL
Gulf Darter* <i>Etheostoma swaini</i>	INT	IN	BI	CHT, FLI
Tallapoosa Darter* <i>Etheostoma tallapoosae</i>		IN	BI	TAL
Amber Darter <i>Percina antesella</i>		IN	BI	COO
Halloween Darter <i>Percina crypta</i>		IN	BI	CHT, FLI
Mobile Logperch* <i>Percina kathae</i>		IN	BI	COO, TAL

Fish List for the Piedmont Ecoregion of Georgia.

Species	Tolerance Ranking	Feeding Guild	Species Category	Drainage Basin
Bridled Darter* <i>Percina kusha</i>	INT	IN	BI	COO
Freckled Darter <i>Percina lenticular</i>		IN	BI	COO
Blackbanded Darter* <i>Percina nigrofasciata</i>		IN	BI	CHT, COO, FLI, OCM, OCO, OGE, SAV, TAL
Bronze Darter* <i>Percina palmaris</i>		IN	BI	COO, TAL
Muscadine Darter* <i>Percina smithvanizi</i>		IN	BI	TAL
Yellow perch* <i>Perca flavescens</i>		CR		EXOTIC
Sauger <i>Sander canadense</i>		CR		CHT**, SAV**
Walleye <i>Sander vitreum</i>		CR		CHT**, COO, OCO**, SAV**
Sciaenidae				
Freshwater Drum* <i>Aplodinotus grunniens</i>		CR		COO

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

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

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

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

Drainage Basin: **CHT** = Chattahoochee; **COO** = Coosa; **FLI** = Flint; **OCM** = Ocmulgee; **OCO** = Oconee; **OGE** = Ogeechee; **SAV** = Savannah; **TAL** = Tallapoosa

EXOTIC = introduced to Georgia; ** = species introduced to the indicated drainage basin