UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Service

Channel and Watershed Processes Research Unit
National Sedimentation Laboratory
Oxford, Mississippi

REFERENCE CONDITIONS FOR SEDIMENT IN THE PASCAGOULA RIVER BASIN, MISSISSIPPI

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April 2005

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Prepared by

U.S. Department of Agriculture – Agricultural Research Service
National Sedimentation Laboratory
Channel and Watershed Process Research Unit

For

Mississippi Department of Environmental Quality

May 2005

REFERENCE CONDITIONS FOR SEDIMENT IN THE PASCAGOULA RIVER BASIN, MISSISSIPPI

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EXECUTIVE SUMMARY

Seven segments within the Pascagoula River Basin are listed as having impaired conditions for aquatic life due to sediment. An additional twelve sites in the basin are listed for biologic impairment. At the request and support of the Mississippi Department of Environmental Quality (MDEQ), the Channel and Watershed Processes Research Unit, National Sedimentation Laboratory, embarked on a study of sediment loadings in the Pascagoula River Basin, Mississippi. The principal objective of the study was to determine suspended-sediment transport rates for stable or unimpaired ("reference") streams in the Basin by which MDEQ could develop Total Maximum-Daily Load (TMDL) water-quality targets for sediment. Without historical sediment-transport data for streams found within the Pascagoula River Basin, a combination of methods were used including empirical analysis of historic data from other sites within the ecoregions that the study area is located, field reconnaissance and detailed data collection and surveying. "Reference" suspended-sediment transport rates were obtained from stable streams with historical flow and sediment-transport data at two scales of study: on a larger scale, Ecoregion Level III; the Southeastern Plains (65) and the Southern Coastal Plains (75), and the smaller Ecoregion Level IV scale. The relative stability of streams at these two scales was determined and compared to the relative stability of sites within the Pascagoula River Basin.

Using the discharge that occurs, on average every 1.5 years ($Q_{1.5}$) as the "effective discharge", and a flow rate that represents long-term sediment-transport conditions, an initial "general reference" annual suspended-sediment yield of 7.91 T/y/km^2 was obtained for Ecoregion 65 and 2.8 T/y/km^2 for Ecoregion 75. These values, however, are based on streams from a wide range of different geomorphologic environments that have undergone different landscape uses and changes. Comparing data regarding stream stability at MDEQ Index of Biologic Integrity (IBI) sites with stability data collected from Level III and IV ecoregion scales, Level IV ecoregions were considered to be the most appropriate representation of stability in the Pascagoula River Basin. A refined "reference" condition was developed for Level IV Ecoregions 65d, 65f and 65p resulting in annual "reference" suspended-sediment yields of 49.8, 42.0 and 10.5 T/y/km^2, respectively at the $Q_{1.5}$.

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INTERACTIVE CD

Characterization of Stream Morphology and Sediment Yields for The Pascagoula River Basin

Digital format of all data collected in the field from the Pascagoula River Basin. Includes the following for each field site:
- Photographs;
- Bed material particle size data; and
- Channel stability Index.

Digital format of all maps produced using data collected in the field from the Pascagoula River Basin.
- Channel Stability Index
- Stage of channel evolution
- Streambank erosion
- Streambank instability
- Channel incision
- Primary Bed Material

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a	An exponent assumed to be 1.0
Concentration	Milligrams per liter; mg/l
D	Characteristic particle diameter, in millimeters; mm
D_{50}	Median particle diameter, in millimeters; mm
D_{75}	Particle size of which 75 % of the material is smaller than, in millimeters; mm
D_{90}	Particle size of which 90 % of the material is smaller than, in millimeters; mm
g	Acceleration due to gravity, in meters per square second; 9.81 m/s^2
IBI	Index of Biologic Integrity
k	Erodibility coefficient, in cubic meters per Newton second; m^3/N-s and cubic centimeters per Newton second; cm^3/N-s
Load	Calculated using power rating curve, in metric tonnes per day or year; T/d or T/y
MDEQ	Mississippi Department of Environmental Quality
$Q_{1.5}$	Discharge with a recurrence interval of 1.5 years, in cubic meters per second; cms
R	Hydraulic radius (area/wetted perimeter), or average flow depth, in meters; m
RGA	Rapid Geomorphic Assessment
S_b	Bed slope, in meters per meter; m/m
TMDL	Total Maximum Daily Load
USGS	United States Geological Survey
Yield	Load divided by area, in metric tonnes per day per square kilometer; $T/d/km^2$ and in metric tonnes per year per square kilometer, $T/y/km^2$
ε	Rate of erosion, in meters per second; m/s
γ_w	Unit weight of water, in Newtons per cubic meter; 9810 N/m^3
ρ_s	Sediment density, in kilograms per cubic meter; 2.65 kg/m^3
ρ_w	Water density, in kilograms per cubic meter; 1 kg/m^3
τ^*	Dimensionless critical shear stress
τ_c	Critical shear stress, in Pascals; Pa
τ_e	Excess shear stress, in Pascals; Pa
τ_o	Average boundary shear stress, in Pascals; Pa

1. INTRODUCTION

Excessive erosion within river channels causes the transport and deposition of sediment, listed as one of the principle pollutants of surface waters in the United States by the 1996 National Water Quality Inventory (Section 305 (b) Report to Congress). Water-quality impairment by sediment can be separated into three major problems: chemical constituents adsorbed onto the surface of fine-grained sediments (sediment quality); sediment quantities (clean sediment) irrespective of adsorbed constituents; and alteration of substrate (bed material) by erosion or deposition. Fully mobile streambeds and deposition of fines amidst interstitial streambed gravels, can pose hazards to fish and benthic macro-invertebrate communities by disrupting habitats, degrading spawning habitat, and reducing the flow of oxygen through gravel beds. Although lethal or sub-lethal thresholds are currently unknown for many species, high concentrations of suspended-sediment over certain durations have been shown by Newcombe and coworkers (1991, 1996) to adversely affect aquatic organisms. It is therefore important to monitor the quantity and quality of sediment within a river system by means of the total maximum-daily load (TMDL); the maximum allowable loadings to, or in a stream or waterbody that does not impair designated uses.

1.1 Problem

Seven segments within the Pascagoula River Basin are listed as having impaired conditions for aquatic life due to sediment (green segments of channel in Figure 1, “Sediment impaired locations”). An additional twelve sites in the basin are listed for biologic impairment (red sediments of channel in Figure 1, “Biologically impaired loations”). By law the Mississippi Department of Environmental Quality (MDEQ) is required to develop a TMDL for segments in the basin, listed as impaired. Water Quality Criteria for the State of Mississippi does not contain a numerical target for sediment but is in narrative form: “Waters shall be free from materials…in such a degree as to create a nuisance, render the waters injurious to public health, recreation, or to aquatic life and wildlife…or impair the waters for any designated uses.” In the absence of a numerical target for sediment, MDEQ seeks quantifiable numerical ranges of suspended-sediment loads for “background” or stable conditions in the Pascagoula River Basin.

The Continental United States is divided into Level III ecoregions which have similar characteristic attributes, including among others, climatic and physiographic conditions, geology and ecology (Omernik, 1995). Preliminary reference suspended-sediment transport rates have been developed for various ecoregions of the United States, including Ecoregion 65 (Simon *et al.*, 2004). The Pascagoula River Basin lies within Ecoregion 65, the Southeastern Plains and Ecoregion 75, the Southern Coastal Plains. Data from stable sites in these ecoregions are used to determine “reference” stream conditions for suspended-sediment transport rates in each ecoregion. To make such estimates more area specific, data can be broken down into Level IV ecoregions and “reference” values for suspended-sediment transport rates improved. As the study region has similar characteristic conditions to the Level III and IV ecoregions, the “reference” suspended-sediment conditions may then be applied to the Pascagoula River Basin.

2. OBJECTIVES

This study compares previously established, Ecoregion 65 “reference” suspended-sediment transport rates to conditions in the Pascagoula River Basin, thus determining “reference” suspended-sediment conditions in the study region. Level IV ecoregion divisions are used to further refine suspended-sediment transport rates in Ecoregion 65 where historical data exists.

3. SEDIMENT DATA SOURCES

3.1 Availability of Data

Analysis of the impacts of suspended sediment requires a database of suspended-sediment concentrations with associated instantaneous water discharge. Data of this type permits analysis of sediment-transport characteristics and the development of rating relations (Porterfield, 1972; Glysson, 1987). Collection of suspended-sediment data is time consuming and expensive in that it must take place over a broad range of flows to accurately evaluate the sediment-transport regime at a site. However, the U.S. Geological Survey (USGS) has identified more than 2,900 sites nationwide where at least 30 matching samples of suspended sediment and instantaneous flow discharge have been collected (Turcios and Gray, 2001). At many of the 2,900 sites, data on the particle-size distribution of suspended- and bed-material sediment are also available. This historical database serves as the foundation for analyzing sediment-transport characteristics over the range of physiographic conditions that exist in Ecoregions 65 and 75, within which the Pascagoula River Basin lies.

To be useful for TMDL practitioners, sediment-transport relations must be placed within a conceptual and analytic framework such that they can be used to address sediment-related problems at sites where no such data exists. To accomplish this, sediment-transport characteristics and relations need to be regionalized according to attributes of channels and drainage basins that are directly related to sediment production, transport, and potential impairment. Ecoregions are convenient units with which to regionalize investigations concerning dominant channel processes, differentiated as stage of channel evolution (Simon and Hupp, 1986; Simon, 1989a).

3.2 Study Area

The study area samples part of the Pascagoula River Basin (Figure 1), the second largest drainage basin in Mississippi. The Pascagoula, Leaf and Chickasawhay Rivers, and Black and Red Creeks are the major streams which drain approximately 24,864 square kilometers into the Gulf of Mexico (Estes, 2002).

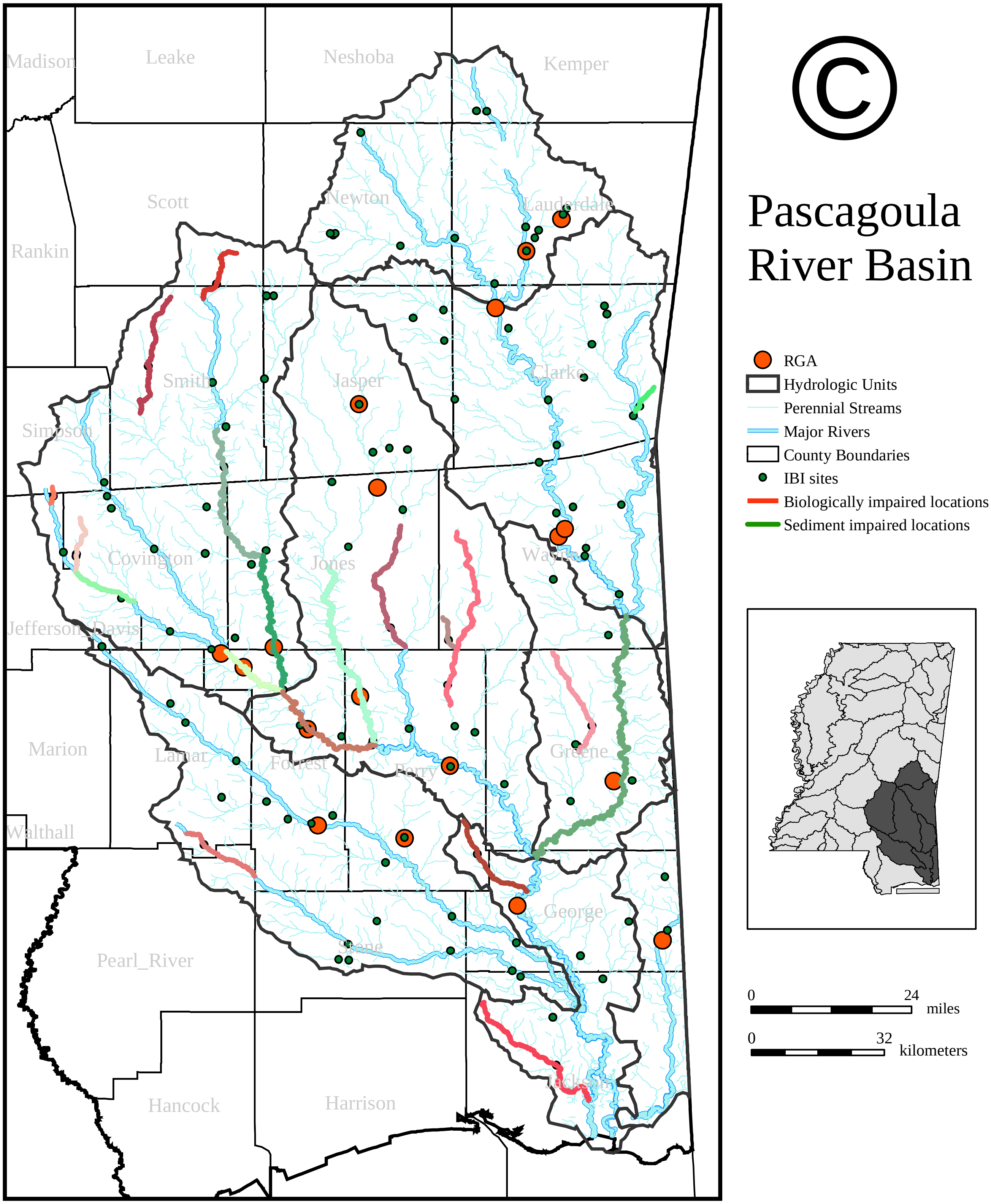

Figure 1 – Location map of MDEQ IBI field sites, sediment impaired reaches of channel (shaded green) and biologically impaired reaches of channel (shaded red) in the Pascagoula River Basin.

About 72 percent of the basin is forested, 21 percent agricultural land and remaining land is urban/residential, with marshland near the coast (Strom, 1998). Historically, there has been point source pollution from industrial and residential areas. Waterbodies appear ‘murky’ with seemingly high amounts of suspended-sediment and may look ‘black’ due to tannins from vegetation (Strom, 1998). Stream bed material is mostly sand with a small number of gravel bed streams.

MDEQ has biotic and abiotic data for many sites within the Pascagoula River Basin in the form of an Index of Biologic Integrity (IBI). There are 114 IBI sites previously visited by MDEQ in order to assess biology and habitat of different species. IBI sites are shown in Figure 1, along with the gauging stations in the Pascagoula River Basin (listed in Appendix A) and impaired reaches of channel.

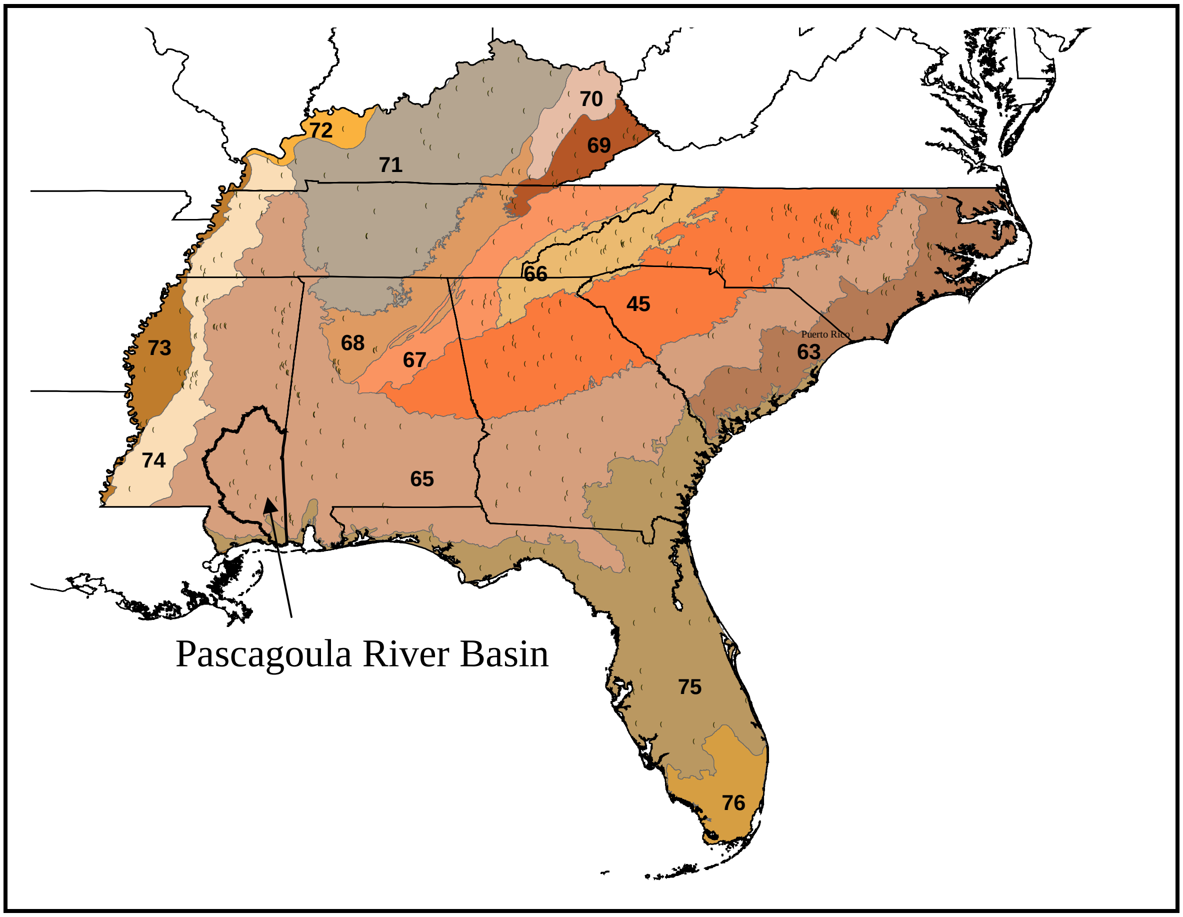

Figure 2 – Location map of the Pascagoula River Basin and the part of Southeastern Plains Ecoregion (#65) and Southern Coastal Plains Ecoregion (#75) within EPA Region IV.

The Pascagoula River Basin is located in the Southeastern Plains (Ecoregion 65) and the Southern Coastal Plains (Ecoregion 75, Ecoregion Level III Figure 2). Ecoregions are subdivided into Level IV Ecoregions, as shown in Figure 3 for the Pascagoula River Basin which spans Level IV Ecoregions 65d, 65f, 65p, 65q, 65r, 75a, 75i, and 75k (Table 1). Annual suspended-sediment or "reference" values can only be calculated for regions where USGS gauging stations are located with sufficient discharge data, at least 10 years of data and sufficient suspended-sediment data, at least 30 samples. Therefore, it was only possible to calculate the annual suspended-sediment or "reference" yield values for Level IV Ecoregions 65d, 65f and 65p.

Ecoregion 65 contains 149 gauging stations (Appendix B) with sufficient flow records and suspended-sediment measurements for data analysis; Ecoregion 75 has 33 (Appendix C). Eleven of the stations in Ecoregion 65 are located within the Pascagoula River Basin (highlighted yellow in Appendix B). Historical suspended-sediment data from Ecoregion 65 can be compared with data from the eleven gages within the Pascagoula River Basin, to ascertain whether Ecoregion 65 reference data can be applied to MDEQ IBI sites in the Pascagoula River Basin, where no historical suspended-sediment data currently exists.

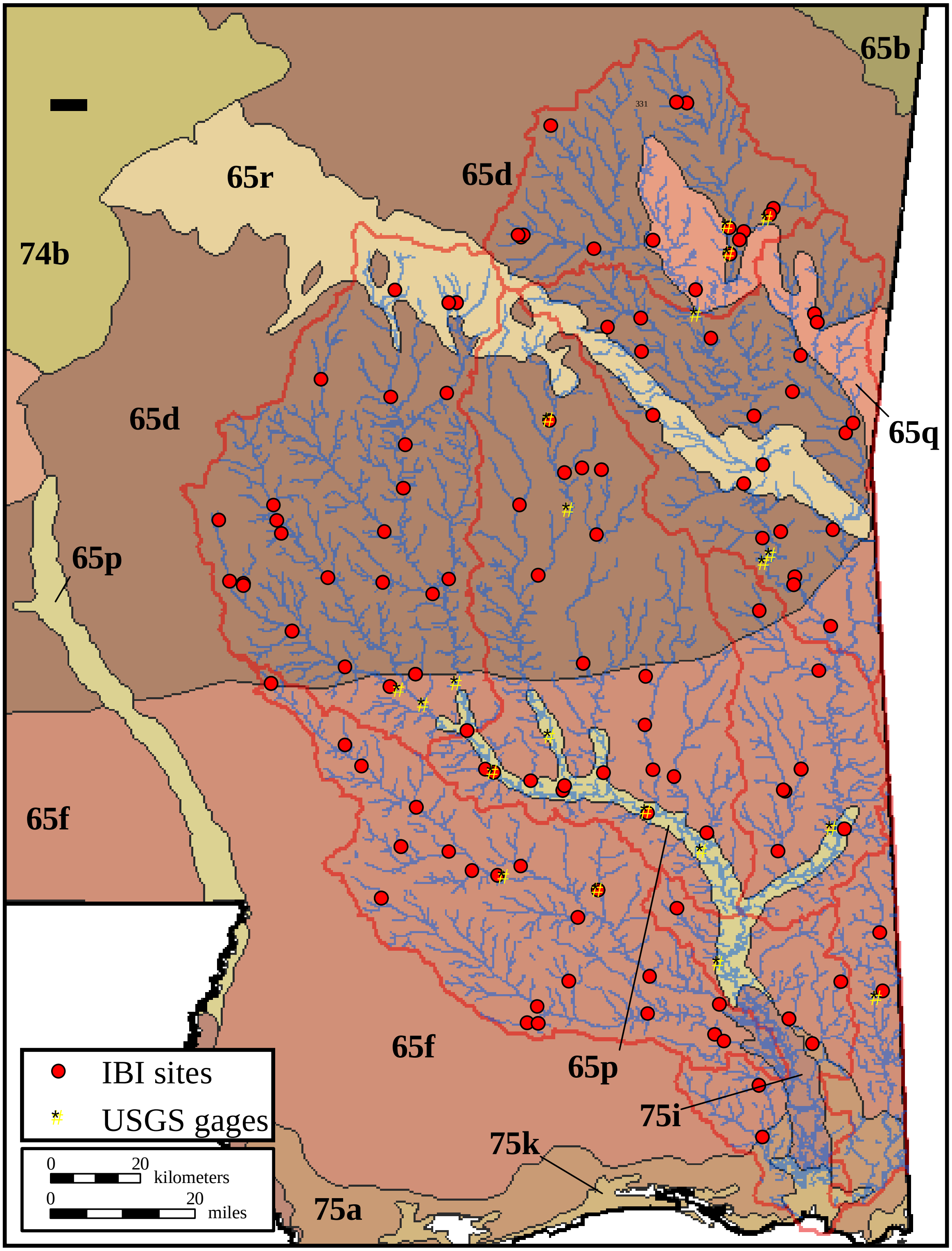

Figure 3 – Map of Pascagoula River Basin showing Level IV ecoregions, location of IBI sites, and USGS gages where Rapid Geomorphic Assessments (RGAs) were conducted.

Table 1 – Summary information regarding Level IV Ecoregions within which the Pascagoula River Basin is located.

Level IV Ecoregions	Area (km^2)	Physiography	Elevation /Local Relief (m)	Geology Surficial and Bedrock	Climate		Potential Natural Vegetation	Land Use and Land Cover
					Precipitation Mean Annual (mm)	Mean Temperature January min/max July min/max (^{o}F)		
65d. Southern Hilly Gulf Coastal Plain	27871	Dissected hills with rounded tops and gently sloping to strongly sloping side slopes; dissected irregular plains; some wide floodplains and broad, level to undulating terraces; low to moderate gradient mostly sandy bottomed streams.	46 - 201 30 - 91	Quaternary fine to coarse sand, and sandy clay decomposition residuum; Tertiary (Miocene to Eocene) sand, clay, silt, limestone, and lignite, Cretaceous sand, clay, and lignite.	55 - 60	33/56 70/91	Oak-hickory-pine forest with post oak, blackjack oak, southern red oak, shortleaf pine, pignut and mockernut hickory; in the south, pine and pine-oak forest with longleaf and some shortleaf pine, blackjack oak, sand post oak, bluejack oak; southern floodplain forest with cypress-gum swamp, bottomland hardwoods, and some loblolly pine.	Mixed forest, pine plantations, intermixed areas of pasture, hayfields, and minor cropland; cattle and poultry production, bottomland forested wetlands, some public lands, oil and gas production in the south.
65f. Southern Pine Plains and Hills	15866	Southward-sloping, dissected irregular plains, some low rolling hills, mostly broad gently sloping ridgetops; low to moderate gradient sand and clay bottomed streams.	6 - 155 30 - 76	Quaternary sandy clay decomposition residuum, alluvial gravel and sand; Tertiary (Miocene) fine to coarse sand, gravelly sand, and clay.	60-68	37/60 70/92	Pine and pine-oak forest. Mostly longleaf pine, some slash pine to the south in wet areas, southern red oak, turkey oak, sand post oak, saw palmetto; some southern floodplain forest with cypress-gum swamp and bottomland hardwoods.	Pine plantations, pasture and some cropland of corn, soybeans, and cotton; poultry, cattle, and dairy production, turfgrass and sod production, some public land.
65p. Southeastern Floodplains and Low Terraces	1730	Major river floodplains and associated low terraces; low gradient streams with sandy and silty substrates, oxbow lakes, ponds, and swamps.	3 - 76 2 - 11	Quaternary alluvial gravelly sand, quartz gravel and sand, silts, and clays.	57 North 60 - 64 South	32-36/54-58 68/91	Southern floodplain forest. Includes cypress-gum swamp (bald cypress, pond cypress, water tupelo, swamp tupelo) and bottomland hardwood forest (bottomland oaks, sweetgum, American elm, red maple, green ash, water hickory).	Mostly forested wetlands and deciduous forest, some pine plantations and cropland on terraces.
65q. Buhrstone/ Limestone Hills	865	Strongly dissected hills and rolling low hills, cuesta with northeast-facing steep slope; moderate or higher gradient streams with sand, gravel, cobble, and bedrock substrates.	76 - 201 61- 122	Quaternary siliceous clay decomposition residuum, limonitic sandy decomposition residuum; Tertiary (Eocene) claystone, siltstone, clay, sandy clay, sandstone, limestone, and marl.	57 - 62	34/57 70/92	Mixed oak-pine forest, with white oak, southern red oak, sweetgum, hickories, shortleaf and some longleaf pine.	Mixed and deciduous forest, pine plantations.
65r. Jackson Prairie	2473	Undulating irregular plains, nearly level to strongly sloping; low gradient streams with chalk, clay, sand, and silt substrates.	64 - 198 15 - 61	Quaternary and Tertiary smectitic clay decomposition residuum; Tertiary (Eocene) clay, calcareous clay, sand, marl, and shells.	55 - 59	34/57 69/91	Oak-hickory-pine forest with post oak, water oak, white oak, southern red oak, mockernut hickory, sweetgum, some shortleaf, longleaf, or loblolly pine; scattered prairies of little bluestem, yellow Indiangrass, prairie clover, and prairie coneflower.	Pasture, pine plantations, mixed forest, cattle production, public land (Bienville National Forest).
75a. Gulf Coast Flatwoods	1725	Flat to gently undulating plain; low gradient streams with sandy and silty substrates.	0.3 - 23 2 - 9	Quaternary quartz sand, shell fragments, silt, clay, muck, peat, some Pleistocene and Pliocene gravel.	61 - 66	40/60 72/90	Slash pine flatwoods/savanna with wiregrass, longleaf pine savanna, longleaf pine-saw palmetto woodland, wet (slash) pine-pond cypress savanna.	Pine plantations, mixed forest, forested wetland, some pasture and cropland on better drained areas, urban.
75i. Floodplains and Low Terraces	453	Major river floodplains and associated low terraces; low gradient streams with sandy and silty substrates, oxbow lakes, ponds, swamps.	0.3 - 15 2 - 8	Quaternary quartz sand, silt, clay, muck, peat, some Pleistocene and Pliocene gravel.	61 - 66	40/60 71/9	Southern floodplain forest. Includes cypress-gum swamp (bald cypress, pond cypress, water tupelo, swamp tupelo) and bottomland hardwood forest (bottomland oaks, sweetgum, American elm, red maple, green ash, and water hickory).	Forested wetland, deciduous forest, wildlife habitat.
75k. Gulf Barrier Islands and Coastal Marshes	570	Tidal marshes, bays, river deltas, lagoons, barrier islands, dunes, beaches.	0 - 8 2 - 5	Quaternary quartz sand, shell fragments, silt, clay, muck, peat.	62 - 65	41/60 72/90	Salt and brackish marshes (cordgrass, saltgrass, rushes); tidal freshwater marsh (arrowhead, spikerush, bullrush); maritime shrub (rosemary, scrub oaks, eastern baccharis); maritime slash pine savanna (slash pine, saltmeadow cordgrass); maritime evergreen forest (live oak, upland laurel oak, slash pine); dune grass (sea oats).	Marsh, forested wetland, urban, evergreen forest, beaches, wildlife habitat, recreation, fish and shellfish production.

Adapted from the U.S. Environmental Protection Agency, Western Ecology Division Unit, Ecoregions of Mississippi: http://www.epa.gov/wed/pages/ecoregions/ms_eco.htm.
Summary Table: Characteristics of the Ecoregions of Mississippi: ftp://ftp.epa.gov/wed/ecoregions/ms/ms_back.pdf

4. METHODOLOGY

The methods used in this study follow a tested procedure aimed at developing defensible estimates of current sediment loads and sources relative to a "reference" sediment load for the Pascagoula River Basin. A "reference" suspended-sediment loading condition can be defined as a concentration (in milligrams per liter; mg/l), load (in metric tonnes per day or year; T/d or T/y) or yield (in tonnes per day per square kilometer, T/d/km^2, or tonnes per year per square kilometer, T/y/km^2), this latter definition is preferred as it is watershed basin size dependent allowing the comparison of basins.

4.1 "Reference" Conditions

Rates and concentrations of suspended-sediment transport vary over time and space due to factors such as precipitation characteristics and discharge, geology, relief, land use and channel stability, among others. There is no reason to assume that "natural" or background rates of sediment transport will be consistent from one region to another. Within the context of clean-sediment TMDLs, it follows that there is no reason to assume then that "target" values should be consistent on a nationwide basis. Similarly, there is no reason to assume that channels within a given region will have consistent rates of sediment transport. For example, unstable channel systems or those draining disturbed watersheds will produce and transport more sediment than stable channel systems in the same region. This reflects differences in the magnitude and perhaps type of erosion processes that dominate a sub-watershed or stream reach.

In order to identify those sediment-transport conditions that represent impacted or impaired conditions, it is essential to first be able to define a non-disturbed, stable, or "reference" condition. For the purposes of this study and report, stability is defined in geomorphic terms; that is, a stream in dynamic equilibrium, capable of transporting all sediment delivered to the system without altering its dimensions over a period of years. This is not to say that the stream is static but that short-term, local processes of scour and fill, erosion and deposition, are balanced through a reach such that the stream does not widen, narrow, degrade or aggrade.

4.1.1 Stages of Channel Evolution

The channel evolution framework set out by Simon and Hupp (1986) is used by TMDL practitioners to asses the stability of a channel reach (Figure 4; Table 2). With stages of channel evolution tied to discrete channel processes and not strictly to specific channel shapes, they have been successfully used to describe systematic channel-adjustment processes over time and space in diverse environments, subject to various disturbances such as stream response to: channelization in the Southeast US Coastal Plain (Simon, 1994); volcanic eruptions in the Cascade Mountains (Simon, 1999); and dams in Tuscany, Italy (Rinaldi and Simon, 1998). Because the stages of channel evolution represent shifts in dominant channel processes, they are systematically related to suspended-sediment and bed-material discharge (Simon, 1989b; Kuhnle and Simon, 2000), fish-community structure, rates of channel widening (Simon and Hupp, 1992), and the density and distribution of woody-riparian vegetation (Hupp, 1992).

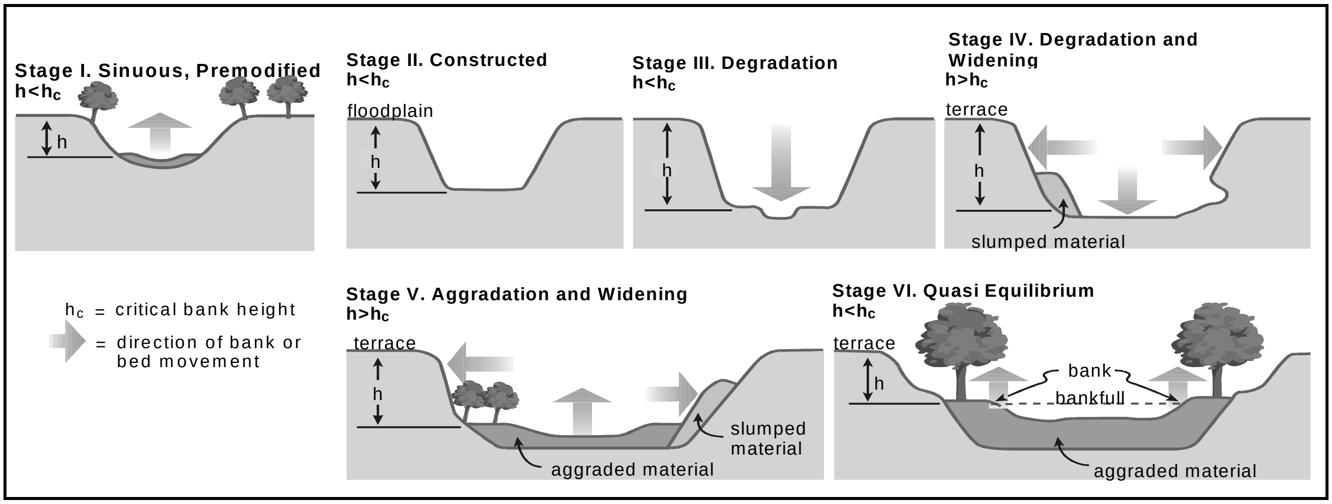

Figure 4 – Six stages of channel evolution from Simon and Hupp (1986) and Simon (1989a) identifying Stages I and VI as "reference" conditions for given Ecoregions.

Table 2 – Summary of conditions to be expected at each stage of channel evolution.

Stage	Descriptive Summary
I	*Pre-modified* – Stable bank conditions, no mass wasting, small, low angle bank slopes. Established woody vegetation, convex upper bank, concave lower bank.
II	*Constructed* – Artificial reshaping of existing banks. Vegetation often removed, banks steepened, heightened and made linear.
III	*Degradation* – Lowering of channel bed and consequent increase of bank heights. Incision without widening. Bank toe material removed causing an increase in bank angle.
IV	*Threshold* – Degradation and basal erosion. Incision and active channel widening. Mass wasting from banks and excessive undercutting. Leaning and fallen vegetation. Vertical face may be present.
V	*Aggradation* – Deposition of material on bed, often sand. Widening of channel through bank retreat; no incision. Concave bank profile. Filed material re-worked and deposited. May see floodplain terraces. Channel follows a meandering course.
VI	*Restabilization* – Reduction in bank heights, aggradation of the channel bed. Deposition on the upper bank therefore visibly buried vegetation. Convex shape. May see floodplain terraces.

An advantage of a process-based channel-evolution scheme for use in TMDL development is that Stages I and VI represent true "reference" conditions. In some cases, such as in the Midwestern United States where land clearing activities near the turn of the 20th Century caused massive changes in rainfall-runoff relations and land use, channels are unlikely to recover to Stage I, pre-modified conditions. Stage VI, a re-stabilized condition, is a much more likely target under present regional land use and altered hydrologic regimes (Simon and Rinaldi, 2000) and can be used as a "reference" condition. Stage VI streams can be characterized as a 'channel-within-a-channel', where the previous floodplain surface is less frequently inundated and can be described as a terrace. This morphology is typical of recovering and re-stabilized stream systems following incision. In pristine areas, where disturbances have not occurred or where they are far less severe, Stage I conditions can be appropriate as a reference.

4.1.2 Rapid Geomorphic Assessments: RGA's

To evaluate channel-stability conditions and stage of channel evolution of a particular reach, a Rapid Geomorphic Assessment (RGA) was carried out using the Channel-Stability Ranking Scheme (Figure 5). RGAs utilize diagnostic criteria of channel form to infer dominant channel processes and the magnitude of channel instabilities through a series of nine questions. Granted, evaluations of this sort do not include an evaluation of watershed or upland conditions; however, stream channels act as conduits for energy, flow and materials as they move through the watershed and will reflect a balance or imbalance in the delivery of sediment. Given the large number of sites in Ecoregions 65 and 75, it was not feasible to perform detailed, time consuming field surveys at every site, RGAs provided an efficient alternative, enabling the rapid characterization of stability conditions.

The RGA procedure consists of five steps to be completed on site:

1. Determine the 'reach'. The 'reach' is described as the length of channel covering 6-20 channel widths, thus is scale dependent and covers at least two pool-riffle sequences.
2. Take photographs looking upstream, downstream and across the reach; for quality assurance and quality control purposes. Photographs are used with RGA forms to review the field evaluation
3. Make observations of channel conditions and diagnostic criteria listed on the channel-stability ranking scheme.
4. Sample bed material.
5. Perform a survey of thalweg, or water surface if the water is too deep to wade. Bed or water surface slope is then calculated over at least two pool-riffle sequences.

4.1.3 Channel-Stability Index

A field form containing nine criteria (Figure 5) was used to record observations of field conditions during RGAs. Each criterion was ranked from zero to four and all values summed to provide an index of relative channel stability. The higher the number the greater the instability: sites with values greater than 20 exhibit considerable instability; stable sites generally rank 10 or less. Intermediate values denote reaches of moderate instability. However, rankings are not weighted, thus a site ranked 20 is not twice as unstable as a site ranked 10.

CHANNEL-STABILITY RANKING SCHEME

River__________________________ **Site Identifier**_____________________________________

Date ______________ **Time**_______ **Crew** _______________ **Samples Taken**__________________________

Pictures (circle) U/S D/S X-section **Slope**__________ **Pattern:** Meandering
Straight
Braided

1. Primary bed material

Bedrock	Boulder/Cobble	Gravel	Sand	Silt Clay	
0	1	2	3	4	_____

2. Bed/bank protection

Yes	No	(with)	1 bank protected	2 banks	
0	1		2	3	_____

3. Degree of incision (Relative elevation of "normal" low water; floodplain/terrace @ 100%)

0-10%	11-25%	26-50%	51-75%	76-100%	
4	3	2	1	0	_____

4. Degree of constriction (Relative decrease in top-bank width from up to downstream)

0-10%	11-25%	26-50%	51-75%	76-100%	
0	1	2	3	4	_____

5. Stream bank erosion (Each bank)

	None	Fluvial	Mass wasting (failures)	
Left	0	1	2	_____
Right	0	1	2	_____

6. Stream bank instability (Percent of each bank failing)

	0-10%	11-25%	26-50%	51-75%	76-100%	
Left	0	0.5	1	1.5	2	_____
Right	0	0.5	1	1.5	2	_____

7. Established riparian woody-vegetative cover (Each bank)

	0-10%	11-25%	26-50%	51-75%	76-100%	
Left	2	1.5	1	0.5	0	_____
Right	2	1.5	1	0.5	0	_____

8. Occurrence of bank accretion (Percent of each bank with fluvial deposition)

	0-10%	11-25%	26-50%	51-75%	76-100%	
Left	2	1.5	1	0.5	0	_____
Right	2	1.5	1	0.5	0	_____

9. Stage of channel evolution

I	II	III	IV	V	VI	
0	1	2	4	3	1.5	_____

Figure 5 – Channel stability ranking scheme used to conduct rapid geomorphic assessments (RGA's). The channel stability index is the sum of the values obtained for the nine criteria.

4.1.4 Bed-Material Conditions

As part of each RGA, bed material was characterized. If the bed material was dominated by gravels (2.00 mm or greater) or coarser fractions, a particle count was carried out. For a particle count, the intermediate axis of one hundred particles across the channel was measured, in order to represent a range of different particle sizes found across the width of the bed. Having carried out the particle count, if 16 % of the particles measured, have a median diameter of less than 2 mm, a bulk particle size sample of 100 g or greater was collected from the left, middle and right portions across the channel. This bulk sample was sieved to half-Phi intervals. Particle size data was combined with particle count data to give percentiles of class sizes and values for commonly used metrics such as the median particle size (Appendix J and K, particle size data from the Pascagoula River Basin and Ecoregion 65 respectively). If the bed material was dominated by fines, only a bulk sample was taken.

When concerned with water quality issues and their impact upon aquatic biota, the condition of the bed material is a key factor. One critical bed condition for biota is the filling of interstitial spaces between coarse material (material 2 mm or larger; gravel, cobbles and boulders) with fines (material smaller than 2 mm; sand, silt and clay). This ‘filling of spaces’ reduces the habitat and breeding ground of macro-invertebrates. One way to examine this condition is through the “embeddedness” of the bed material. For this study we defined embeddedness by the percentage of material finer than 2 mm in an otherwise coarse matrix. Only ten sites in the study region were dominated by a coarse matrix of gravels (all other sites were sand bed streams) therefore embeddedness could not be calculated. As a result, an excess shear-stress approach was used to overcome this issue.

4.2 Calculation of Critical and Excess Shear Stresses

An alternative method was used to characterize bed-material conditions as definitions through embeddedness were invalid. This included developing excess-shear stress relations for each site to determine the percentage of time the critical shear stress of the bed material was exceeded and thus was transported. Resistance of non-cohesive materials such as sand, which dominates streams in the study area, is a function of bed roughness and particle size (weight), and is expressed in terms of dimensionless critical shear stress (Shields, 1936):

$$\tau^* = \tau_o / (\rho_s - \rho_w)\, g\, D \qquad (1)$$

where,

τ^* is critical dimensionless shear stress; critical shear stress (τ_c) in dimensional form can be obtained by invoking the Shields criterion, and for hydro-dynamically rough beds, utilizing a value of 0.06 for τ^*:

$$\tau_c = 0.06\, (\rho_s - \rho_w)\, g\, D \qquad (2)$$

0.03 is another commonly used τ^*. The average of these two τ^* values is 0.045. These three τ^* were employed.

τ_c is the critical shear stress (Pa);

ρ_s is sediment density (2.65 kg/m^3);

ρ_w is water density (1 kg/m^3);

g is acceleration due to gravity (9.81 m/s^2); and

D is the characteristic particle diameter (mm). For this purpose, the median particle diameter (D_{50}), the 75th percentile (D_{75}) and 90th percentile (D_{90}) were used.

Average boundary shear stress (τ_o) is the drag exerted by the flow on the bed:

$$\tau_o = \gamma_w\, R\, S_b \qquad (3)$$

where,

γ_w is the unit weight of water (9810 N/m^3);

R is the hydraulic radius (area/wetted perimeter) (m); if this is not available average flow depth (m) can be used; and

S_b is the slope (m/m)

Stream flow data are available from the USGS for a large number of gauging stations in Ecoregion 65 in the form of 9-207 measurements. These data include the date of the event, flow width, discharge and cross-sectional area. Cross-sectional area divided by channel width provides mean flow depth. A relationship is then developed between flow depth and discharge as shown in Figure 6. This relationship can be applied to mean-daily flow data for the same site where depth is not included in the record. In this way all data for the above calculations is provided, enabling average boundary shear stress to be estimated for the reach.

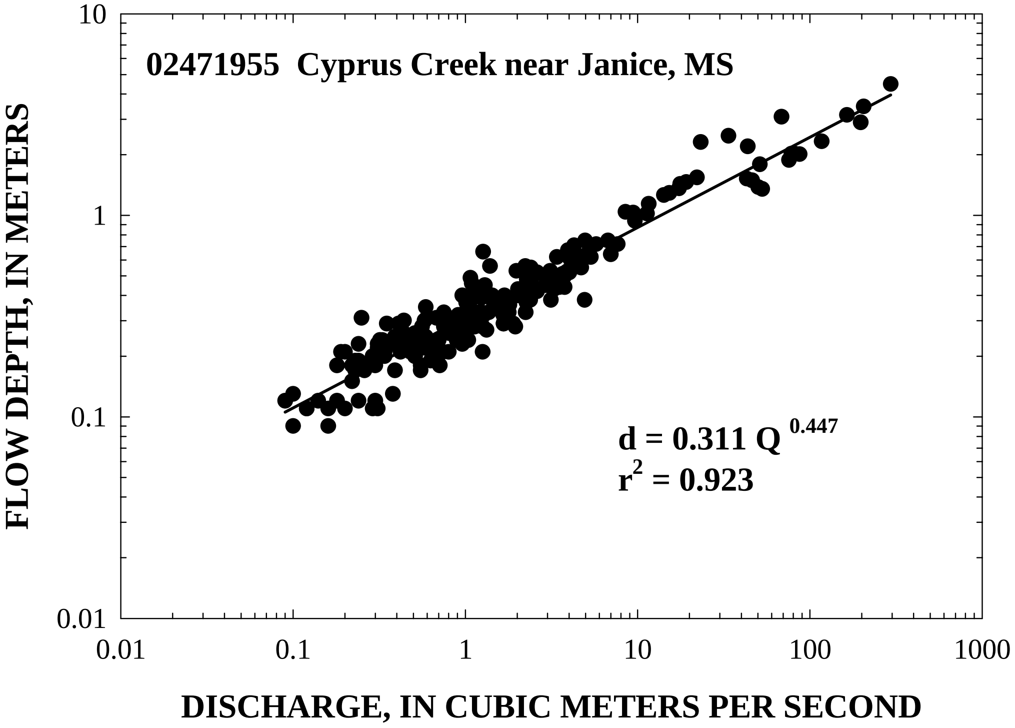

Figure 6 – Using flow depth and discharge measurements to derive an equation to be applied to all flow data where depth measurements are not available for Cyprus Creek near Janice 02471955.

Using Equation 2, τ_c was calculated for all sites in Ecoregion 65 with available flow data. τ_c was calculated using three characteristic particle diameters (D_{50}, D_{75} and D_{90}), each with three different dimensionless shear stress values ($\tau^* = 0.03, 0.045$ and 0.06).

Mean-daily shear stress was calculated using Equation 3 for the period of flow record. These values were then sorted into 33 logarithmic classes (Yevjevich, 1972) and the percentage of time shear stress values of each class occurred was calculated. Excess shear stress (τ_e) was then determined as the ratio:

$$\tau_e = \tau_o / \tau_c \qquad (4)$$

From this, the percent of time that boundary shear stress is exceeded for a certain particle diameter size, at a given τ^*, was calculated for excess shear stress values of 1, 3, 5, 7 and 10. An excess shear stress of 1 was used because this is the point of incipient motion; critical shear stress is equal to boundary shear stress. Given that streambeds are dominated by sand, critical shear stress was exceeded close to 100 % of the time. As a result of this other values of excess shear stress were tested. An excess shear stress of 3 was used because this is the measure used to describe the motion of all bed material at the reference particle size. In an attempt to find a threshold value, excess shear stress values of 5, 7, and 10 were also investigated. This translates to, the percentage of time that particles of a given size are in motion; because, for example, the excess shear stress is greater 3.

4.3 Geotechnical Data Collection

At several IBI sites, the material found on the channel bed was a hard cemented sand/clay substance. When bulk samples of this material were sieved, the median particle size diameters measured were numbers associated with sand (see IBI site 869 'Jets', Appendix J). Such materials, however do not behave as sands because of the compaction that the material has undergone to produce a seemingly 'hard', cemented substrate. As a result, it was deemed necessary to determine the critical shear stress using a jet-test device.

The submerged jet-test device is used to estimate erosion rates due to hydraulic forces in fine-grained materials *in situ* (Hanson 1990; 1991; Hanson and Simon, 2001) (Figure 7-a). The device shoots a jet of water at a known head (stress) onto the streambed causing it to erode at a given rate. As bed material erodes, the distance between the jet and the bed increases, resulting in a decrease in the applied shear stress. Theoretically, the rate of erosion beneath the jet decreases asymptotically with time to zero (example given in Figure 7-b). A critical shear stress for the material can then be calculated from the field data as that shear stress where there is no erosion.

The rate of erosion is assumed to be proportional to the shear stress in excess of a critical shear stress and is expressed as:

$$\varepsilon = k\,(\tau_o - \tau_c)^{a} = k\,(\tau_e)^{a} \tag{5}$$

where,

ε is the rate of erosion (m/s)

k is the erodibility coefficient (m^3/N-s); and

a is an exponent assumed to equal 1.0;

An inverse relation between τ_c and k occurs when soils exhibiting a low τ_c have a high k or when soils having a high τ_c have a low k. The measure of material resistance to hydraulic stresses is a function of both τ_c and k. Based on observations from across the

United States, k can be estimated as a function of τ_c (Hanson and Simon, 2001). This is generalized to:

$$k = 0.1\ \tau_c^{-0.5} \tag{6}$$

Bed material was tested at two sites in the study region using the jet-test device. At each site, tests were replicated four times. Material at these sites had a particle size diameter in the sand region, when dried, crushed and sieved. However, when in its natural cohesive form, it behaves as a more resistant material. The resistance of this material is illustrated by the high critical shear stress values required to mobilize the material as shown in Table 3. Despite applying 55 – 85 Pa of pressure to the bed material for over an hour, the maximum depth of scour measured only reached 0.397 cm. The critical shear stress values measured several orders of magnitude higher than known values for sand (0.062 Pa). Using particle size as the only variable to examine bed material mobility may, therefore, bias results.

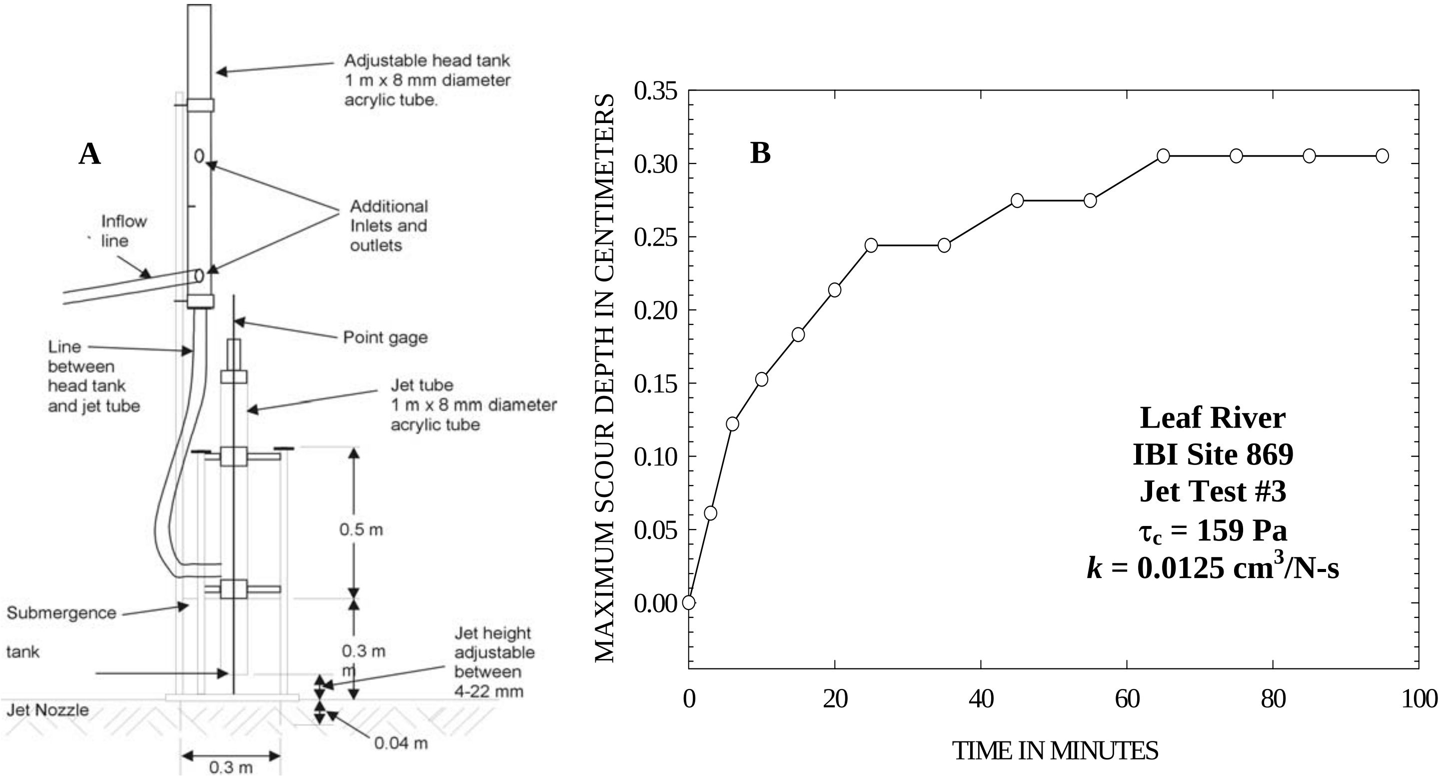

Figure 7 – A) Schematic of submerged jet-test device used to measure the erodibility coefficient k, and critical shear stress τ_c, of fine-grained materials. B) Graph produced for Leaf River jet test #3 as the jet impinges on *in-situ* material over time. Reliable tests reach an asymptote where no further erosion is occurring, as this one has.

Table 3 – Submerged jet-test values obtained from the Leaf River and Gaines Creek.

Site Location	Critical shear stress in Pa τ_c	Erodibility coefficient in cm^3/N-s k	Maximum depth of scour in cm	Average pressure applied in Pa
Leaf River IBI # 869	401	0.00134	0.244	82.7
Leaf River IBI # 869	174	0.00831	0.275	69.9
Leaf River IBI # 869	159	0.125	0.305	69.9
Leaf River IBI # 869	123	0.0123	0.397	83.7
Average	**214**	**0.0368**	**0.305**	**76.4**
Gaines Creek IBI # 496	59.1	0.123	0.244	56.5
Gaines Creek IBI # 496	170	0.00864	0.153	61.7
Gaines Creek IBI # 496	75.0	0.118	0.214	56.5
Gaines Creek IBI # 496	177	0.00771	0.305	61.7
Average	**120**	**0.0644**	**0.229**	**59.1**

4.4 Analysis of Suspended-Sediment Data

Analysis of suspended-sediment transport data at each USGS gauging station involves establishing a relation between flow and sediment concentration or load. Instantaneous-concentration data combined with either an instantaneous flow value or flow data representing the value obtained from the stage-discharge relation at 15-minute intervals are best. Mean-daily values of both flow and sediment loads, which are readily available from the USGS, tend to be biased towards lower flows, particularly in flashy basins. To establish sediment-transport rating relations, instantaneous concentration and 15-minute flow data were used from USGS gauging-station records.

For suspended-sediment the following tasks are outlined:

1. Update empirically derived sediment relations for the Southeastern Plains using historical flow and sediment-transport data;
2. Calculate annual sediment loads for all stations based on the sediment-transport relations and mean-daily flow values;
3. Derive sediment-transport duration curves based on percent of time a given load, concentration or yield is exceeded;
4. Based on diagnostic geomorphic criteria, determine relative stability of each site where historical data is available;
5. Determine regional sediment loadings by stage of channel evolution, dominant bed-material size class and relative stability;
6. Derive general suspended-sediment “references” for streams in the Pascagoula River Basin using data from the Southeastern Plains and stability conditions from sites within the basin.

Suspended-sediment transport relations are empirical representations of the sediment-transport regime at a given gauging station location, reflecting geomorphic, hydraulic and other watershed processes operating upstream. It is acknowledged that these power functions tend to mask specifics of governing sediment-transport processes, yet they still provide a useful foundation for calculating the amount of suspended sediment being transported over a broad range of flows (four or five orders of magnitude in many cases). Because the relations between water discharge and suspended-sediment load or concentration are approximate, typically high coefficients of determination between these variables (for example 0.90) may still have order-of-magnitude 95% prediction limits. This is generally caused by the natural variability of sediment-transport processes, rather than due to error in the suspended-sediment measurements. Predictions of the rate of sediment transport at a particular place and time are, therefore, not exact. However, prediction of mean transport rates over a suitably long period of time (represented by a transport relation) should have a higher degree of reliability if a dataset has been collected over the range of flows. Therefore, this is a valid means of describing and comparing the suspended-sediment transport regimes for streams from a broad range of environments.

Using storm event data concerning discharge and load, a suspended-sediment transport rating equation was developed (Porterfield, 1972; Glysson, 1987; Simon, 1989b). Discharge was plotted against concentration in log-log space and a power function obtained by regression (Figure 8). In studies carried out in other ecoregions across the United States, trends of these data (in log-log space) often increase linearly and then break off and increase more slowly at high discharges. Preliminary analyses show that although sand concentrations continue to increase with discharge, the silt-clay fraction attenuates, causing the transport relation to flatten (Kuhnle and Simon, 2000). As streambeds in the region are dominated by sand, this attenuation did not occur.

One of the approaches that we selected to describe suspended-sediment transport at a site is based on the concept of "effective discharge." Because the effective discharge is that discharge, or range of discharges, that shape channels and perform the most geomorphic work (and thus transport the most sediment) over the long term (Leopold and Wolman, 1960; Wolman and Miller, 1960) it can serve as a useful indicator of regional suspended-sediment transport conditions for "reference" and impacted sites. In many parts of the United States, the effective discharge for suspended-sediment is approximately equal to the peak flow that occurs on average, about every 1.5 years ($Q_{1.5}$; Simon *et al*., 2004) and may be analogous to the bankfull discharge in stable streams.

To verify the flow frequency for the effective discharge, the recurrence interval of the flow class that transports the most suspended sediment was calculated for more than 400 sites from the following seventeen Ecoregions: Coast Range (#1), Sierra Nevada (#5), Southern California Mountains (#8), Eastern Cascades (#9), Blue Mountains (#11), Snake River Basin (#12), Northern Rockies (#15), Arizona-New Mexico Plateau (#22), Southwest Tablelands (#26), Flint Hills (#28), Central Irregular Plains (#40), Central Corn Belt Plains (#54), Middle Atlantic Coastal Plains (#63), Southeastern Plains (#65), Ridge and Valley (#67), Interior River Lowlands (#72) and Mississippi Valley Loess

Plains (#74). These Ecoregions were initially selected to provide a broad range of physiographic and climatic conditions. As of this writing, additional sites are being analyzed from ecoregions across the United States. The recurrence interval of the effective discharge ranged from 1.1 years to 2.3 years for these ecoregions (Simon *et al.*, 2003), with an average of 1.5 years.

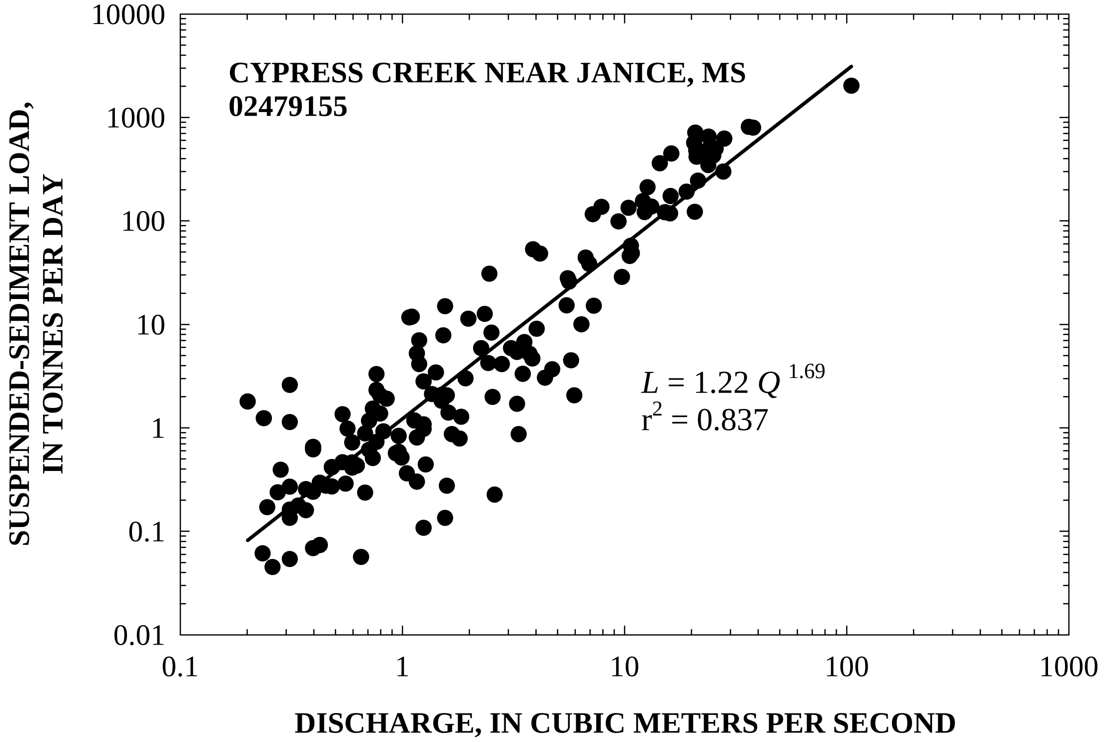

Figure 8 – Rating relation for gage 02479155 Cyprus Creek at Janice, MS.

4.4.1 Calculating Effective Discharge and Load at the Effective Discharge

Calculating the effective discharge is a matter of integrating a flow-frequency curve with a sediment-transport rating to obtain the discharge (or range of discharges) that transports the most sediment over the long term. This involves a three-step process: (1) Construct a flow-frequency distribution; (2) Construct a sediment-transport rating relation; and (3) Integrate the two relations by multiplying the sediment-transport rate for a specific discharge class by that discharge. The discharge class with the maximum product is defined as the effective discharge (Andrews, 1980).

Using the annual-maximum peak-flow series for each of the sites with available data in Ecoregion 65 and 75, the effective discharge ($Q_{1.5}$) was then calculated from the log-

Pearson Type III distribution. The example shown in Figure 9 is for Cyprus Creek near Janice where the $Q_{1.5}$ was determined to be 74 m^3/s from the annual-maximum series.

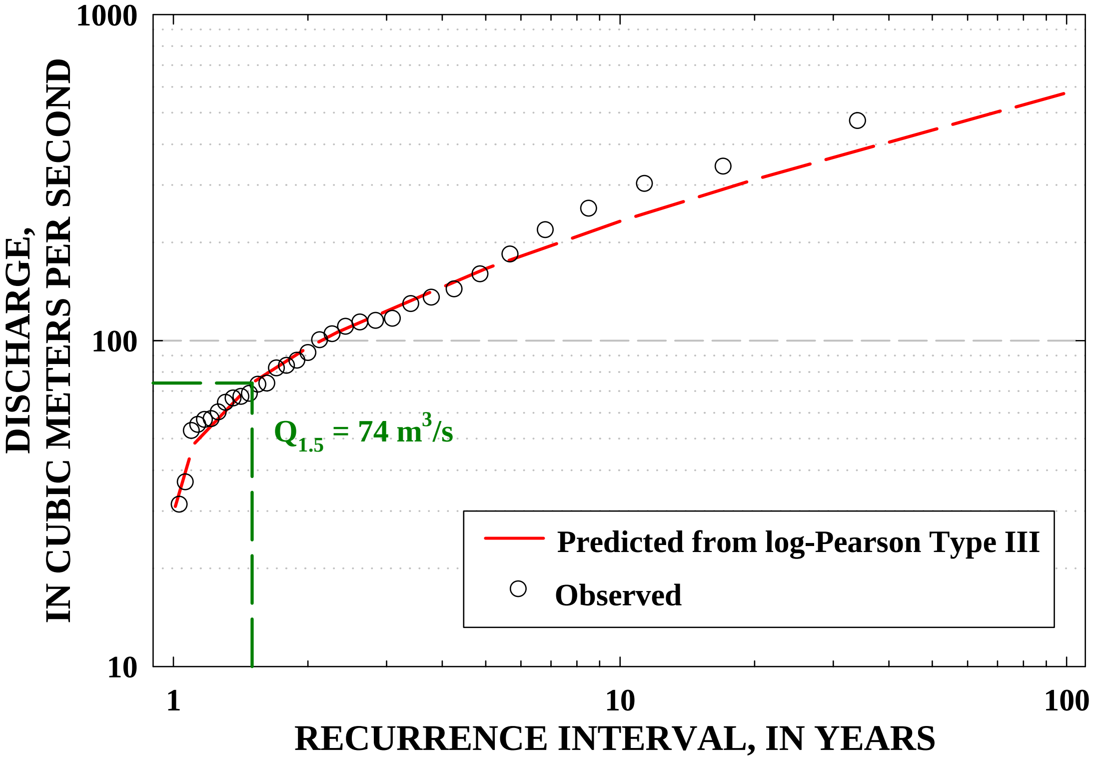

Figure 9 – Flood frequency distribution for Cyprus Creek at Janice, showing the $Q_{1.5}$ to be used in calculating sediment loads and yields at the effective discharge.

The suspended-sediment load at the $Q_{1.5}$ was obtained by using the transport rating developed for the site (Figure 8), the $Q_{1.5}$ (Figure 9), and solving for the load. This rating equation was used to create daily load values in tonnes per day from mean-daily discharge. The mean-daily loads were summed for any given complete calendar year, providing a mean annual load (T/y). To normalize data for watersheds of different size, the sediment load was divided by drainage area providing calculations of mean annual sediment yield ($T/y/km^2$). This provides the amount of suspended-sediment passing through a site, per year based on the area draining into that site. All rating relations were checked to be sure that the $Q_{1.5}$ falls within the measured bounds of the data set.

5. RESULTS AND DISCUSSION

5.1 Channel-Stability Index Results

RGA assessments were carried out at the 114 MDEQ IBI sites (Appendix D) and 182 USGS gauging stations in Ecoregions 65 (Appendix H) and 75 (Appendix I). This data was analyzed at a Level III scale, Ecoregion 65 and 75, and at a smaller Ecoregion Level IV scale. As stated in Section 3, the Pascagoula River Basin spans 8 Level IV ecoregions, however there are only USGS gauging stations with at least ten years of discharge data and thirty suspended-sediment samples in Ecoregions 65d, 65f and 65p, therefore only these ecoregions were used to improve previously ascertained “reference” conditions for suspended-sediment transport rates. Reference transport rates can be applied to IBI sites where no suspended-sediment data currently exists once the level of stability at these sites has been defined.

RGAs were carried out to aid characterization of the geomorphic processes acting on the channel at a given reach. Questions examining the type and amount of erosion acting on the banks at a site and the incision of the bed help to assess the stability of a channel. Answers to these questions were then summed and a channel-stability rank assigned to that site. Appendices E, F and G map responses to a select number of these questions. Figure 10 illustrates the distribution of the channel-stability index for all sites in each study region; Level IV Ecoregion 65d, f and p is a subset of the Ecoregion 65 dataset. The graphs show that Ecoregion 75 has less sites overall and that these sites are generally more stable than those in Ecoregion 65 and the Pascagoula River Basin. A greater number of the sites in Ecoregion 65 were found to be extremely unstable (scoring over 20) compared to IBI sites.

Sites ranking under 10 are considered stable, those over 20 unstable, with moderately unstable sites falling between these extremes; relative percentages of stability within the various study regions are given in Table 4 and Figure 11. The channel-stability ranks for sites in the Pascagoula River Basin are mapped in Figure 12 to show the spatial distribution of stability.

Ecoregion 75 has no sites that rank over 20 on the channel-stability ranking scheme, and thus is generally more stable than Ecoregion 65. Sites within the Pascagoula River Basin and Ecoregion 65 have similar relative stabilities at the stable end of the scale; IBI sites have just 6 % more sites in the stable range. The difference comes at the unstable end of the scale: Ecoregion 65 has 16 % more of its sites ranking greater than 20 on the channel-stability scheme, than the IBI sites.

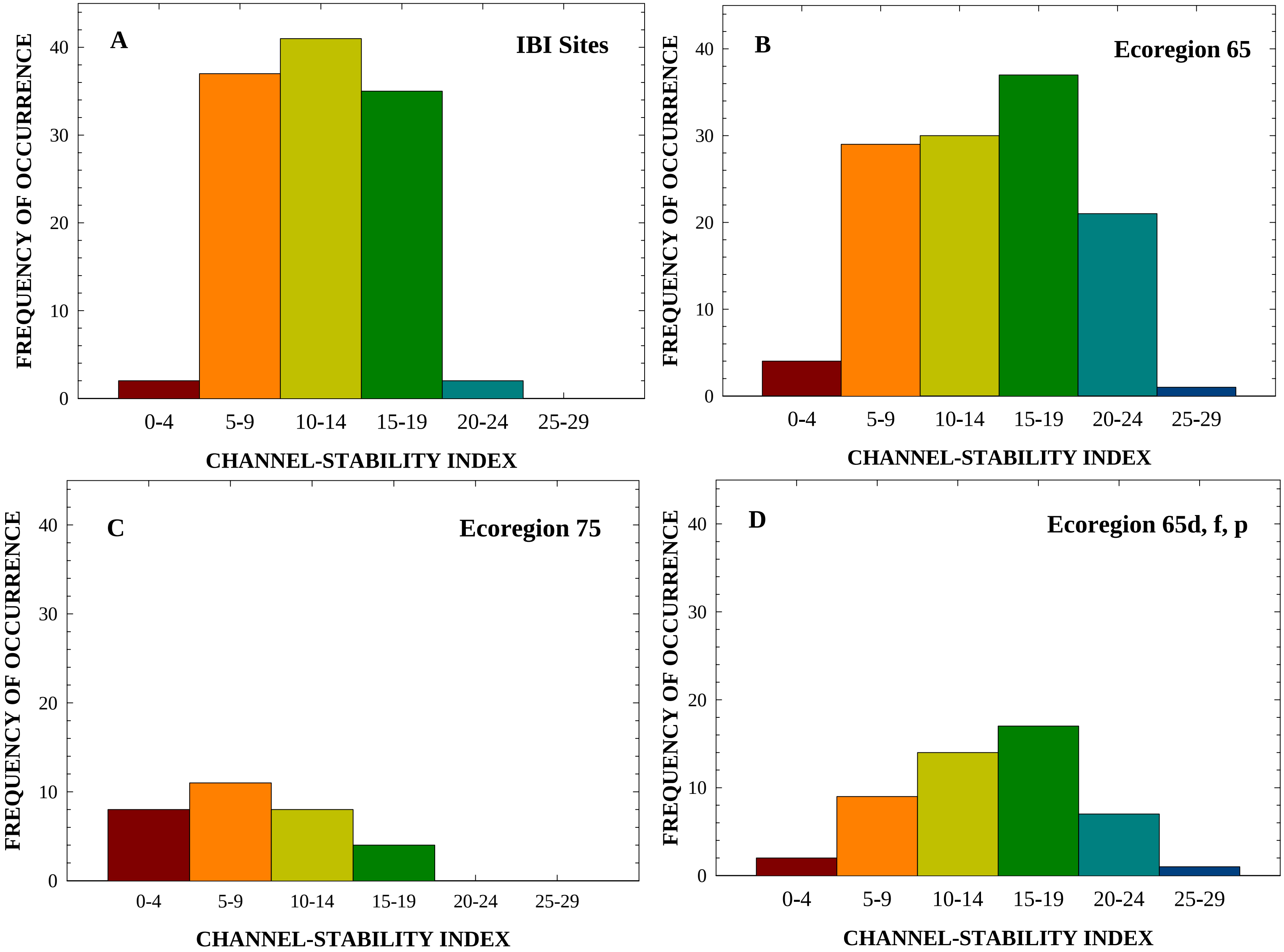

Figure 10 – Distribution of channel-stability index for; A) IBI sites in the Pascagoula River Basin; B) Ecoregion 65, C) Ecoregion 75, D) Level IV Ecoregion 65d, f, and p.

Table 4 – Summary of channel-stability indices recorded at all levels of study.

Channel-stability index	Relative frequency in percent				
	IBI	Ecoregion 65d, f, p	Ecoregion 65	Ecoregion 75	
0 - 10	33.3	22.0	27.0	61.3	Stable
10.5 - 20	65.0	62.0	54.9	38.7	Moderately Unstable
20.5 - 30	1.71	16.00	18.0	0.00	Unstable

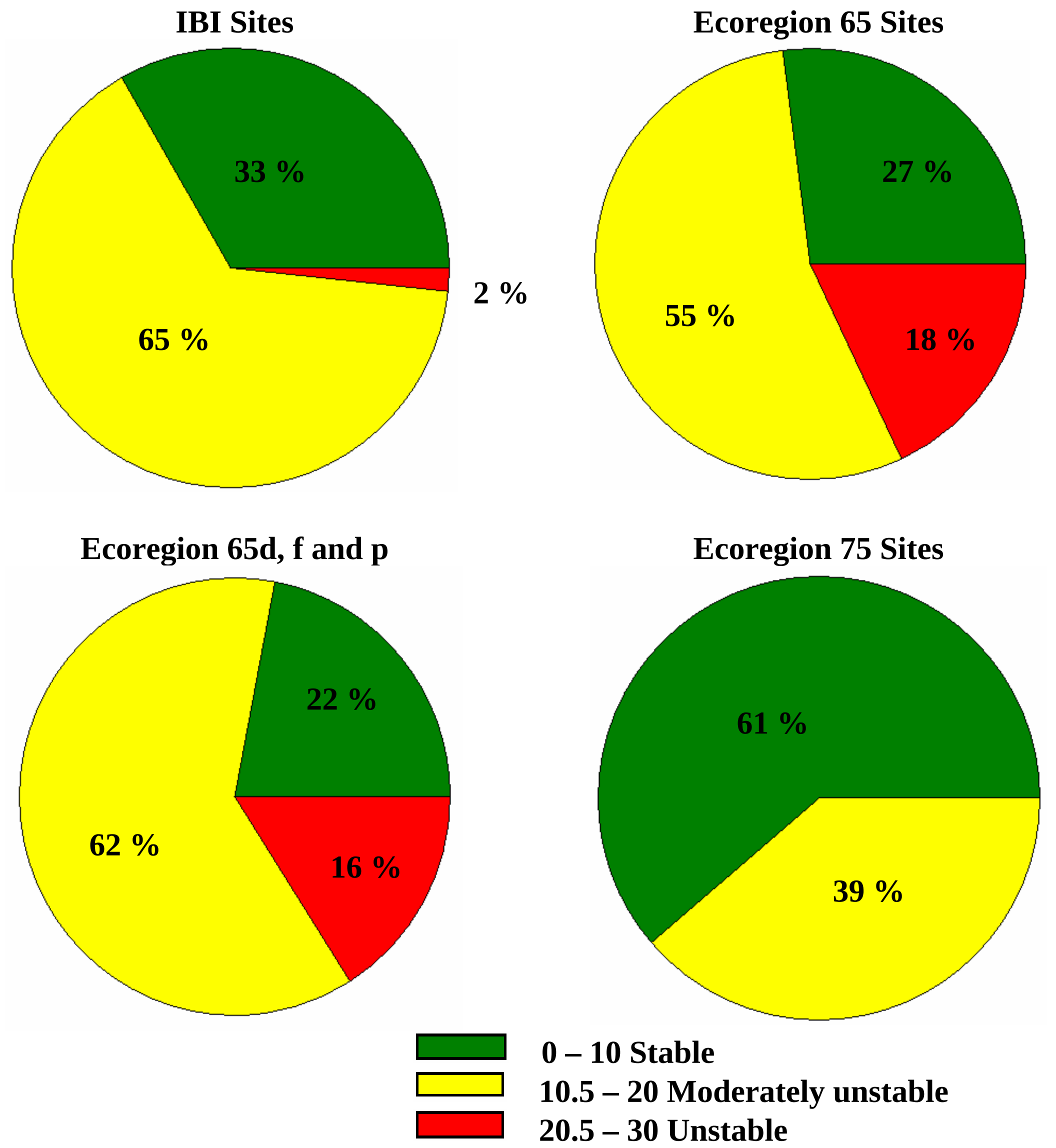

Figure 11 – Summary of channel-stability index. Ecoregion 75 has no sites considered as unstable. These colors refer to those is Figure 12.

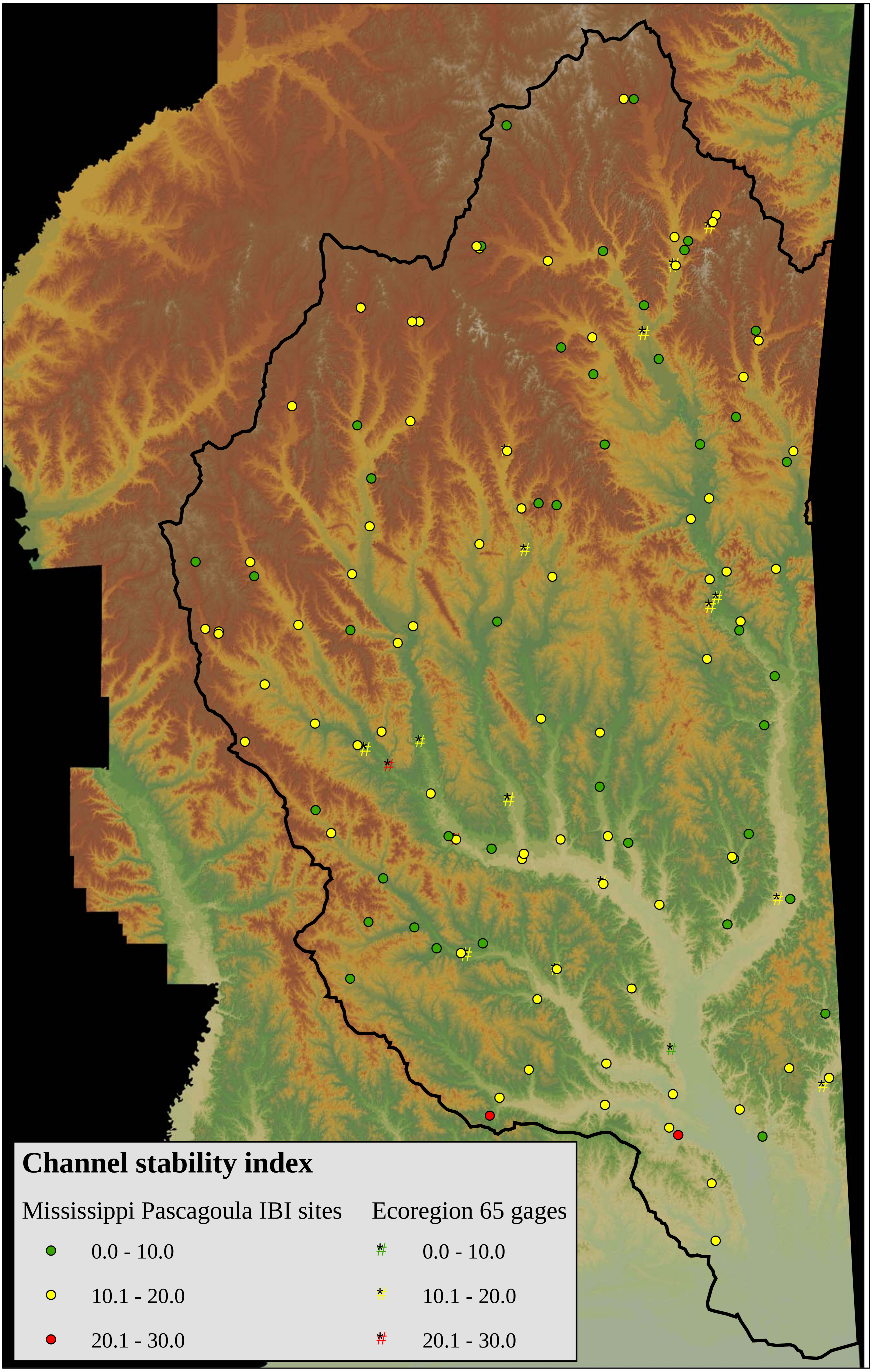

Figure 12 – Map showing channel-stability index for IBI and USGS gauging stations within the Pascagoula River Basin.

5.2 Stage of Channel Evolution Results

There is no particular channel-stability rank for any given stage; therefore using rank to assess stability can cause results to be misleading; for instance a stable, stage VI channel can rank above or below 10 and consequently appear to be stable or unstable by observing only rank. As a preferred alternative to the channel-stability index, the stage of channel evolution can be examined; stages I and VI represent stable channels, stages III, IV, and V unstable channels, and stage II is given to constructed channels.

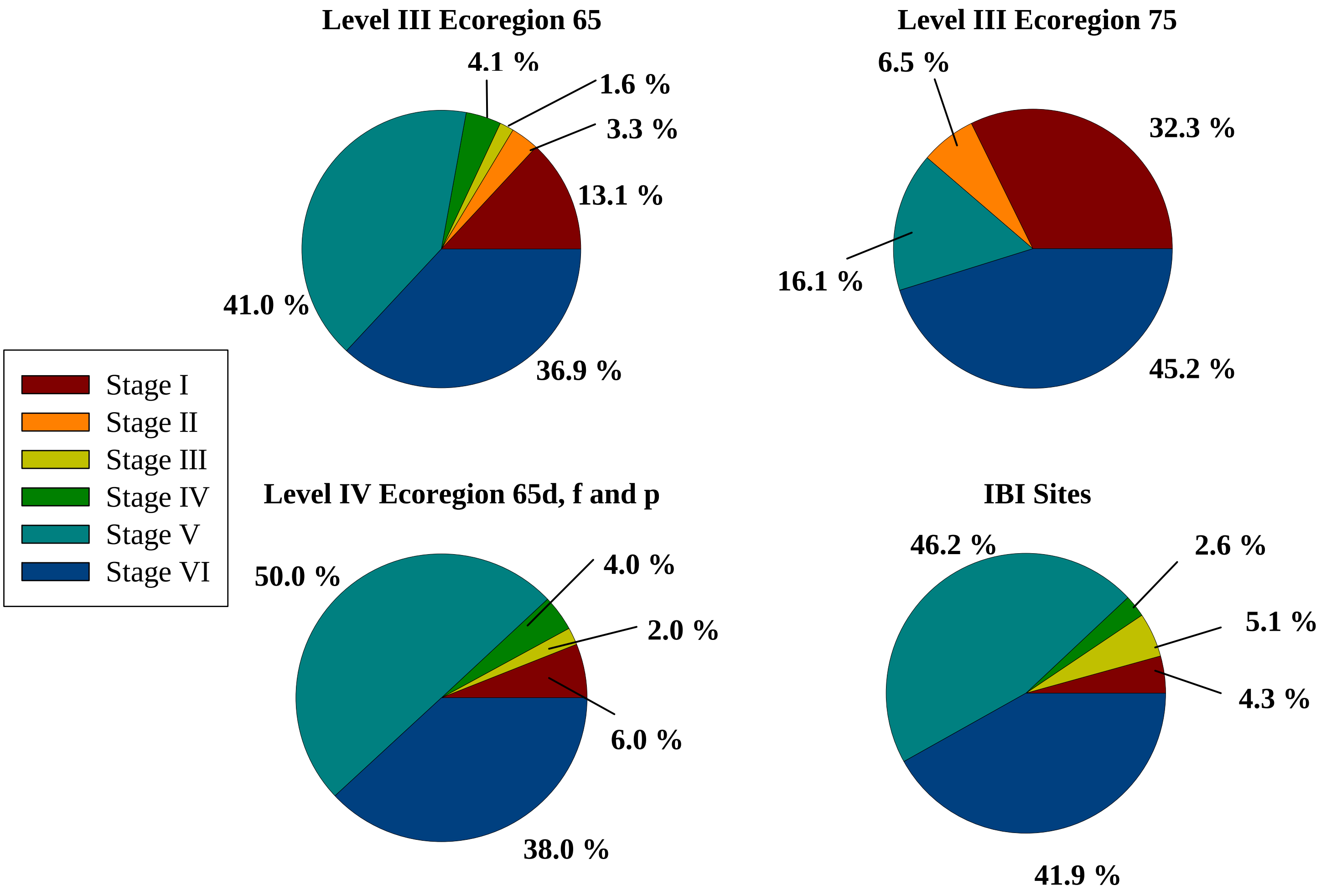

Figure 13 – Stages of channel evolution for all levels of study.

Figure 13 shows the distribution of stages of channel evolution within the Pascagoula River Basin. Ecoregion 65 and IBI sites almost have an equal number of stable streams: 46.2 % of IBI sites are stable, 50 % of Ecoregion 65 sites are stable (Table 5). Even though numbers are close between these two study scales, the charts show that the majority of Ecoregion 65 sites are stable, with the opposite being true of IBI sites. The Pascagoula River Basin falls into eight different Level IV ecoregions however not all of these can be examined because a sufficient amount of discharge and suspended-sediment data is required for annual suspended-sediment yield analyses, thus only 65d, 65f and 65p are examined. At this smaller ecoregion scale, more specific to the study area, percentages represent IBI data more accurately, with 44 % of the sites being stable, showing an unstable majority, as is found with IBI data. Ecoregion 75 has the greatest percentage of stable sites with only 7 (21 %), of the 33 sites being found to be unstable. This is expected for Ecoregion 75 as coastal plains are flat, low-lying areas with sand dominated, low gradient channels, late in the stage of channel evolution. In contrast to Ecoregion 75, the majority of sites in Ecoregion 65 are unstable, likely to be a result of sand dominated channels with a greater channel bed gradient that may have been channelized in the past for agricultural and urbanization purposes and are now recovering to a more ‘natural’ state. Figure 14 shows the spatial distribution of stage of channel evolution. Stage I sites are commonly found up near channel headwaters where little or no disturbance to the reach has occurred.

Using stage of channel evolution as the measure of stability allows Level IV Ecoregions 65d, f and p to provide a good representation of IBI sites. Inferences drawn from suspended-sediment transport rates at Level IV Ecoregions 65d, f and p can be applied to IBI sites in these regions where no suspended-sediment data currently exists.

Table 5 – Relative frequency of stage of channel evolution at different study scales.

Stage of channel evolution	Relative frequency	
	Stable	Unstable
Level III		
Ecoregion 65	50.0	46.7
Ecoregion 75	77.4	16.1
Level IV		
Ecoregions 65d, f and p	**44.0**	56.0
IBI sites	**46.2**	53.9

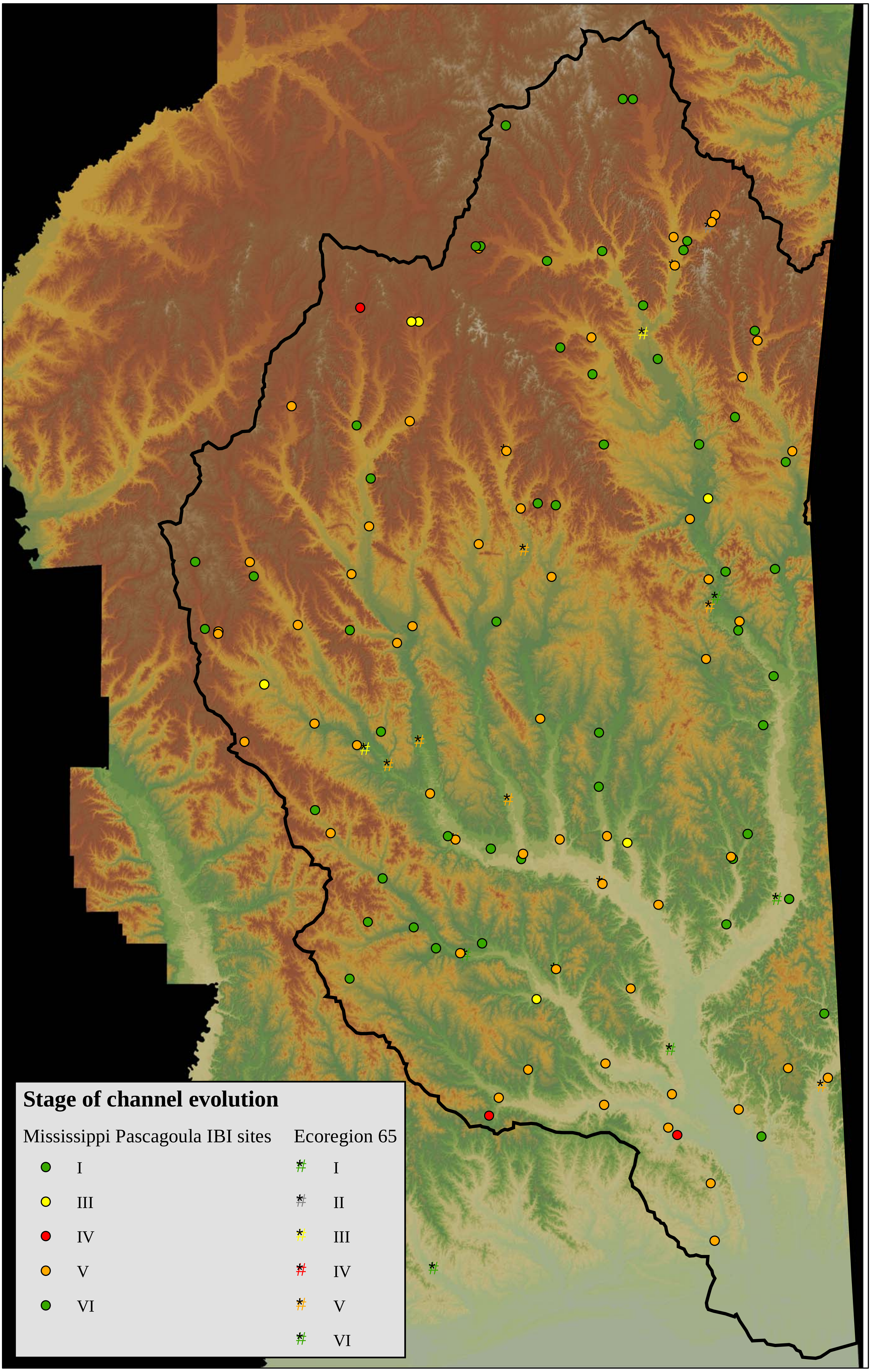

Figure 14 – Map showing stage of channel evolution for IBI and USGS gauging stations within the Pascagoula River Basin.

5.3 Bed Material Composition

Dominant bed material was determined as part of the RGAs and is important when considering water quality issues because aquatic biota are affected by the filling of interstitial spaces between a coarse matrix, or, the level of embeddedness. Percentages of size classes for bed material at IBI sites and Ecoregion 65 are given in Appendix J and K respectively and those within the Pascagoula River Basin mapped in Figure 18.

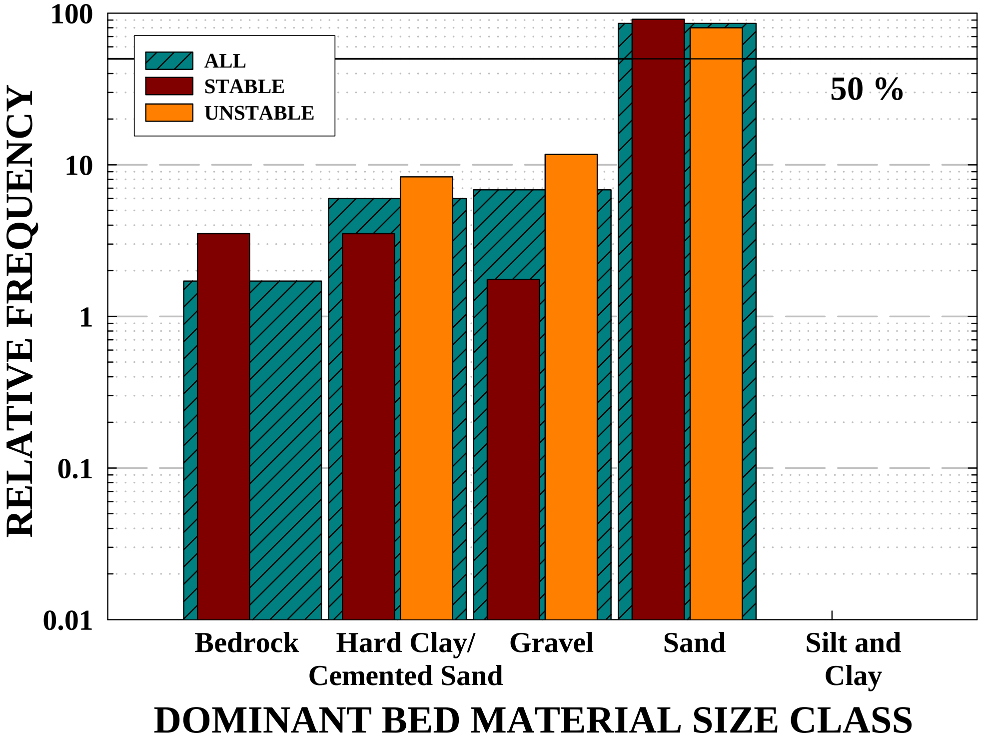

Figure 15 – Relative frequencies of bed material dominating at IBI sites in the Pascagoula River Basin.

Two of the sites in the Pascagoula River Basin were found to have bed materials dominated by bedrock and were stable streams. The bedrock stops the channel from incising and often also exists in the stream banks thus preventing lateral erosion in the form of mass wasting or fluvial undercutting. As can be seen in Figure 18, bedrock dominated sites were found near the headwaters of channels. Only 10 sites visited in the basin were gravel bed streams. Consequently, embeddedness could not be used as a method of analysis as this requires the comparison of the amount of material smaller than 2 mm between stable and unstable streams, expecting stable steams to have a lower percentage. Figure 15 shows relative frequencies of bed materials for sites in the Pascagoula River Basin. Whether a reach was stable or unstable, sand dominated the bed material. Figure 16 shows the D_{50} of sites in the basin. The median D_{50} value was less than 2 mm for all sites, which means that the majority of the sites had a median particle size value in the sand range.

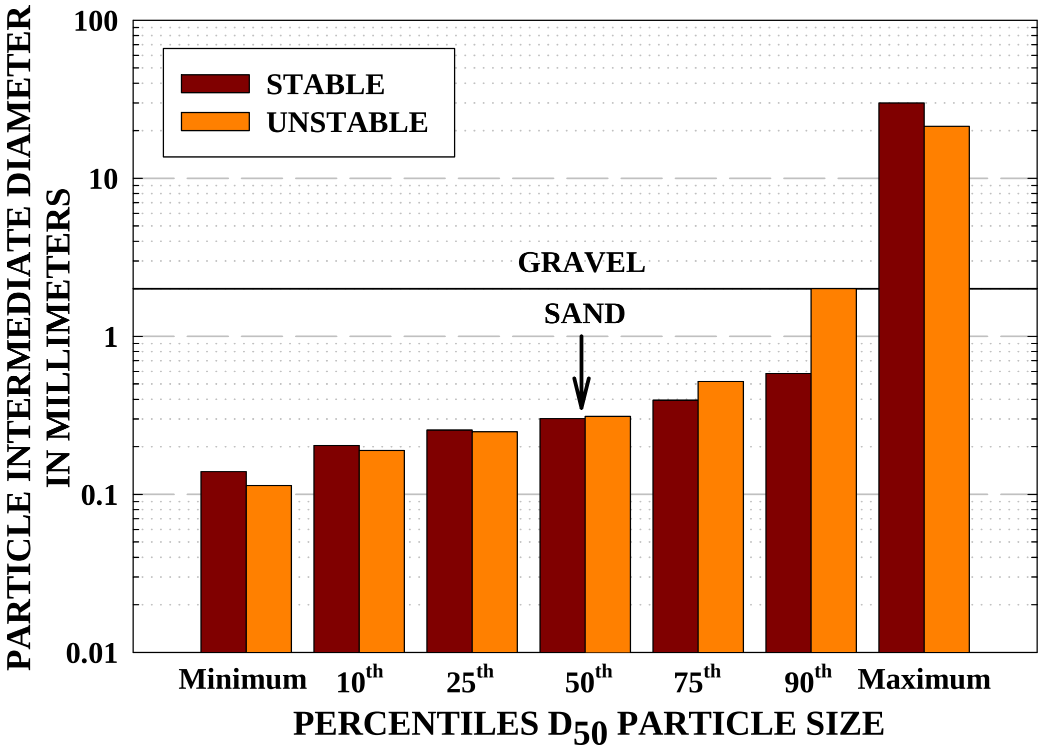

Figure 16 – Median particle size values for bed material at IBI sites in the Pascagoula River Basin.

Using Shield's equation and particle size D_{50}, it was possible to calculate the shear stress required by a stream to erode the bed material; i.e. the critical shear stress of that material (Appendix J). For sites where the bed material had a D_{50} in the sand range, but existed in a harder cemented form, the critical shear stress was determined by the *in-situ* jet test device which was used at two representative sites on the Leaf River and Gaines Creek. From tests carried out at these sites, a minimum critical shear stress value for this material was determined to be 100 Pa, three orders of magnitude greater than all other materials with a D_{50} in the sand range.

Four of the sites in Ecoregion 65 had boulder/cobble as the dominant bed material (Figure 17) and some streambeds were dominated by a mixture of silt and clay, neither of which were found in the Pascagoula River Basin. As with the Pascagoula River Basin, the majority of the channels in Ecoregion 65 had a sand bed. The comparison between the different scales of study is illustrated well by Table 6 which gives the statistics of the D_{50} values for IBI sites in the Pascagoula River Basin and the USGS gauging stations in Ecoregion 65. The median D_{50} value for stable sites in the two areas differs by 0.189 mm. Both values are in the sand range and no major difference can be seen. The table also shows that there is almost no difference between median D_{50} values for stable and unstable sites at the relative study scales, thus bed material can not be used to create a reference value and differentiate stable sites from unstable sites.

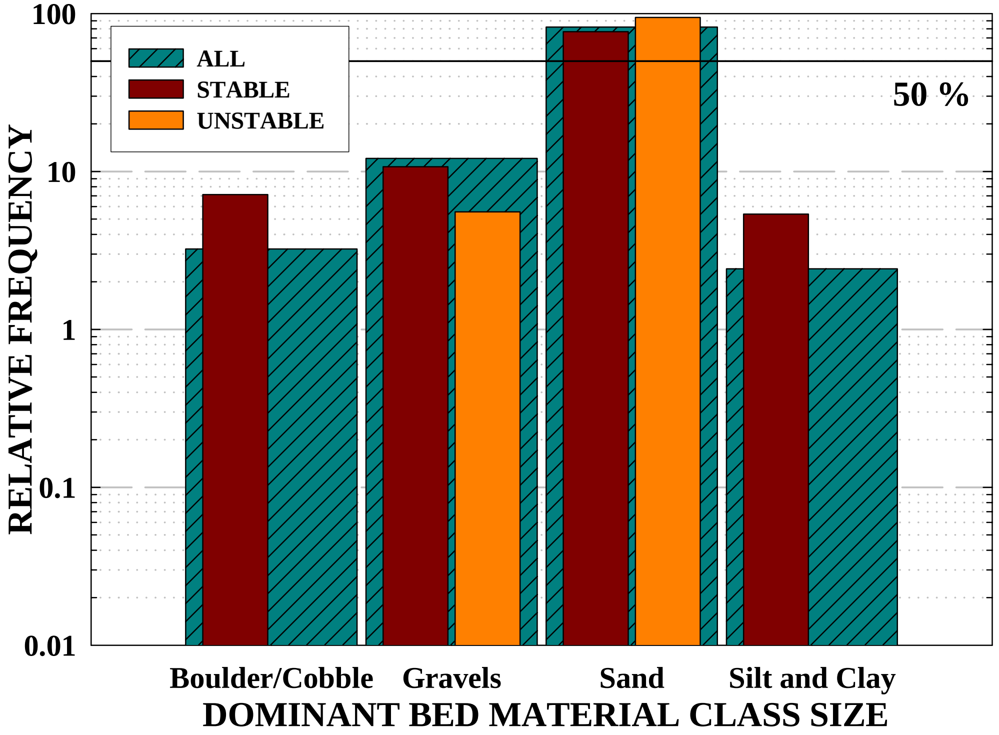

Figure 17 – Relative frequencies of bed material dominating in Ecoregion 65 sites.

Table 6 – Comparison of D50 values for IBI sites in the Pascagoula River Basin and USGS gauging stations in Ecoregion 65.

	Minimum	Percentile					Maximum	Mean
		10th	25th	50th	75th	90th		
	Stable/reference sites							
IBI sites	0.139	0.204	0.255	**0.301**	0.394	0.581	30.0	1.03
Ecoregion 65	0.127	0.227	0.290	**0.490**	1.10	2.46	14.0	1.26
	Unstable sites							
IBI sites	0.114	0.190	0.249	**0.312**	0.519	2.00	21.3	1.61
Ecoregion 65	0.140	0.220	0.310	**0.435**	0.600	0.975	5.90	0.746

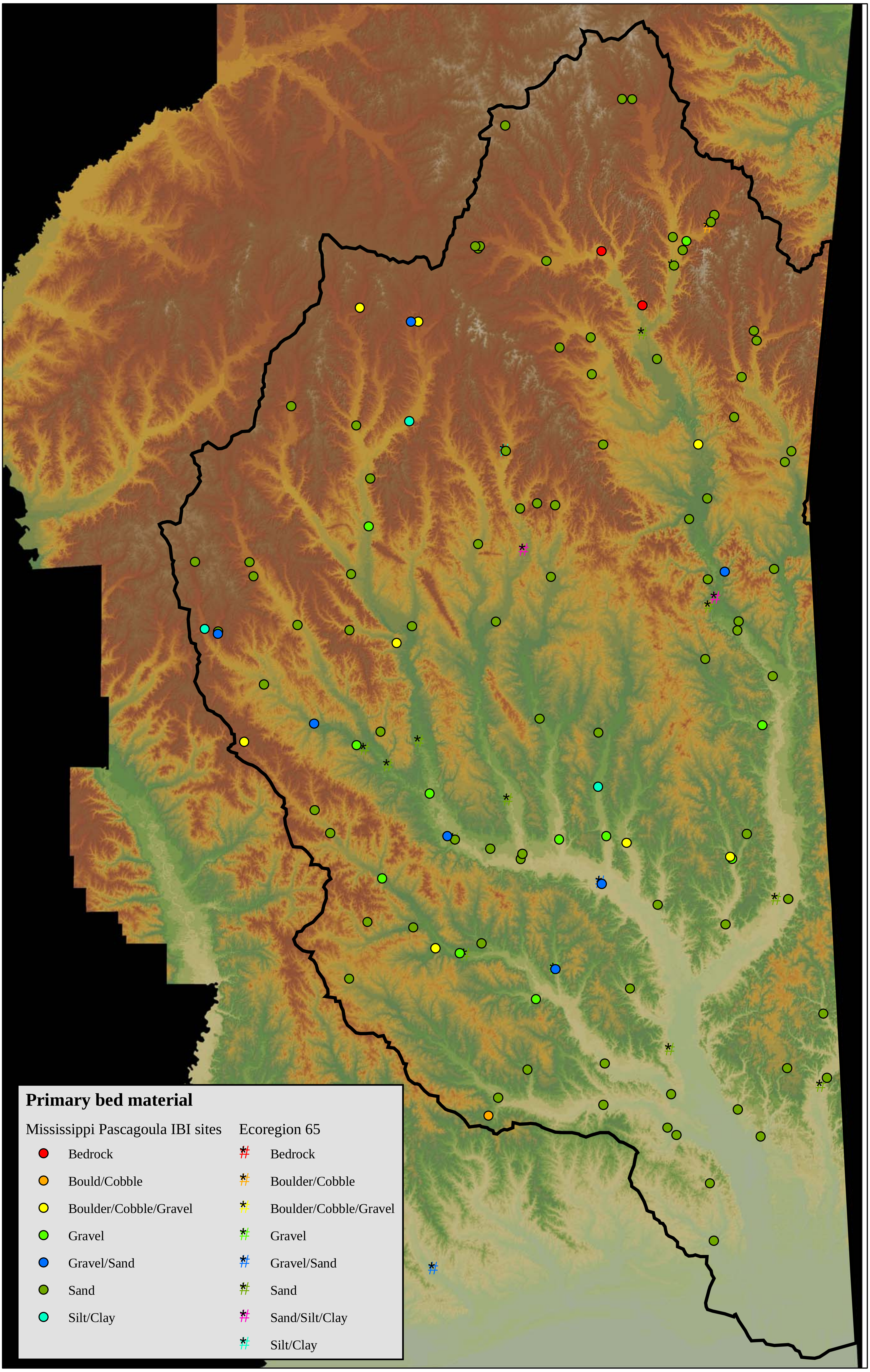

Figure 18 – Map showing bed material for IBI and USGS gauging stations within the Pascagoula River Basin.

5.4 Mobility of Bed Material using Excess Shear Stress Calculations

Stable or "reference" streams are considered thus because an equal amount of material enters and leaves the localized system, therefore there is little incision or aggradation at a stable site. The critical shear stress of a particle dictates the shear stress required by a body of water to mobilize that particle and thus the bed material. If the shear stress of the stream exceeds the critical shear stress of a particular bed material there is an excess shear stress and incision may occur as a result of the transportation of material. As bed material could not be used to determine reference conditions for stable streams, excess shear stress was investigated as an alternative analysis method. Many different scenarios were examined concerning excess shear stress values: the bed material D_{50}, D_{75} and D_{90} values for each site, (the value at which 50, 75 and 90 percent of the material has a particle diameter smaller than, respectively), the critical dimensionless shear stress, (at values of 0.03, 0.045 and 0.06), and the period of time that excess shear stress exceeds 1, 3, 5, 7, and 10. A shear stress value of 1 is the point at which particles begin to mobilize, however due to the inherent nature of sand bed material channels, almost all streams showed the excess shear stress of 1 to be exceeded 100 % of the time. As a result of this, no differentiation could be made between stable and unstable streams thus data are not displayed or discussed further. Values of 5, 7, and 10 were arbitrary numbers and results from calculations using those values yielded no trends or differences between stable and unstable streams. This was because the percentages of time that the shear stress was exceeded was so small that they were meaningless, and so data for these tests are not discussed further. An excess shear stress value of 3 had results that clearly show a difference between stable and unstable channels and are therefore shown below.

Table 7 – Using a critical dimensionless shear stress of 0.045, the percentage of time that excess shear stress exceeds 3 is given for different particle size values (i.e. the percentage of time that the entire bed material is in motion).

	Percentage of time excess shear stress is greater than 3		
	D_{50}	**D_{75}**	**D_{90}**
STABLE			
10th Percentile	0.00	0.0244	0.00
25% Percentile	8.68	19.9	0.00
Median	97.1	81.3	**42.2**
75th Percentile	100	100	100
90th Percentile	100	100	100
UNSTABLE			
10th Percentile	6.60	0.00	0.00
25% Percentile	57.9	42.2	28.5
Median	92.5	91.2	**84.1**
75th Percentile	100	100	99.8
90th Percentile	100	100	100

Sand has a narrow particle diameter range between 0.063 mm and 1.99 mm; therefore representative values (D_{50}, D_{75} and D_{90}) are very similar. As the critical shear stress calculated depends upon the size of the particle, D_{50} and D_{75} yielded such small shear stress values that only D_{90} values were used. This is illustrated in Table 7 by the high percentages of times that the excess shear stress value was greater than 3. For D_{50} and D_{75}, 50 % of the bed material is in motion 97 and 81 % of the time, respectively. The average value of dimensionless shear stress (0.045) was used and the percentage of time excess shear stress was greater than 3, as this is the point at which all bed material of a given particle size value is in motion, and thus is the most important shear stress value to examine.

Table 7 and Figure 19 compare the percentage of time that an excess shear stress value of 3 is exceeded for stable and unstable streams. That is, the percentage of time that the entire bed material for a given particle size is in motion. A "reference" condition of 42.2 % is given as the median for stable channels: thus, a channel is considered to be stable if 50 % of the D_{90} sized material or smaller, is in motion less than 42.2 % of the time. Unstable streams have 50 % of the D_{90} sized material or smaller, in motion 84.1 % of the time. These both represent active streambeds, a function of the small particle diameters of the majority of streambeds in the Southeastern Plains. As it has previously been shown (Section 5.2) that Ecoregion 65 is representative of the level of stability found in the Pascagoula River Basin, it can also be said that to be considered a stable stream, sites in the study region may only have 50 % of the D_{90} or smaller sized material in motion 42.2 % of time.

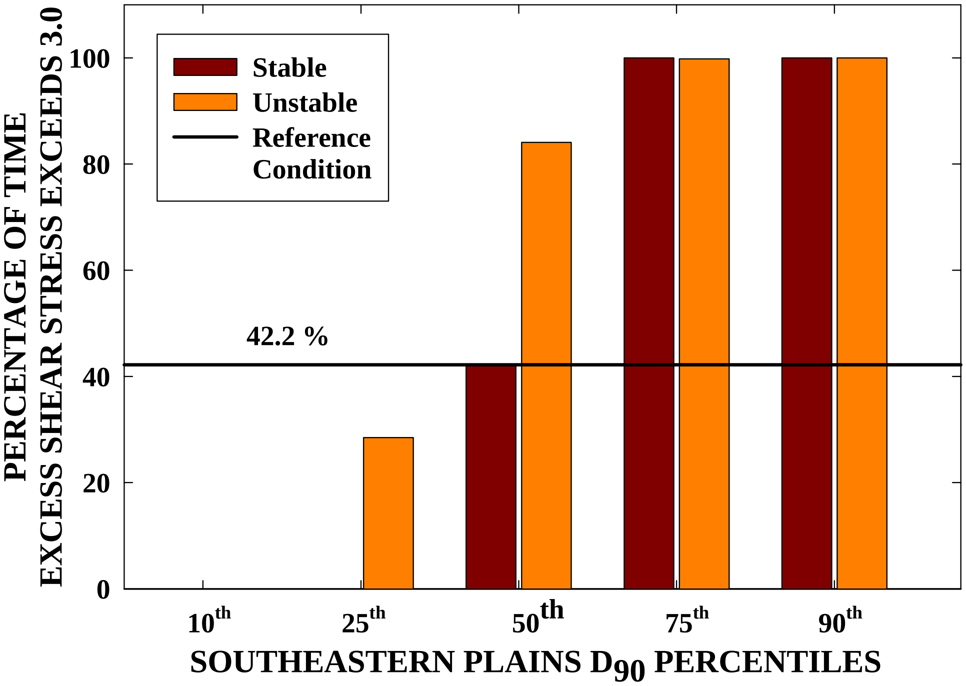

Figure 19 – Percentage of time that excess shear stress exceeds 3 for each percentile of the data. The "reference" condition is described by the median value of the stable channels, 42.2 % of the time.

The results shown here are determined from a number of calculations using the equations stated earlier (Section 4.2). Required field input is D_{90} (mm) measurements from a bed material sample and thalweg slope (m/m) from a representative reach of the channel. It is an analytical technique that cannot be carried out in the field.

5.5 “Reference” Suspended-Sediment Transport Rates

Information regarding site stability gathered in the field (presented in section 5.2) is placed in a matrix with yield and effective discharge data, and organized by stability.

5.5.1 Level III Ecoregion 75; “Reference” Values for the Southern Coastal Plains

The median suspended-sediment yield at the $Q_{1.5}$ for stable sites in Ecoregion 75 is 0.04 T/d/km^2 (Figure 20). As the $Q_{1.5}$ is the discharge at which rivers have the greatest ability to cause geomorphic change in the system, a low yield at the $Q_{1.5}$ such as this, illustrates a system with very little geomorphic change. Rivers in Ecoregion 75 tend to be wide, with low thalweg gradients and large floodplains in which to slowly migrate. For these reasons, channels do not have the boundary shear stress required to transport large amounts of sediment ($\tau_o = \gamma_w R S_b$).

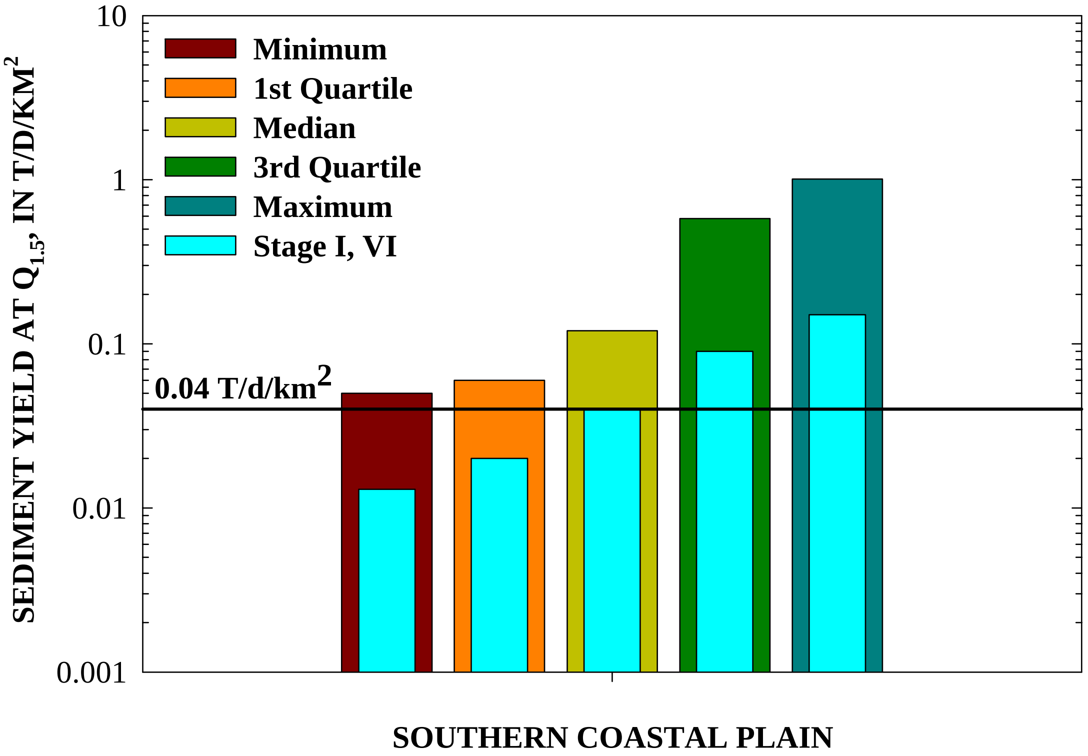

Figure 20 –Suspended-sediment yields at the $Q_{1.5}$ for Ecoregion 75 showing the median value for stable streams.

This low $Q_{1.5}$ yield of 0.04 T/d/km^2 is supported by a low annual suspended-sediment yield of 2.8 T/y/km^2 for stable channels in Ecoregion 75 (Table 8); this value is the "reference" annual suspended-sediment yield for Ecoregion 75. The interquartile range of annual suspended-sediment for Ecoregion 75 stable sites is 1.5 to 4.5 T/y/km^2. 'Annual yield' analysis has been undertaken for only three separate ecoregions at the current time; Ecoregion 45, Piedmont, has an annual suspended-sediment yield or "reference" value of 24.2 T/y/km^2 calculated from its 34 stable sites, Ecoregion 65, Southeastern Plains, has an annual suspended-sediment yield or "reference" value of 7.91 T/y/km^2 calculated from 49 stable sites, and Ecoregion 75, with the lowest "reference" value of 2.8 T/y/km^2 calculated from 26 stable sites. It is possible to state that this value of 2.8 T/y/km^2 is the lowest "reference" value calculated to date, however until more annual yield analyses are carried out, there can be no declaration made as to the significance of this statement, and thus no inferences made.

Table 8 – Annual suspended-sediment yields in Ecoregion 75; median stable value is the "reference" value.

Percentile	All sites	Stable sites	Unstable sites
10th	1.2	1.0	3.1
25th	1.6	1.5	4.3
50th	3.2	**2.8**	6.3
75th	5.8	4.5	9.8
90th	11.3	9.5	24.5
Mean	5.8	4.4	11.3

It has previously been shown in Section 5.2 that channels in Ecoregion 75 are not a good representative of current IBI site stability because the channels have such different geomorphology; 77.4 % of Ecoregion 75 sites were stable, compared with 46.2 % of IBI sites, a result of only two IBI sites being located in Ecoregion 75. Consequently, Ecoregion 75 suspended-sediment values will not be used to produce a "reference" value for suspended-sediment at IBI sites in general. However, for the two IBI sites that were located in Ecoregion 75 (sites 541 and 544), it is recommended that Ecoregion 75 annual suspended-sediment values be used as a "reference", therefore if a stream has an annual suspended-sediment yield greater than 2.8 T/y/km^2 it may be found to be unstable.

5.5.2 Level III Ecoregion 65; "Reference" Values for the Southeastern Plains

As channel bed gradient steepens, average boundary shear stress is increased; consequently the ability to mobilize particles is also increased. As the Southeastern Plains has greater relief than the Southern Coastal Plains we can expect to see a higher suspended-sediment yield for sites in Ecoregion 65. 50 % of stable channels have mean annual suspended-sediment yields ranging from 4.22 to 15.1 T/y/km^2 (Table 9). The interquartile range for Ecoregion 65 stable site annual suspended-sediment yield values is greater than that for Ecoregion 75 (3 and 9 T/y/km^2 respectively). This may mean that the USGS chose to place gauging stations on a more varied distribution of stream sizes in

Ecoregion 65 increasing the natural variability in suspended-sediment yield; however there is little evidence to support this claim. Ecoregion 65 stable sites have drainage areas across a range of 56889 km^2 whilst the range of Ecoregion 75 stable sites drainage area is 49641 km^2.

Table 9 – Annual suspended-sediment yields in Ecoregion 65; median stable value is the "reference" value.

Percentile	All sites	Stable sites	Unstable sites
10th	3.39	3.15	9.29
25th	6.13	4.22	21.1
50th	11.7	**7.91**	36.4
75th	38.6	15.1	96.3
90th	113	49.1	237
Mean	62.1	23.7	133

The median suspended-sediment yield for stable sites in Ecoregion 65 is 7.9 T/y/km^2 (Figure 21). This value is the "reference" suspended-sediment yield for Ecoregion 65 and is three times greater than that of Ecoregion 75, but remains in the same order of magnitude. Again, as there are just three ecoregions for which annual suspended-sediment yield has been calculated, deductions cannot be made about the sediment yield of this ecoregion compared to others across the country.

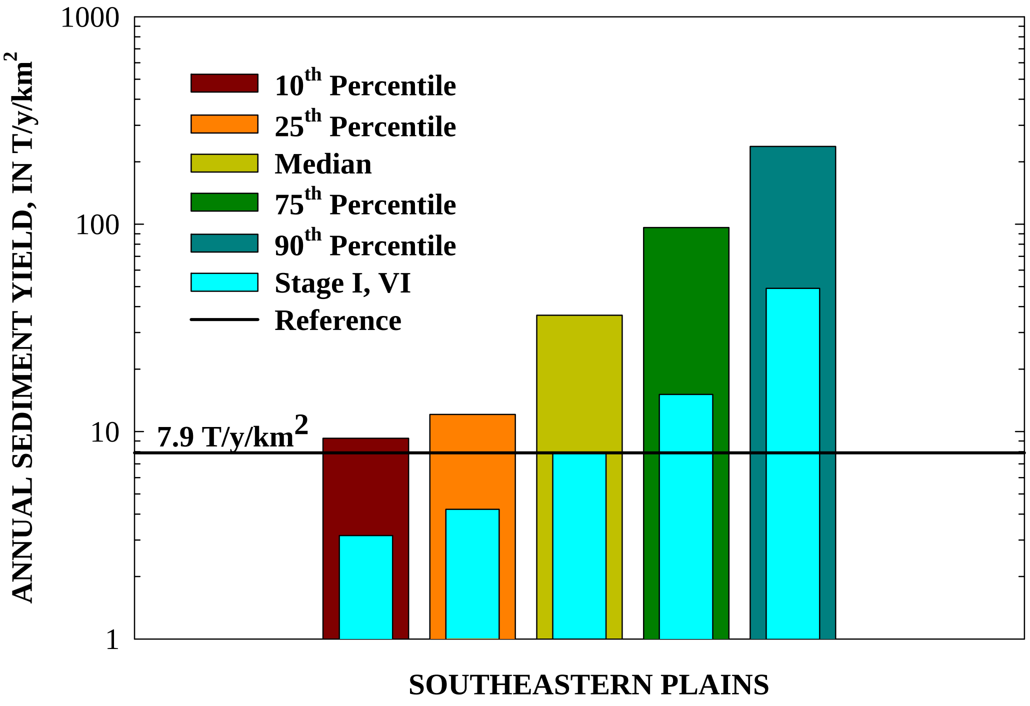

Figure 21– Annual suspended-sediment yields at USGS gauging stations in Ecoregion 65, showing reference values for stable streams.

A site in Ecoregion 65 recording a mean annual suspended-sediment yield greater than 7.9 T/y/km^2 is considered unstable; there will be a greater amount of suspended-sediment leaving a given site than is being transported into it, potentially resulting in erosion. Such degradation can take the form of incision through bed material and down cutting of the channel, or mass wasting of the banks causing bank material to fall into the channel and be transferred downstream.

5.5.3 Level IV Ecoregion; "Reference" Suspended-Sediment Values

Narrowing the study down to a smaller scale requires Level IV ecoregion data. Within Level III Ecoregion 65, areas are divided into Level IV regions. The Pascagoula River Basin spans Level IV Ecoregions 65d, 65f, 65p, 65q, 65r, 75a, 75i, and 75k. "Reference" values can only be calculated for regions where USGS gauging stations are located, as this is the source of the discharge and suspended-sediment data. Therefore, it was only possible to calculate the annual suspended-sediment or "reference" yield values for Level IV Ecoregion 65d, 65f and 65p. There are no IBI sites in Ecoregion 75i and k and only two in 75a. As there is no suspended-sediment data from streams in Level IV Ecoregion 75a, 75i and 75k, it is recommended that Level III Ecoregion 75 "reference" suspended-sediment values be used for the two sites in 75a, and future sites located in Ecoregions 75a, i and k.

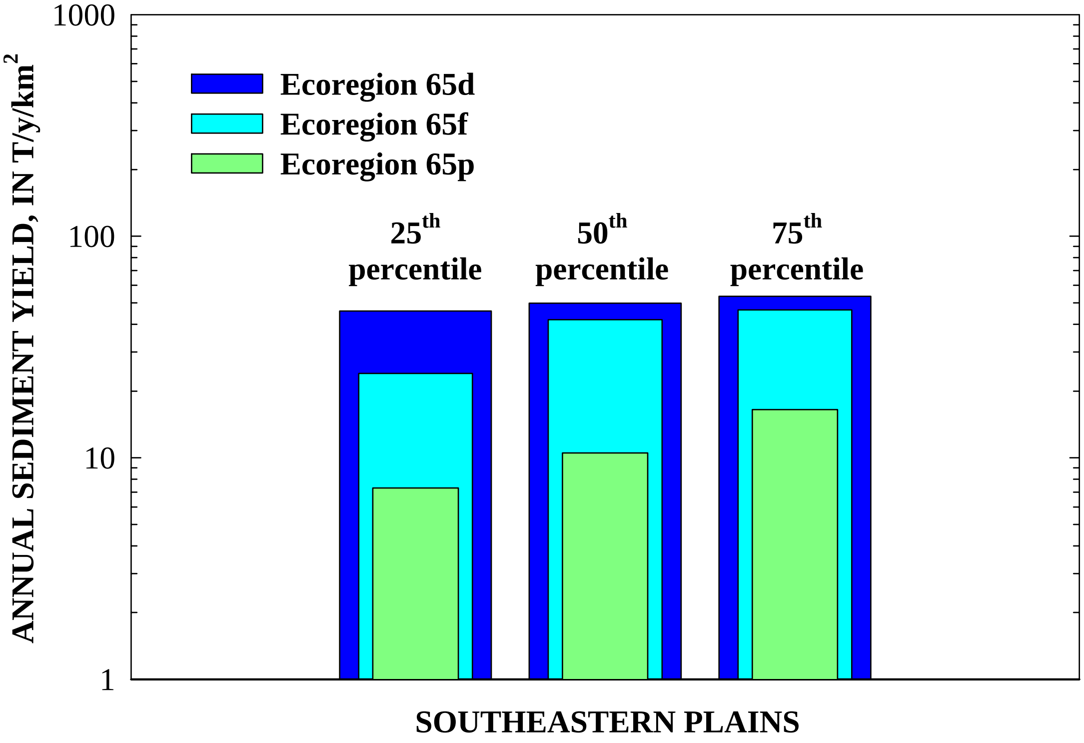

Figure 22 – Annual Suspended-sediment yields for stable sites at the $Q_{1.5}$ in Level IV ecoregions within Ecoregion 65.

Figure 22 shows suspended-sediment yields for stable sites in Ecoregions 65d, 65f and 65p, the regions within which IBI sites lie and USGS gauging stations have collected at least 30 sets of suspended-sediment data. Overall, these ecoregions have much higher suspended-sediment yields and thus are less stable than sites in Ecoregion 65 as a whole (supported by field collected channel stability information; 50 % of Level III Ecoregion 65 sites are stable, compared to 44 % of Level IV Ecoregion 65d, f and p). This greater instability may result from varying bed material size, with gravel/cobble streams likely to be more stable.

Table 10 – Quartile values of annual suspend-sediment yields for stable sites at the $Q_{1.5}$ for Level IV ecoregions within Ecoregion 65 that the Pascagoula River Basin is located in, and that have at least 30 suspended-sediment sample data.

Percentile	Ecoregion 65d	Ecoregion 65f	Ecoregion 65p
25th	46.0	24.0	7.3
50th	**49.8**	**42.0**	**10.5**
75th	53.5	46.5	16.5

The average of the median suspended-sediment yield values (Table 10) for stable sites in Level IV ecoregions within Ecoregion 65 that the Pascagoula River Basin is located in and that have at least 30 suspended-sediment sample data is 34.1 $T/y/km^2$. This value is an order of magnitude higher than that of Ecoregion 65, suggesting lower stability. It was shown in section 5.2 that the stability of sites within Level IV ecoregions provides the greatest similarity to those found in the Pascagoula River Basin; 44 % Ecoregion 65d, f and p are stable compared to 46.2 % of IBI sites. Therefore, for Ecoregions 65d, 65f, and 65p it is more appropriate to use annual suspended-sediment yield values derived from the specific Level IV ecoregion that a given site is located in, than Level III which covers a much broader region. However, for instances where it is not possible to calculate an annual suspended-sediment yield due to lack of USGS gauge data and suspended-sediment data in the study area, such as for regions 65r, and 65q, it is recommended that the Level III data be used as a “reference” value. As earlier stated, it was not possible to calculate annual suspended-sediment yields for Level IV Ecoregion 75 because there are no gauges found in the Pascagoula River Basin and in the Level IV ecoregion.

It was intended to compare the annual suspended-sediment yield of Level IV ecoregions that the Pascagoula River Basin falls in, with USGS gauging stations found within the Pascagoula River Basin. This would enable Level IV ecoregion data to be related to USGS gauging station sites within the Pascagoula River Basin to examine the relationship at the two scales. However there are not enough stable USGS gauging station sites in appropriate Level IV Ecoregions to enable this comparison.

Table 11 – Annual suspended-sediment yield at USGS gauging stations in the Pascagoula River Basin.

Gage	ER Level IV	Stage	Mean annual yield in T/y/km^2	Reference annual yield in T/y/km^2				Yield at the $Q_{1.5}$ in T/d/km^2
				Level III	Ratio	Level IV	Ratio	
02473460	**65d**	**V**	38.6	7.9	4.9	49.8	0.8	3.52
02476000	**65d**	**V**	42.6	7.9	5.4	49.8	0.9	2.13
02476500	**65d**	**II**	179.1	7.9	22.6	49.8	3.6	44.4
02476600	**65d**	**V**	77.5	7.9	9.8	49.8	1.6	4.45
02477000	**65d**	**III**	42.0	7.9	5.3	49.8	0.8	1.53
02477500	**65d**	**V**	62.5	7.9	7.9	49.8	1.3	1.18
02472500	**65f**	**III**	29.2	7.9	3.7	42.0	0.7	1.57
02479130	**65f**	**VI**	37.3	7.9	4.8	42.0	0.9	1.78
02479155	**65f**	**VI**	54.0	7.9	6.8	42.0	1.3	12.9
02479560	**65f**	**V**	38.5	7.9	4.9	42.0	0.9	1.52
02474500	**65p**	**V**	64.3	7.9	8.1	10.5	6.1	1.92
02475000	**65p**	**V**	67.1	7.9	8.5	10.5	6.4	2.10
02478500	**65p**	**VI**	56.4	7.9	7.1	10.5	5.4	1.07

The mean annual suspended-sediment yield calculated at each gauge is given as a ratio to the respective Level III and Level IV value in Table 11. Level III Ecoregion 65 mean annual suspended-sediment yield is much lower than those calculated at the gauges. Ratios between mean annual suspended-sediment yield for the ecoregion and each specific gauge range from 3.7 to 22.6. This shows that Level III Ecoregion 65 reference values are less appropriate for use in the Pascagoula River Basin. If used in the Pascagoula River Basin, the Ecoregion 65 reference value would show all sites to be unstable when in reality, they are not. For example gauge 02479130 has a mean annual suspended-sediment yield 4.8 times greater than the reference value, but is still stable. Using the Level IV ecoregion reference values for the most part produces ratios below one, with a much smaller range of 0.7 to 6.4. Mean annual suspended-sediment yield for gauge 02479130 has a ratio of 0.9 with Ecoregion 65f reference value, therefore is considered stable as it has a mean annual suspended-sediment yield less than the reference value. This site was found to be stable in the field. Using Level IV ecoregion reference values is more appropriate for the Pascagoula River Basin than using reference values calculated from Level III Ecoregion 65. However, there are still some sites that are not represented correctly. Ecoregion Level III reference values tend to underestimate channel stability and give lower predictions of mean annual suspended-sediment yield. Comparatively, Ecoregion Level IV reference values tend to overestimate channel stability and give high predictions of mean annual suspended-sediment yield. Differences between reference values and calculated values are smaller when using the smaller scale of Level IV ecoregion. Relating this back to the study region, it is appropriate to use Level IV Ecoregion reference values for Ecoregion 65d, f and p to estimate the mean annual suspended-sediment yield of sites in the Pascagoula River Basin located in these ecoregions based on the relative stability. Until further data can be acquired regarding long-term flow and suspended-sediment data in Level IV Ecoregions that are not represented here, Level III "reference" values are recommended.

6. SUMMARY AND CONCLUSIONS

Combinations of field-based geomorphic assessments and sampling, analysis of historical flow and sediment-transport data was used to fulfill the major objective of this research which was to determine “reference” conditions for sediment in the Pascagoula River Basin. This was accomplished at two scales, Ecoregion Level III and IV, using the geomorphic concept of effective discharge which has been approximated by the discharge that occurs, on average, every 1.5 years ($Q_{1.5}$).

A small portion of the Pascagoula River Basin is located in Level III Ecoregion 75. Any further studies regarding “reference” values in the Basin for areas located in Ecoregion 75 should use the central 50% of the data as “reference” values; 1.5 to 4.5 T/y/km^2. Remaining sites in the Pascagoula River Basin fall into Level III Ecoregion 65. The central 50 % of the distribution of mean annual suspended-sediment yields for stable, “reference” channels at the $Q_{1.5}$ with various types of bed material range from 4.22 to 15.1 T/y/km^2 in Ecoregion 65. The median annual suspended-sediment yield for these “reference” sites is 7.9 T/y/km^2.

The channel stability of sites located in the Pascagoula River Basin were compared with the stability of sites in 1) Level III Ecoregion 65, and 2) Level IV Ecoregion 65d, 65f, and 65p, in order to gauge which scale was more appropriate to the study region. It was established that Level IV ecoregion sites local to the study region have ratios of stable and unstable sites similar to sites in the Pascagoula River Basin, whilst overall, Ecoregion 65 was found to be generally more stable. From this, it was determined that Level IV Ecoregion 65d, 65f and 65p “reference” values provide more appropriate estimates of mean annual suspended-sediment for areas located in these Level IV regions, than Level III Ecoregion 65 values. Examining mean annual suspended-sediment yields for Level IV Ecoregions 65d, 65f, and 65p provides “reference” values (and 25th – 75th percentile ranges) of 49.8 (46.0 – 53.5), 42.0 (24.0 – 46.5), and 10.5 (7.30 – 16.5) T/y/km^2 respectively. Improved “reference” values could only be made for Level IV Ecoregions 65d, 65f, and 65p as only these ecoregions had sufficient (at least 30 suspended-sediment samples and 10 years of discharge data) historical data from USGS gauges. For Level IV ecoregions where there is an insufficient amount of historical data, refinements to Level III “reference” values could not be made. For sites in these areas it is recommended that the relevant Level III “reference” values be used. Assumptions concerning bed material could not be made, as issues of embeddedness were not valid for the Pascagoula River Basin because the majority of channels have bed materials dominated by sand.

The “reference” values reported here should not be taken as a single value but as a range of values encompassing the interquartile range (between the 25th and 75th percentiles). These values should be combined with ongoing efforts to relate sediment indices with measured impairments of designated use, such as support for aquatic ecosystems. It may be possible to relate the suspended-sediment values stated here to the biologic data collected by MDEQ throughout the Pascagoula River Basin using its Index of Biologic Integrity. This methodology is seen as a means of establishing scientifically defensible TMDLs for uncontaminated suspended-sediment in streams and rivers.

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APPENDICES

Appendix A. MDEQ IBI sites within the Pascagoula River Basin. Stations highlighted indicate USGS gauging stations.

IBI number	Station name	Station location	Latitude	Longitude
328	Cedar Creek	near Theadville (at Morton Marathon Road)	32.2016389	-89.300139
329	West Tallahalla Creek	(@ Morton Marathon Rd.)	32.2019722	-89.316194
331	Okatibbee Creek	near Rio	32.6020278	-88.839833
332	Houston Creek	near Rio	32.6030278	-88.861111
335	Potterchitto Creek	at Hwy 503	32.3101389	-89.026056
336	Chunky River	at Chunky	32.3270278	-88.908250
337	Okatibbee Creek	at Meridian at Old Hwy 80	32.3518611	-88.755417
338	Sowashee Creek	near Meridian	32.3444167	-88.726444
339	Okatibbee Creek	near Arundel (east of Arundel)	32.2997222	-88.753667
341	Chunky River	near Enterprise (@ Dunns Falls)	32.2281286	-88.822157
343	Bostick Branch	at Stonewall Burlington Denim Plant	32.1313056	-88.791889
349	Irby Mill Creek	at BW Johnson Road	32.1803056	-88.584694
350	Long Creek	near Sykes at Hwy 18	32.0968889	-88.611861
393	Bowie Creek	near Mt Carmel Hwy 84	31.6450556	-89.755611
394	Dry Creek	at Hwy 84	31.6406111	-89.727417
399	Oakahay Creek	near Raleigh at Hwy 18	32.0488889	-89.571639
400	Leaf River	near Sylvareena at Hwy 18	32.0135278	-89.432972
401	West Tallahala	near Sylvareena at Smith Co 99	32.0214444	-89.320167
403	Keys Mill Creek	near Leaf River	31.9176667	-89.403444
404	Okatoma Creek	near Mt. Olive (250m US of Cherry Bridge Rd.)	31.7665000	-89.660694
405	Leonards Mill Creek	near Mt. Olive (75-100m US of Rock Hill Rd crossing)	31.7404444	-89.651722
406	Oakahay Creek	near Hot Coffee on Hwy 37	31.7441667	-89.444944
407	Okatoma Creek	near Collins at Hwy 84	31.6524722	-89.558861
408	Oakey Woods Creek	at Hwy 588	31.6193333	-89.348833
409	West Bouie Creek	at Sumrail Road	31.5450278	-89.630000
410	Souinlovey Creek	near Pachuta at Hwy 513	32.1710278	-88.932694
412	Castaffa Creek	at Hwy 11 near Barnett	31.9767778	-88.908111
413	Tallahala Creek	near Heidleberg (@ Hwy 528)	31.9663611	-89.115194
414	Horse Branch	near Heidleberg	31.8676111	-89.011222
416	Tallahoma Creek	near Moss	31.7977222	-89.174778
417	Tallahala	near Laurel	31.6571667	-89.137972
418	Buckatunna Creek	near Sykes at Hwy 18 (@ Hwy 514)	32.1626667	-88.578972
419	Chickasawhay River	at DeSoto	31.9758056	-88.705472
420	Five Mile Creek	near Crandall	31.9418333	-88.521778
421	Hortons Mill Creek	at Boice and Hwy 45	31.7442778	-88.651972
422	Coldwater Creek	at Tokio Frost Bridge	31.7483333	-88.547278
423	Yellow Creek	near Boice (@ Old River Rd.)	31.7309167	-88.688333
424	Maynor Creek	near Clara	31.5863056	-88.694833
474	Black Creek	at Broome Road	31.4407500	-89.672083
475	Shelton Creek	at Delk Road	31.4588611	-89.383306
476	Bowie Creek	near Hattiesburg at Hwy 49	31.4344167	-89.434556
477	Monroe Creek	at Monearoe Road	31.3168250	-89.523639
478	Leaf River	near Palmer at Sims Bridge	31.2624753	-89.226833
480	Black Creek	near Purvis at Hwy11	31.1925556	-89.381167
481	Big Creek	at Rockhill-Brooklyn Road	31.0660000	-89.269556
482	Beaver Dam Branch	near Purvis	31.1137500	-89.412389
483	Little Black Creek	near Rockhill (~ 150m US of Rockhill-Brooklynn Rd.)	31.1035278	-89.316167
484	Black Creek	near Brooklyn at Hwy 49	31.0565000	-89.218500
485	Red Creek	near Lumberton at Hwy 11	31.0107500	-89.451222
487	Bogue Homo	at Ovett	31.4808056	-89.047278
489	West Little Thompson Creek	at Forest Rd 2062	31.4544444	-88.922444
492	Thompson Creek	near Richton	31.3568889	-88.923833
493	Bogue Homo Creek	near New Agusta (250m US of Old Augusta road crossing)	31.2618410	-89.007204
494	Leaf River	near Mahned	31.2265556	-89.088444
495	Thompson Creek	near Hintonville	31.2670833	-88.907722
496	Gaines Creek	near Beaumont	31.2543056	-88.865250
497	Atkinson Creek	near McLain at Confluence of Leaf River	31.1418333	-88.800389
498	Cypress Creek	at Janice (~ 200m US of Hwy 29 road crossing)	31.0265000	-89.017056
500	Beaver Dam Creek	near Janice at Hwy 29	30.9722778	-89.058444
502	Whisky Creek	on Salem Road (Leaf Road)	30.9903465	-88.859961

IBI number	Station name	Station location	Latitude	Longitude
504	Mason Creek	at Jonathan	31.2686389	-88.611333
505	Meadow Creek	near Leaksville	31.1497500	-88.524917
506	Big Creek	near Vernal (Jonathan Road)	31.2243056	-88.642611
507	Brushy Creek	near Shipman	30.9415556	-88.453833
522	Black Creek	near Wiggins at Hwy 26	30.8547222	-88.914500
523	Red Creek	near Ramsey Springs (at Hwy 15)	30.7799148	-88.918050
524	Flint Creek	near Whites Crossing at Hwy 26	30.8447542	-89.076685
525	Red Creek	at Perkinston at Hwy 49	30.7941111	-89.139167
527	Tenmile Creek	at Perkinston-Silverun Road	30.7615556	-89.159556
538	Black Creek	near Vestry at Hwy 57	30.7982188	-88.775237
539	Little Cedar Creek	at Hwy 613	30.8433611	-88.531500
540	Red Creek	at Vestry	30.7376389	-88.784222
541	Big Cedar Creek	near Harleston at Hwy 63	30.7199722	-88.588250
542	Indian Creek	near Basin	30.7696111	-88.636028
543	Moungers Creek	near Vancleave (Busby Rd.)	30.6362500	-88.695750
544	Bluff Creek	near Vancleave at Water Park	30.5323333	-88.688583
549	Bowie Creek	near Sumrall at Hwy 589	31.4735556	-89.524278
550	Chickasawhay River	near Shubuta	31.8776944	-88.687417
551	Escatawpa River	near Agricola at CR 612	30.8254167	-88.447833
709	Big Creek	Near State Line on Chicora Greene County Road	31.4655278	-88.575778
710	Big Creek	Near Sand Hill on Sandhill Church Road	31.6492778	-89.316500
711	Kittrell Mill Creek	at McDonald Road	31.2276111	-88.646556
713	Poplar Creek	Near Brooklyn at Grapevine Road	31.0743056	-89.172361
714	Skiffer Creek	at Mount Olive Road	31.7670833	-89.776528
715	Station Creek	near Collins at Mitchell Road	31.6428611	-89.448722
716	Tallahata Creek	near Heidelberg at CR 31	31.8622780	-89.085333
718	Upper Leaf River	Near Homewood at Morton/Marathon Road	32.2273889	-89.424361
751	Unnamed Trib to Leaf River	Near Beaumont at Hwy 15	31.1806111	-88.917972
847	Bougue Homa Creek	Just N of Bogue Homa Lake	31.7376111	-89.020611
858	Leaf River	Hwy 11	31.3461944	-89.280139
859	Priest Creek	on James St	31.2688889	-89.243000
860	Reese Creek	on Old River Rd	31.2455833	-89.152861
861	Horse Branch	on CR 33	31.8713889	-89.049528
862	Long Branch	on Clark Co 672	32.0243889	-88.628583
863	Cedar Creek	at Hwy 511	31.9615278	-88.507750
864	Eucutta Creek	on River Rd	31.8403056	-88.726250
867	Big Creek	Off Hwy 57 ? Tom White Rd	31.1049167	-88.657722
869	Leaf River	Up from boat ramp at 588	31.8306944	-89.407583
870	Tallahalla Creek	Off Hwy 29 off Old River Rd	31.2358056	-89.085250
877	Sowashee Creek	Meridian POTW upstream of discharge	32.3911389	-88.666778
878	Sowashee Creek	Meridian POTW downstream Of discharge	32.3783056	-88.673806
879	Potterchitto Creek	Newton POTW upstream of discharge	32.3329722	-89.171361
880	Potterchitto Creek	Newton POTW downstream of discharge	32.3375278	-89.167139
884	Chunky Creek	Union POTW downstream of discharge	32.5564167	-89.112250
890	Patton Creek thence to Chick	Waynesboro POTW	31.6539444	-88.623694
891	Patton Creek thence to Chick	Waynesboro POTW	31.6377222	-88.626333
892	Richardson Mill Creek	Newton POTW	32.3376111	-89.177722
894	Dry Creek	At Hwy 84 downstream of bridge	31.6365556	-89.727889
904	Chickasawhay River	at Chicora River Road	31.5542222	-88.552653
941	Little Red Creek	near Vestry at Vestry Road	30.7242556	-88.765358
942	Penantly Creek	at Rose Hill	32.1533333	-88.998611
943	Twistwood Creek	near Pachuta at HWY 18	32.1045833	-88.930917
946	Sowashee Creek	Below Meridian South POTW	32.3279250	-88.735003
952	Black Creek	near Oloh at Oak Grove Rd	31.2751472	-89.490836

Appendix B. Sites with sufficient, available suspended-sediment data and supporting fieldwork in the Southeastern Plains, Ecoregion 65. Highlighted in yellow are USGS stream gages located within the Pascagoula River Basin.

State	Gage number	Gage identification	Dates of sediment samples			Number of suspended sediment samples
			From	To	Duration (y)	
MD	01594000	Little Patuxent River at Savage	09/05/85	09/15/97	12.1	355
MD	01594440	Patuxent River near Bowie	01/30/78	08/05/98	20.6	629
MD	01594526	Western Branch at Upper Marlboro	10/09/85	09/24/96	11.0	291
MD	01594670	Hunting Creek near Huntingtown	03/14/89	09/16/97	8.5	288
MD	01594705	Agricultural Runoff Site at Barstow	05/01/89	10/23/90	1.5	46
MD	01594710	Killpeck Creek at Huntersville	10/08/85	09/16/97	12.0	427
MD	01594780	Agricultural Runoff Site near St. Leonard	07/16/86	09/22/94	8.2	164
VA	01668000	Rappahannock River near Fredericksburg	12/30/77	11/09/94	16.9	130
VA	01673000	Pamunkey River near Hanover	10/16/74	01/25/99	24.3	168
VA	01674500	Mattaponi River near Beulahville	04/10/79	01/27/99	19.9	114
VA	02038700	James River near Dutch Gap	08/13/75	02/27/79	3.6	54
VA	02041650	Appomattox River at Matoaca	12/28/77	01/25/99	21.1	115
VA	02047000	Nottoway River near Sebrell	12/15/77	09/26/96	18.8	109
VA	02052000	Meherrin River at Emporia	04/18/79	08/18/93	14.4	67
NC	02080500	Roanoke River at Roanoke Rapids	09/02/75	11/27/95	20.3	143
NC	02081000	Roanoke River near Scotland Neck	10/01/74	12/01/76	2.2	38
NC	02083000	Fishing Creek near Enfield	09/03/75	09/07/79	4.0	31
NC	02083500	Tar River at Tarboro	08/28/73	02/19/97	23.5	198
NC	02083833	Pete Mitchell Swamp at Sr1409 near Penny Hill	03/09/93	11/15/96	3.7	48
NC	02087570	Neuse River at Smithfield	12/21/73	09/13/96	22.8	96
NC	02089500	Neuse River at Kinston	08/28/73	09/29/98	25.2	218
NC	02090625	Turner Swamp near Eureka	08/29/73	05/05/78	4.7	32
NC	02091500	Contentnea Creek at Hookerton	09/04/75	09/29/98	23.1	172
NC	02091700	Little Contentnea Creek near Farmville	08/24/75	06/07/95	19.8	38
NC	02102500	Cape Fear River at Lillington	12/21/73	09/27/83	9.8	39
NC	02102908	Flat Creek near Inverness	07/30/75	09/05/79	4.1	30
NC	02106000	Little Coharie Creek near Roseboro	08/25/75	09/07/79	4.0	34
NC	02106500	Black River near Tomahawk	08/25/75	09/21/84	9.1	35
NC	02106648	Black River at Sr1722 near Dunn	03/07/77	08/15/81	4.5	81
NC	02106681	Black River near Dunn	03/07/77	08/15/81	4.5	92
NC	02129000	Pee Dee River near Rockingham	09/05/73	09/03/86	13.0	108
SC	02131000	Pee Dee River at Peedee	10/26/77	09/28/95	18.0	120
NC	02133500	Drowning Creek near Hoffman	07/30/75	09/07/79	4.1	30
SC	02135300	Scape Ore Swamp near Bishopville	01/30/73	07/24/96	23.5	191
SC	02169500	Congaree River at Columbia	10/27/77	09/09/97	19.9	38
SC	02169570	Gills Creek at Columbia	10/10/95	05/13/98	2.6	73
SC	02171500	Santee River near Pineville	01/16/74	09/13/77	3.7	45
SC	02197300	Upper Three Runs near New Ellenton	02/14/73	09/28/93	20.7	144
GA	02197830	Brier Creek near Waynesboro	04/01/70	07/05/84	14.3	43
GA	02198000	Brier Creek at Millhaven	12/21/57	02/28/78	20.2	135
GA	02203000	Canoochee River near Claxton	12/22/57	04/02/70	12.3	37
GA	02213000	Ocmulgee River at Macon	12/16/57	07/18/68	10.6	217
GA	02215100	Tucsawhatchee Creek near Hawkinsville	03/04/93	05/22/96	3.2	55
GA	02215260	Ocmulgee River at Abbeville	10/11/60	09/27/61	1.0	114
GA	02215500	Ocmulgee River at Lumber City	02/03/58	07/25/94	36.6	55
GA	02223500	Oconee River at Dublin	03/02/61	12/13/71	10.8	328
GA	02225500	Ohoopee River near Reidsville	01/13/58	08/16/84	26.7	94
GA	02316000	Alapaha River near Alapaha	03/06/58	08/18/76	18.5	45
GA	02317797	Little River at Tifton Worth Co Line Rd, near Tifton	03/05/93	05/30/96	3.2	38
GA	02317830	Little River at Kinard Bridge Rd, near Lenox	03/25/70	07/26/78	8.4	41
GA	02318000	Little River near Adel	03/06/59	07/15/61	2.4	38
GA	02318500	Withlacoochee River at US 84, near Quitman	03/11/93	09/10/97	4.5	53
FL	02320500	Suwannee River at Branford	01/17/74	01/12/96	22.0	146
FL	02326838	Lafayette Creek, Miccosukee Rd (No.28) Tallahasse	03/10/93	04/22/96	3.1	51
FL	02329000	Ochlockonee River near Havana	11/01/74	12/12/95	21.2	127
GA	02341800	Upatoi Creek near Columbus	11/21/77	07/31/84	6.7	75
AL	02343801	Chattahoochee River near Columbia	10/19/82	09/01/94	11.9	69

State	Gage number	Gage identification	Dates of sediment samples			Number of suspended sediment samples
			From	To	Duration (y)	
GA	02349500	Flint River at Montezuma	11/22/57	07/06/94	36.7	38
GA	02350080	Lime Creek near Cobb	03/03/93	09/20/95	2.6	70
GA	02350600	Kinchafoonee Creek at Preston	03/01/61	08/26/77	16.5	57
GA	02352500	Flint River at Albany	03/01/61	08/29/69	8.5	56
GA	02353000	Flint River at Newton	03/01/61	09/11/97	36.6	518
GA	02353500	Ichawaynochaway Creek at Milford	11/13/58	05/11/94	35.6	105
GA	02356980	Aycocks Creek near Boykin	03/02/93	03/07/95	2.0	40
GA	02357000	Spring Creek near Iron City	04/06/62	07/08/94	32.3	43
GA	02358000	Apalachicola River at Chattahoochee	02/01/74	09/10/97	23.7	1765
GA	02359000	Chipola River near Altha	11/21/74	09/07/94	19.8	119
FL	02368000	Yellow River at Milligan	11/07/74	09/02/93	18.9	123
AL	02369800	Blackwater River near Bradley	10/17/84	04/13/95	10.5	45
FL	02375500	Escambia River near Century	10/24/74	09/08/94	19.9	125
AL	02376500	Perdido River at Barrineau Park	01/18/78	09/08/94	16.7	87
AL	02420000	Alabama River near Montgomery	01/21/75	03/06/97	22.2	355
AL	02423000	Alabama River at Selma	11/06/89	02/11/97	7.3	116
AL	02424590	Cahaba River near Suttle	11/06/89	02/11/97	7.3	104
AL	02427470	Alabama River near Catherine	11/08/89	09/20/94	4.9	61
AL	02427511	Alabama River near Midway	11/08/89	09/20/94	4.9	57
AL	02429500	Alabama River at Claiborne	11/15/73	01/15/98	24.2	307
MS	02430000	Mackeys Creek near Dennis	06/08/77	09/27/79	2.3	94
MS	02430500	Tombigbee River near Marietta	11/17/88	04/14/97	8.4	49
MS	02430680	Twentymile Creek near Guntown	12/29/88	04/14/97	8.3	39
MS	02430690	Twentymile Creek near Mantachie	12/29/88	09/05/95	6.7	35
MS	02431000	Tombigbee River near Fulton	09/25/74	07/21/98	23.9	170
MS	02431410	Mantachie Creek below Dorsey	11/22/88	09/05/95	6.8	129
MS	02433500	Tombigbee River at Bigbee	01/05/89	04/30/98	9.3	61
MS	02436500	Town Creek near Nettleton	09/25/74	07/26/95	20.9	204
MS	02437500	Tombigbee River at Aberdeen	09/26/74	04/29/98	23.7	88
MS	02439400	Buttahatchee River near Aberdeen	09/26/74	04/29/98	23.7	71
MS	02441498	Tombigbee River in Columbus Bendway at Columbus	03/05/89	03/07/97	8.0	36
MS	02443500	Luxapallila Creek near Columbus	11/15/88	04/28/98	9.5	65
AL	02444157	Tombigbee River at State Hwy86 near Pickensville	10/21/88	01/10/97	8.2	168
AL	02444500	Tombigbee River near Cochrane	10/21/88	01/10/97	8.2	168
AL	02447008	Tombigbee River at Cooks Bend above Cut	01/13/89	02/16/94	5.1	43
AL	02447010	Tombigbee River in Cook's Bendway near Warsaw	01/13/89	02/16/94	5.1	42
MS	02448000	Noxubee River at Macon	09/10/74	09/07/95	21.0	189
AL	02449000	Tombigbee River at Gainesville	01/23/75	08/10/93	18.6	371
AL	02464035	Cripple Creek east of Samantha	08/25/77	04/22/83	5.7	56
AL	02465000	Black Warrior River at Northport	06/07/79	02/20/95	15.8	220
AL	02466031	Black Warrior River below Selden Dam near Eutaw	03/14/78	08/10/93	15.5	91
AL	02468500	Chickasaw Bogue near Linden	10/16/89	09/03/91	1.9	38
AL	02469525	Tombigbee River near Nanafalia	11/07/89	01/24/97	7.2	126
AL	02469762	Tombigbee River below Coffeeville L&D near Coffeeville	10/24/74	09/19/96	22.0	172
AL	02470040	Tombigbee River near Jackson	11/22/88	01/23/97	8.2	135
MS	02472373	Leaf River at Eastabuchie	01/20/75	08/12/81	6.6	45
MS	02472880	Bouie River near Glendale	10/07/77	08/12/81	3.9	41
MS	02473260	Leaf River near Palmer	09/09/74	08/12/81	6.9	51
MS	02473460	Tallahala Creek at Waldrup	05/12/76	10/07/79	3.4	32
MS	02473490	Tallahala Creek near Sandersville	09/10/74	10/07/79	5.1	41
MS	02474740	Leaf River at Beaumont	10/06/77	08/12/81	3.9	43
MS	02477492	Chickasawhay River at Woodwards	10/06/77	08/13/81	3.9	43
MS	02478500	Chickasawhay River at Leakesville	09/10/74	08/13/81	6.9	53
MS	02479020	Pascagoula River near Benndale	11/27/73	06/29/95	21.6	154
MS	02479155	Cypress Creek near Janice	10/30/73	08/22/96	22.9	138
MS	02479560	Escatawpa River near Agricola	10/16/85	08/18/93	7.9	32
AL	02479945	Big Creek at County Rd 63 near Wilmer	02/04/92	05/10/95	3.3	78
AL	02479948	Juniper Creek at Glenwood Road near Fairview	02/04/92	08/03/94	2.5	35
AL	02479950	Collins Creek at Glenwood Road near Fairview	04/09/92	11/02/94	2.6	37
AL	02479980	Crooked Creek near Fairview	04/08/92	11/02/94	2.6	64
AL	02480002	Hamilton Creek at Snow Road near Semmes	02/03/92	05/10/95	3.3	64
MS	02481510	Wolf River near Landon	01/06/78	07/23/86	8.6	49
MS	03592800	Yellow Creek near Doskie	06/08/77	02/01/78	0.7	37

State	Gage number	Gage identification	Dates of sediment samples			Number of suspended sediment samples
			From	To	Duration (y)	
TN	03593005	Tennessee River at Pickwick Landing Dam	04/23/75	06/16/94	19.2	117
TN	07024300	Beaver Creek at Huntingdon	07/25/79	09/12/86	7.2	39
TN	07029410	Mosses Creek near Pocahontas	03/03/77	05/03/78	1.2	53
TN	07029425	Hatchie River near Lacy	03/03/77	05/03/78	1.2	45
TN	07029500	Hatchie River at Bolivar	03/04/77	08/03/95	18.5	125
MS	07274235	Otoucalofa Creek near Paris	04/22/88	05/10/95	7.1	94
MS	07274237	Otoucalofa Creek at Paris	04/22/88	05/10/95	7.1	89
MS	07274245	Otoucalofa Creek east of Water Valley	04/22/88	05/10/95	7.1	97
MS	07274247	Otoucalofa Creek Canal east-southeast of Water Valley	04/22/88	05/10/95	7.1	97
MS	07274251	Town Creek at Water Valley	04/22/88	05/10/95	7.1	93
MS	07274252	Otoucalofa Creek Canal near Water Valley	11/16/87	07/22/97	9.7	91
MS	07277000	Pigeonroost Creek near Lewisburg	-	-	-	-
MS	07282000	Yalobusha River and Topashaw Creek Canal at Calhoun City	-	-	-	-
MS	07282100	Topashaw Creek Canal near Calhoun City	-	-	-	-
VA	0204228301	Chickahominy River Trib at atlee Ex near Greenwood	12/05/93	06/17/94	0.5	82
NC	0210782005	Nahunga Creek at Sr1301 near Warsaw	08/13/82	08/09/90	8.0	101
NC	0210787855	Grove Creek at Sr1375 near Warsaw	09/15/83	08/09/90	6.9	102
NC	0210788875	Grove Creek at SR1301 near Kenansville	09/15/83	08/09/90	6.9	104
NC	0210789100	Grove Creek at Kenansville	08/13/82	08/09/90	8.0	105
NC	0210789120	Grove Creek near Kenansville	09/15/83	08/09/90	6.9	98
AL	323642087541800	Tombigbee River at Rattlesnake Bend in Cut near Demopolis	01/20/87	03/09/97	10.2	64
AL	323653087540800	Tombigbee River at Rattlesnake Bend in Old Channel near Demopolis	01/20/87	03/09/97	10.2	62
AL	323704087542400	Tombigbee River at Rattlesnake Bend above cut near Demopolis	01/20/87	03/09/97	10.2	61
AL	325645088100700	Tombigbee River at Cooks Bend in cut at Sed Range 4	01/13/89	02/16/94	5.1	41
MS	332030088212200	Tombigbee River in cut at Hairston Bend below Columbus	02/11/94	03/07/97	3.1	36
MS	332100088224500	Tombigbee River Old Channel at Hairston Bend below Columbus	02/11/94	03/07/97	3.1	36
MS	332112088223500	Tombigbee River above cut at Hairston Bend below Columbus	02/11/94	03/07/97	3.1	36
MS	332751088261000	Tombigbee River in Columbus Cut near Columbus	03/05/89	03/07/97	8.0	36
MS	332929088273300	Tombigbee River above Cut near Columbus	03/05/89	03/07/97	8.0	36

Appendix C. Sites with sufficient, available suspended-sediment data and supporting fieldwork in the Southern Coastal Plains, Ecoregion 75.

State	Gage number	Gage identification	Dates of sediment samples			Number of suspended sediment samples
			From	To	Duration (y)	
GA	02198500	Savannah River near Clyo	1/17/1974	9/30/1994	20.8	145
GA	02202500	Ogeechee River near Eden	7/14/1958	4/19/1995	36.9	327
GA	02226000	Altamaha River at Doctortown	3/11/1958	10/13/1977	19.6	87
GA	02226100	Penholoway Creek near Jesup	9/13/1964	8/7/1984	20.0	54
GA	02226160	Altamaha River near Everett City	10/6/1977	8/30/1995	17.9	124
GA	02227500	Little Satilla River near Offerman	9/13/1964	8/7/1984	20.0	57
GA	02228000	Satilla River at atkinson	2/8/1959	8/24/1993	34.6	199
FL	02229000	Middle Prong St Marys River at Taylor	4/7/1976	6/11/1996	20.2	58
FL	02231000	St. Marys River near Macclenny	1/15/1974	5/28/1986	12.4	95
FL	02236000	St. Johns River near Deland	5/15/1979	9/6/1995	16.4	52
FL	02240000	Ocklawaha River near Conner	1/16/1975	8/25/1994	19.7	70
FL	02244450	(N) St. Johns River at Palatka	1/16/1974	3/4/1982	8.2	64
FL	02248000	Spruce Creek near Samsula	10/24/1974	8/24/1993	18.9	121
FL	02253000	Main Canal at Vero Beach	10/23/1974	9/2/1992	17.9	106
FL	02256500	Fisheating Creek at Palmdale	4/29/1975	8/16/1993	18.4	80
FL	02273000	Kissimmee River at S-65E near Okeechobee	9/12/1973	9/9/1998	25.1	151
FL	02296750	Peace River at Arcadia	2/7/1974	9/8/1998	24.7	157
FL	02298830	Myakka River near Sarasota	12/29/1977	9/25/1986	8.8	62
FL	02300700	Bullfrog Creek near Wimauma	3/23/1993	6/18/1996	3.2	35
FL	02301500	Alafia River at Lithia	12/29/1977	1/26/1994	16.1	84
FL	02303000	Hillsborough River near Zephyrhills	2/3/1974	9/23/1986	12.7	98
FL	02313000	Withlacoochee River near Holder	10/10/1974	9/7/1995	21.0	118
GA	02314500	Suwannee River at US 441, at Fargo	5/15/1967	4/10/1970	2.9	299
GA	02317500	Alapaha River at Statenville	10/11/1961	11/18/1971	10.1	377
FL	02321500	Santa Fe River at Worthington Springs	5/10/1979	6/7/1994	15.1	69
FL	02324000	Steinhatchee River near Cross City	1/10/1978	6/8/1994	16.5	86
FL	02326512	Aucilla River near Scanlon	1/10/1978	4/29/1986	8.3	56
FL	02326900	St. Marks River near Newport	1/11/1978	8/6/1985	7.6	58
FL	02327100	Sopchoppy River near Sopchoppy	6/14/1972	6/11/1996	24.1	158
FL	02359170	Apalachicola River near Sumatra	3/9/1983	6/11/1998	15.3	1329
FL	02359500	Econfina Creek near Bennett	4/12/1979	8/14/1985	6.4	39
FL	02366500	Choctawhatchee River near Bruce	11/13/1974	9/7/1994	19.9	122
LA	02492000	Bogue Chitto River near Bush	10/15/1976	8/28/1990	13.9	86

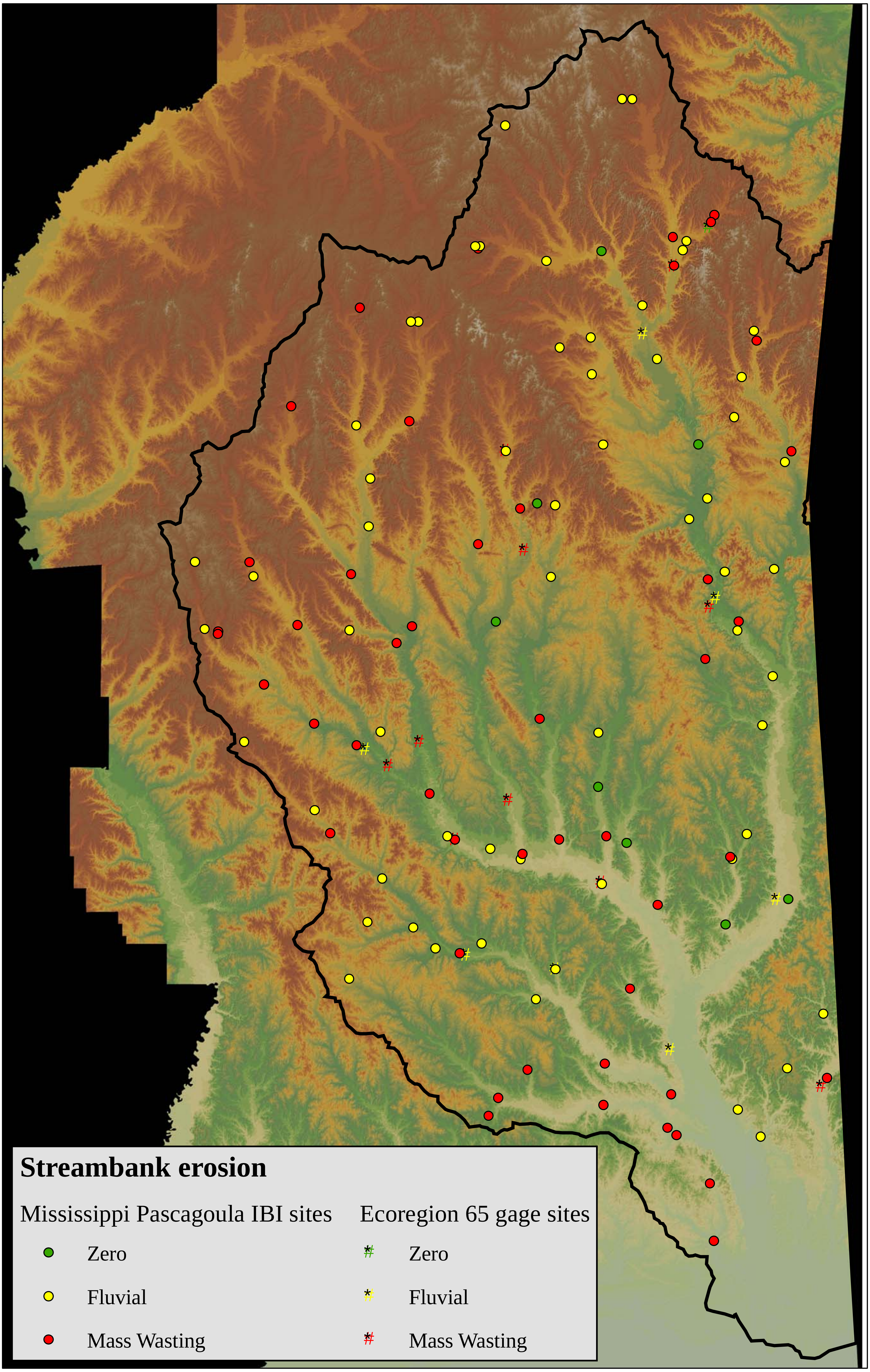
Appendix D. Rapid Geomorphic Assessments (RGA's) carried out at IBI sites in the Pascagoula River Basin.

Site	Stage of channel evolution	Bed material	Bed or bank protection	Incision	Constriction	Streambank erosion		Streambank instability		Woody vegetative cover		Bank accretion		Channel stability index
						Left	Right	Left	Right	Left	Right	Left	Right	
310	VI	Hard Clay	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	51-75%	11-25%	0-10%	11.5
312	VI	Hard Clay	No	51-75%	0-10%	None	None	11-25%	0-10%	51-75%	51-75%	51-75%	26-50%	10.5
313	VI	Hard Clay	No	26-50%	0-10%	Fluvial	None	0-10%	0-10%	26-50%	51-75%	0-10%	26-50%	14
328	III	Hard Clay	No	26-50%	0-10%	Fluvial	Fluvial	11-25%	0-10%	76-100%	51-75%	0-10%	11-25%	13
329	III	Sand/Silt Clay	No	51-75%	0-10%	Fluvial	Fluvial	0-10%	26-50%	26-50%	26-50%	26-50%	0-10%	14.5
331	VI	Sand	No	51-75%	0-10%	None	Fluvial	0-10%	11-25%	76-100%	76-100%	76-100%	51-75%	8.5
332	VI	Sand	No	11-25%	0-10%	Fluvial	None	0-10%	0-10%	51-75%	51-75%	51-75%	76-100%	11
335	VI	Sand	No	11-25%	0-10%	Fluvial	None	0-10%	0-10%	51-75%	51-75%	51-75%	76-100%	11
336	VI	Bedrock	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	51-75%	4
337	V	Sand	No	11-25%	0-10%	Mass Wasting	Fluvial	51-75%	11-25%	76-100%	76-100%	76-100%	76-100%	15
338	VI	Gravel	No	51-75%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	51-75%	51-75%	8.5
339	V	Sand	No	26-50%	0-10%	Fluvial	Mass Wasting	0-10%	51-75%	76-100%	76-100%	76-100%	26-50%	14.5
341	I	Bedrock	No	11-25%	0-10%	Fluvial	Fluvial	11-25%	0-10%	76-100%	76-100%	11-25%	11-25%	9.5
343	VI	Sand	No	26-50%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	9.5
349	VI	Sand	No	26-50%	0-10%	None	Fluvial	0-10%	11-25%	76-100%	76-100%	76-100%	51-75%	9.5
350	V	Sand	No	51-75%	0-10%	Fluvial	Fluvial	0-10%	26-50%	76-100%	51-75%	76-100%	11-25%	13
393	VI	Silt/Clay	No	76-100%	0-10%	None	Fluvial	0-10%	0-10%	76-100%	76-100%	11-25%	11-25%	10.5
394	V	Sand	No	26-50%	0-10%	Mass Wasting	None	26-50%	0-10%	26-50%	51-75%	26-50%	51-75%	15
399	V	Sand	No	26-50%	0-10%	Fluvial	Mass Wasting	0-10%	51-75%	76-100%	26-50%	76-100%	11-25%	16
400	VI	Sand	No	26-50%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	9.5
401	V	Silt/Clay	No	26-50%	0-10%	Mass Wasting	Fluvial	26-50%	0-10%	26-50%	51-75%	26-50%	26-50%	17.5
403	VI	Sand	No	51-75%	0-10%	None	Fluvial	0-10%	11-25%	76-100%	51-75%	76-100%	76-100%	8.5
404	V	Sand	1 Bank	51-75%	0-10%	Fluvial	Mass Wasting	26-50%	51-75%	51-75%	26-50%	11-25%	0-10%	19.5
405	VI	Sand	No	26-50%	0-10%	Fluvial	None	0-10%	0-10%	51-75%	76-100%	51-75%	51-75%	10
406	V	Sand	No	51-75%	0-10%	Mass Wasting	None	26-50%	0-10%	26-50%	51-75%	51-75%	76-100%	13
407	V	Sand	No	51-75%	0-10%	Mass Wasting	None	26-50%	0-10%	51-75%	51-75%	51-75%	51-75%	13
408	V	Hard Clay and Gravel	No	26-50%	0-10%	Fluvial	Mass Wasting	51-75%	76-100%	26-50%	11-25%	11-25%	26-50%	19
409	III	Sand	No	26-50%	0-10%	Fluvial	Mass Wasting	0-10%	26-50%	51-75%	51-75%	76-100%	51-75%	13.5
410	V	Sand	No	0-10%	0-10%	Fluvial	Fluvial	11-25%	11-25%	51-75%	51-75%	51-75%	51-75%	16
412	VI	Sand	No	51-75%	0-10%	Fluvial	Fluvial	0-10%	0-10%	51-75%	76-100%	76-100%	76-100%	9

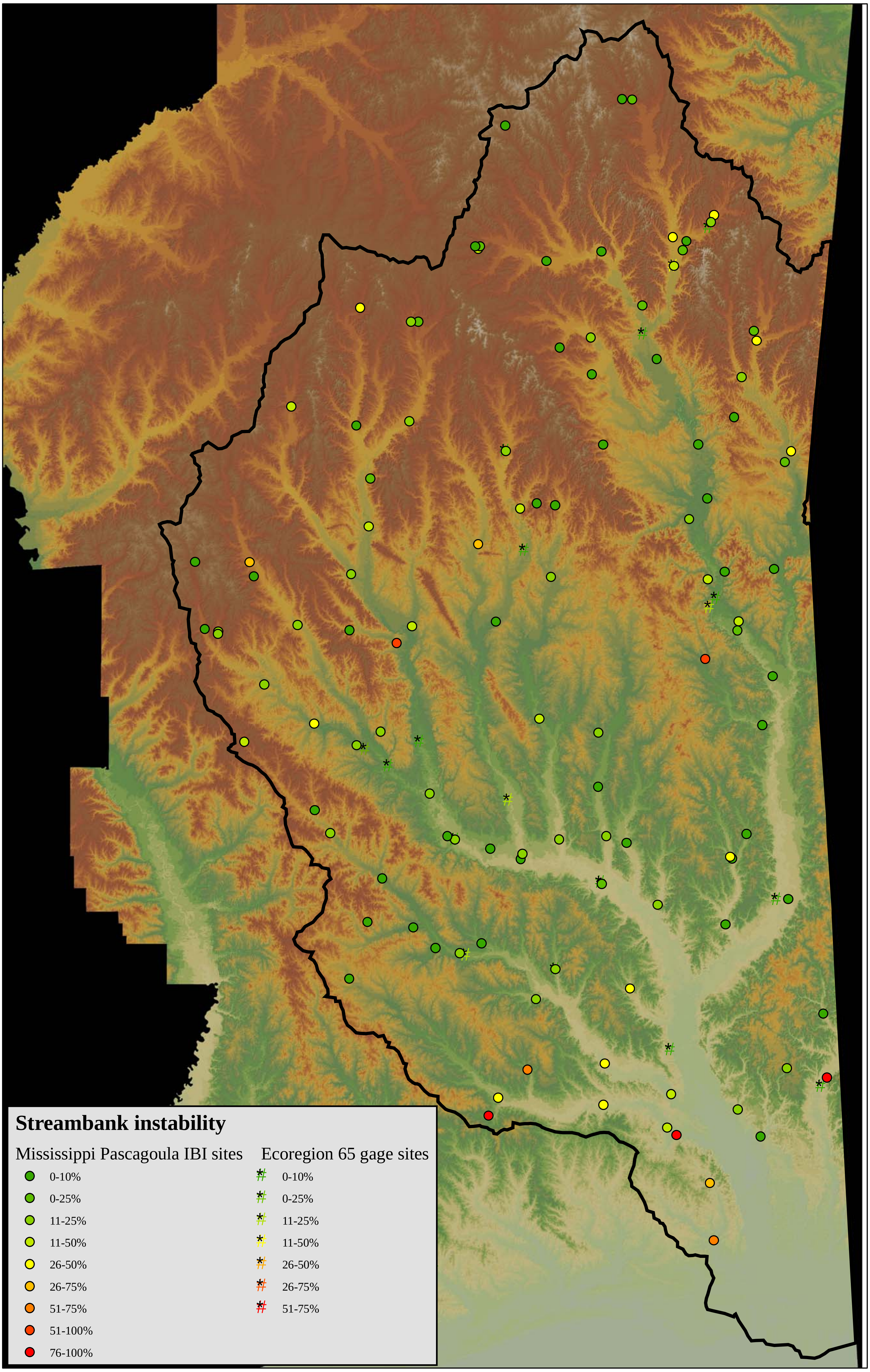
Site	Stage of channel evolution	Bed material	Bed or bank protection	Incision	Constriction	Streambank erosion		Streambank instability		Woody vegetative cover		Bank accretion		Channel stability index
						Left	Right	Left	Right	Left	Right	Left	Right	
413	V	Sand	No	26-50%	0-10%	Fluvial	Fluvial	11-25%	11-25%	51-75%	26-50%	51-75%	51-75%	14.5
414	VI	Sand	No	76-100%	0-10%	Fluvial	Fluvial	0-10%	0-10%	51-75%	76-100%	51-75%	51-75%	9
416	V	Sand	No	26-50%	0-10%	Mass Wasting	Mass Wasting	26-50%	51-75%	51-75%	26-50%	76-100%	11-25%	18.5
417	VI	Sand	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	51-75%	76-100%	51-75%	7.5
418	V	Sand	No	26-50%	0-10%	Fluvial	Mass Wasting	0-10%	76-100%	76-100%	26-50%	76-100%	0-10%	17
419	I	Hard Clay	No	51-75%	0-10%	None	None	0-10%	0-10%	51-75%	51-75%	76-100%	76-100%	4.5
420	VI	Sand	No	76-100%	0-10%	Fluvial	Fluvial	11-25%	0-10%	76-100%	76-100%	51-75%	76-100%	8.5
421	VI	Sand/Gravel	No	0-10%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	51-75%	76-100%	11.5
422	VI	Sand	No	11-25%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	51-75%	76-100%	51-75%	11.5
423	V	Sand	No	76-100%	0-10%	Fluvial	Mass Wasting	0-10%	51-75%	76-100%	76-100%	76-100%	26-50%	12.5
424	V	Sand	No	51-75%	0-10%	Mass Wasting	Mass Wasting	51-75%	76-100%	26-50%	76-100%	51-75%	26-50%	18
474	V	Hard Clay and Gravel	No	11-25%	0-10%	Fluvial	Fluvial	26-50%	11-25%	51-75%	51-75%	26-50%	76-100%	14
475	VI	Sand	No	26-50%	0-10%	Fluvial	Fluvial	11-25%	11-25%	26-50%	51-75%	26-50%	76-100%	13
476	V	Gravel	No	51-75%	11-25%	Mass Wasting	None	26-50%	0-10%	26-50%	76-100%	51-75%	76-100%	12.5
477	I	Sand	No	51-75%	0-10%	None	Fluvial	0-10%	0-10%	51-75%	76-100%	76-100%	76-100%	6.5
478	V	Sand	No	26-50%	0-10%	Mass Wasting	None	26-50%	0-10%	26-50%	26-50%	26-50%	76-100%	15
480	VI	Gravel	No	51-75%	0-10%	Fluvial	None	0-10%	0-10%	76-100%	76-100%	26-50%	26-50%	8.5
481	VI	Hard Clay and Sand	No	51-75%	0-10%	None	Fluvial	0-10%	0-10%	51-75%	76-100%	51-75%	76-100%	7
482	I	Sand	No	76-100%	0-10%	None	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	51-75%	5.5
483	VI	Sand	No	26-50%	0-10%	None	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	51-75%	9
484	V	Gravel	No	26-50%	0-10%	Mass Wasting	None	26-50%	0-10%	26-50%	26-50%	26-50%	76-100%	14
485	VI	Sand	No	26-50%	0-10%	None	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	8.5
487	V	Sand	No	51-75%	0-10%	Fluvial	Mass Wasting	0-10%	51-75%	51-75%	51-75%	76-100%	76-100%	13.5
489	VI	Sand	No	11-25%	0-10%	Fluvial	Fluvial	11-25%	11-25%	76-100%	76-100%	76-100%	76-100%	11.5
492	VI	Silt/Clay	No	76-100%	0-10%	None	None	0-10%	0-10%	76-100%	51-75%	76-100%	76-100%	7
493	V	Gravel	No	26-50%	0-10%	Mass Wasting	None	26-50%	0-10%	51-75%	51-75%	26-50%	51-75%	13.5
494	VI	Sand	No	51-75%	0-10%	Fluvial	None	0-10%	0-10%	26-50%	26-50%	26-50%	26-50%	11.5
495	V	Gravel	No	26-50%	0-10%	None	Mass Wasting	0-10%	26-50%	26-50%	26-50%	76-100%	26-50%	14
496	III	Hard Clay	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	11-25%	26-50%	8
497	V	Sand	No	26-50%	0-10%	Mass Wasting	None	26-50%	0-10%	26-50%	51-75%	26-50%	51-75%	15
498	V	Sand/Gravel	No	0-10%	0-10%	Fluvial	Fluvial	11-25%	11-25%	76-100%	51-75%	26-50%	51-75%	15.5
500	III	Hard Clay and Sand	No	11-25%	0-10%	Fluvial	Fluvial	11-25%	11-25%	51-75%	51-75%	11-25%	11-25%	15

Site	Stage of channel evolution	Bed material	Bed or bank protection	Incision	Constriction	Streambank erosion		Streambank instability		Woody vegetative cover		Bank accretion		Channel stability index
						Left	Right	Left	Right	Left	Right	Left	Right	
502	V	Sand	No	11-25%	0-10%	Fluvial	Mass Wasting	0-10%	76-100%	51-75%	11-25%	76-100%	26-50%	18
504	VI	Sand	No	51-75%	0-10%	Fluvial	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	7.5
505	VI	Sand	No	76-100%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	26-50%	26-50%	7.5
506	VI	Hard Clay and Sand	No	51-75%	0-10%	None	Fluvial	0-10%	0-10%	51-75%	51-75%	76-100%	51-75%	8
507	VI	Sand	No	76-100%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	7.5
522	V	Sand	No	51-75%	0-10%	None	Mass Wasting	0-10%	76-100%	76-100%	26-50%	76-100%	11-25%	14.5
523	V	Sand	No	51-75%	0-10%	Fluvial	Mass Wasting	0-10%	76-100%	0-10%	11-25%	76-100%	51-75%	17
524	V	Sand	No	26-50%	0-10%	Mass Wasting	Mass Wasting	51-75%	51-75%	76-100%	76-100%	26-50%	51-75%	17.5
525	V	Sand	No	11-25%	0-10%	Fluvial	Mass Wasting	11-25%	51-75%	26-50%	26-50%	26-50%	26-50%	19
527	IV	Hard Clay	No	0-10%	0-10%	Mass Wasting	Mass Wasting	76-100%	76-100%	76-100%	76-100%	26-50%	0-10%	21
538	V	Sand	No	51-75%	0-10%	Mass Wasting	None	51-75%	0-10%	26-50%	51-75%	11-25%	76-100%	14.5
539	V	Sand	No	51-75%	0-10%	Fluvial	Fluvial	11-25%	11-25%	26-50%	26-50%	26-50%	26-50%	15
540	V	Sand	No	51-75%	0-10%	None	Mass Wasting	0-10%	51-75%	51-75%	26-50%	51-75%	26-50%	14.5
541	VI	Sand	No	26-50%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	9.5
542	V	Sand	No	26-50%	0-10%	Fluvial	Fluvial	11-25%	11-25%	51-75%	51-75%	76-100%	76-100%	13
543	V	Sand	No	11-25%	0-10%	Fluvial	Mass Wasting	11-25%	76-100%	51-75%	51-75%	76-100%	76-100%	16.5
544	V	Sand	No	76-100%	0-10%	Mass Wasting	Mass Wasting	51-75%	51-75%	26-50%	51-75%	76-100%	76-100%	15.5
549	V	Sand/Gravel	No	26-50%	0-10%	Fluvial	Mass Wasting	0-10%	76-100%	11-25%	26-50%	76-100%	0-10%	18
550	III	Sand	No	11-25%	0-10%	Fluvial	Fluvial	0-10%	0-10%	11-25%	0-10%	51-75%	11-25%	16.5
551	V	Sand	No	26-50%	0-10%	Mass Wasting	Mass Wasting	76-100%	76-100%	76-100%	76-100%	51-75%	51-75%	18
709	VI	Hard Clay and Sand	No	11-25%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	9.5
710	V	Sand	No	26-50%	0-10%	Fluvial	Mass Wasting	0-10%	51-75%	76-100%	51-75%	76-100%	11-25%	15.5
711	V	Hard Clay and Sand	No	26-50%	0-10%	Mass Wasting	None	76-100%	0-10%	11-25%	51-75%	11-25%	11-25%	16.5
713	VI	Sand	No	26-50%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	9.5
714	VI	Sand	No	51-75%	0-10%	None	Fluvial	0-10%	0-10%	76-100%	51-75%	76-100%	51-75%	8.5
715	VI	Sand	No	51-75%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	8.5
716	V	Sand	No	11-25%	0-10%	Fluvial	Mass Wasting	51-75%	0-10%	51-75%	76-100%	76-100%	26-50%	16
718	IV	Hard Clay and Sand	No	11-25%	0-10%	Fluvial	Mass Wasting	0-10%	76-100%	76-100%	26-50%	76-100%	11-25%	17
751	V	Sand/Gravel	No	11-25%	0-10%	Fluvial	Fluvial	11-25%	0-10%	11-25%	11-25%	76-100%	0-10%	17
847	V	Sand	No	26-50%	0-10%	Fluvial	Fluvial	11-25%	11-25%	76-100%	76-100%	51-75%	0-10%	14.5
858	V	Gravel	No	26-50%	0-10%	None	Mass Wasting	0-10%	26-50%	26-50%	26-50%	76-100%	26-50%	14
859	VI	Sand/Gravel	No	26-50%	0-10%	None	Fluvial	0-10%	0-10%	76-100%	76-100%	51-75%	26-50%	9.5

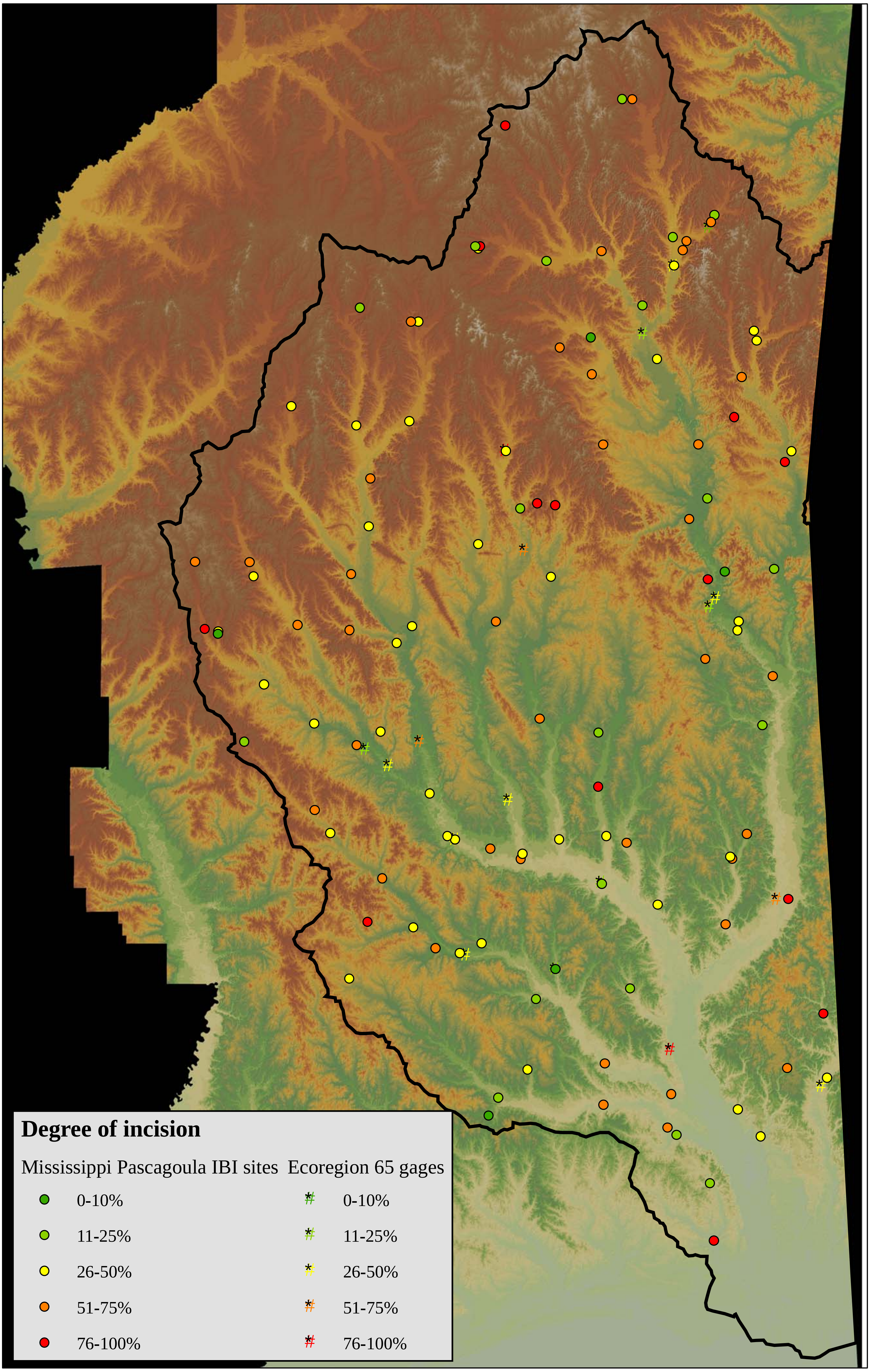
Site	Stage of channel evolution	Bed material	Bed or bank protection	Incision	Constriction	Streambank erosion		Streambank instability		Woody vegetative cover		Bank accretion		Channel stability index
						Left	Right	Left	Right	Left	Right	Left	Right	
860	VI	Sand	No	51-75%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	51-75%	76-100%	76-100%	9
861	I	Sand	No	76-100%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	26-50%	26-50%	6
862	VI	Sand	No	76-100%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	7.5
863	V	Sand	No	26-50%	0-10%	Mass Wasting	Fluvial	11-25%	51-75%	76-100%	76-100%	76-100%	76-100%	14
864	V	Sand	No	51-75%	0-10%	Fluvial	Fluvial	0-10%	26-50%	76-100%	51-75%	76-100%	51-75%	12
867	VI	Sand	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	51-75%	76-100%	51-75%	7.5
869	V	Sand and Hard Clay	No	26-50%	0-10%	Fluvial	Fluvial	11-25%	26-50%	76-100%	51-75%	76-100%	76-100%	12
870	V	Sand	No	26-50%	0-10%	Mass Wasting	None	26-50%	0-10%	26-50%	26-50%	26-50%	76-100%	15
877	V	Sand	No	11-25%	0-10%	Mass Wasting	None	76-100%	0-10%	11-25%	76-100%	51-75%	76-100%	16
878	V	Sand	1 Bank	51-75%	0-10%	None	Mass Wasting	0-10%	26-50%	51-75%	26-50%	26-50%	51-75%	15
879	V	Sand	No	26-50%	0-10%	Mass Wasting	Fluvial	51-75%	0-10%	51-75%	76-100%	26-50%	76-100%	15
880	VI	Sand	No	76-100%	0-10%	Fluvial	Fluvial	0-10%	11-25%	76-100%	76-100%	51-75%	51-75%	9
884	VI	Sand	No	76-100%	0-10%	None	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	11-25%	8
890	V	Sand	No	26-50%	0-10%	Mass Wasting	Fluvial	51-75%	0-10%	26-50%	76-100%	11-25%	76-100%	16
891	VI	Sand	No	26-50%	0-10%	Fluvial	Fluvial	11-25%	0-10%	76-100%	76-100%	76-100%	76-100%	10
892	VI	Sand	No	11-25%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	51-75%	51-75%	76-100%	11.5
894	V	Sand/Gravel	No	0-10%	0-10%	Fluvial	Mass Wasting	0-10%	26-50%	76-100%	76-100%	76-100%	11-25%	16
904	VI	Sand	No	51-75%	0-10%	Fluvial	None	0-10%	0-10%	26-50%	51-75%	51-75%	51-75%	10
941	IV	Sand	No	11-25%	0-10%	Mass Wasting	Mass Wasting	76-100%	76-100%	11-25%	11-25%	11-25%	26-50%	24.5
942	VI	Sand	No	51-75%	0-10%	Fluvial	None	0-10%	0-10%	26-50%	51-75%	76-100%	76-100%	9
943	VI	Sand	No	51-75%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	8.5
946	VI	Sand	1 Bank	51-75%	0-10%	Fluvial	Fluvial	11-25%	0-10%	76-100%	76-100%	76-100%	76-100%	10
952	V	Sand	No	26-50%	0-10%	Mass Wasting	None	26-50%	0-10%	51-75%	26-50%	51-75%	76-100%	14



Appendix E. Map of stream bank erosion at IBI sites and USGS gauging stations in the Pascagoula River Basin.



Appendix F. Map of stream bank instability, the combined percentage of each bank failing due to mass wasting, at IBI sites and USGS gauging stations in the Pascagoula River Basin



Appendix G. Map of channel incision, the relative elevation of "normal" low water to the floodplain or terrace, at IBI sites and USGS gauging stations in the Pascagoula River Basin.

Appendix H. Rapid Geomorphic Assessments (RGA's) carried out in Ecoregion 65, The Southeastern Plains. USGS gages within the Pascagoula River Basin were re-visted during the study period in 2004. Two sets of data are held for the eleven re-visited sites and are provided in a separate table below. Data are organized by gage station identification number.

State	Station identification	Stage of channel evolution	Bed material	Bed or bank protection	Incision	Constriction	Streambank erosion		Streambank instability		Woody vegetative cover		Bank accretion		Channel stability index
							Left	Right	Left	Right	Left	Right	Left	Right	
VA	01668000	VI	Boulder/Cobble	No	0-10%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	26-50%	26-50%	9.5
VA	01673000	V	Sand	No	0-10%	0-10%	Fluvial	Fluvial	11-25%	26-50%	51-75%	51-75%	26-50%	0-10%	18.5
VA	01674500	V	Silty sand	No	26-50%	0-10%	Fluvial	None	0-10%	26-50%	51-75%	51-75%	51-75%	0-10%	15
VA	02038700	VI	Sand	No	0-10%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	9.5
VA	02041650	VI	Bedrock	No	0-10%	0-10%	None	None	0-10%	0-10%	51-75%	51-75%	0-10%	0-10%	11.5
VA	02047000	V	Sand	No	11-25%	0-10%	Fluvial	Fluvial	11-25%	11-25%	26-50%	26-50%	26-50%	26-50%	17
VA	02052000	V	Sand	No	11-25%	0-10%	Fluvial	Fluvial	26-50%	26-50%	51-75%	51-75%	26-50%	26-50%	17
NC	02080500	I	Boulder/Cobble	No	0-10%	0-10%	None	None	0-10%	0-10%	51-75%	51-75%	0-10%	0-10%	11
NC	02081000	VI	Sand	No	0-10%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	11-25%	0-10%	13
NC	02083000	V	Sandy Gravel	No	11-25%	0-10%	Fluvial	Fluvial	11-25%	0-10%	51-75%	51-75%	11-25%	51-75%	15
NC	02083500	VI	Sand	No	0-10%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	51-75%	51-75%	10.5
NC	02083833	VI	Sand	No	76-100%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	0-10%	0-10%	9.5
NC	02087570	V	Sand	No Bed, 2 Banks	26-50%	0-10%	Mass Wasting	Mass Wasting	26-50%	26-50%	0-10%	0-10%	51-75%	26-50%	23.5
NC	02089500	V	Sand	1 Bank	11-25%	0-10%	Fluvial	Fluvial	11-25%	26-50%	26-50%	26-50%	0-10%	26-50%	19.5
NC	02090625	VI	Silty sand	No	26-50%	11-25%	None	None	0-10%	0-10%	76-100%	76-100%	0-10%	0-10%	13
NC	02091500	V	Sand	No	26-50%	0-10%	Fluvial	Fluvial	51-75%	11-25%	0-10%	51-75%	26-50%	76-100%	16.5
NC	02091700	VI	Silty sand	No	26-50%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	51-75%	51-75%	9
NC	02102500	VI	Cobble/Gravel	No	51-75%	0-10%	None	Fluvial	0-10%	0-10%	76-100%	76-100%	0-10%	0-10%	10
NC	02102908	III	Gravel	No	51-75%	0-10%	Fluvial	Fluvial	0-10%	0-10%	51-75%	51-75%	11-25%	11-25%	12
NC	02106000	I	Sand	No	76-100%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	0-10%	0-10%	8
NC	02106500	I	Sand	No	76-100%	0-10%	Fluvial	None	0-10%	0-10%	76-100%	76-100%	26-50%	26-50%	7
NC	02106648	I	Sand	No	76-100%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	51-75%	51-75%	5
NC	02106681	I	Sand	No	76-100%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	26-50%	26-50%	6
NC	02129000	VI	Boulder/Cobble	No	11-25%	0-10%	Fluvial	Fluvial	0-10%	0-10%	51-75%	51-75%	76-100%	76-100%	9.5
SC	02131000	V	Sand	No	26-50%	0-10%	Mass Wasting	Mass Wasting	51-75%	51-75%	26-50%	26-50%	26-50%	26-50%	20
NC	02133500	I	Sand	No	76-100%	0-10%	Fluvial	None	0-10%	0-10%	11-25%	26-50%	26-50%	26-50%	9.5
SC	02135300	I	Sand	No	76-100%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	26-50%	26-50%	6
SC	02169500	VI	Bedrock	Bed Protection	0-10%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	26-50%	51-75%	7
SC	02169570	VI	Sand	No	11-25%	0-10%	Fluvial	Fluvial	0-10%	11-25%	26-50%	11-25%	76-100%	51-75%	14
SC	02171500	IV	Sandy Gravel	2 Banks	26-50%	11-25%	Mass Wasting	Mass Wasting	51-75%	26-50%	0-10%	0-10%	0-10%	0-10%	27
SC	02197300	VI	Sand	No Bed, 2 Banks	11-25%	0-10%	Fluvial	None	0-10%	0-10%	51-75%	76-100%	51-75%	51-75%	14

State	Station identification	Stage of channel evolution	Bed material	Bed or bank protection	Incision	Constriction	Streambank erosion		Streambank instability		Woody vegetative cover		Bank accretion		Channel stability index
							Left	Right	Left	Right	Left	Right	Left	Right	
GA	02197830	V	Sand	No	26-50%	0-10%	Fluvial	Fluvial	11-25%	11-25%	26-50%	26-50%	26-50%	26-50%	16
GA	02198000	IV	Sand	No	51-75%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	11-25%	11-25%	14
GA	02203000	VI	Sand	Bed Protection	11-25%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	9.5
GA	02213000	VI	Silt/Clay	2 Banks	11-25%	0-10%	Fluvial	Fluvial	11-25%	11-25%	51-75%	51-75%	11-25%	11-25%	18.5
GA	02215100	I	Sand	No	26-50%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	26-50%	26-50%	10
GA	02215260	IV	Sand	No	51-75%	0-10%	Mass Wasting	Mass Wasting	51-75%	51-75%	0-10%	0-10%	11-25%	11-25%	23
GA	02215500	V	Sand	No	26-50%	0-10%	Mass Wasting	Mass Wasting	11-25%	11-25%	26-50%	26-50%	51-75%	51-75%	17
GA	02223500	VI	Sand	No	11-25%	0-10%	Fluvial	Fluvial	11-25%	11-25%	51-75%	51-75%	76-100%	76-100%	12.5
GA	02225500	IV	Sand	No	26-50%	0-10%	Mass Wasting	Mass Wasting	51-75%	51-75%	11-25%	11-25%	0-10%	0-10%	24
GA	02316000	V	Sand	No	26-50%	0-10%	Mass Wasting	Mass Wasting	11-25%	51-75%	11-25%	0-10%	51-75%	11-25%	20.5
GA	02317797	II	Sand	Bed Protection	76-100%	76-100%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	8
GA	02317830	I	Sand	No	51-75%	11-25%	Fluvial	Fluvial	11-25%	0-10%	26-50%	26-50%	76-100%	76-100%	10.5
GA	02318000	VI	Silty sand	No	11-25%	0-10%	Fluvial	Fluvial	0-10%	0-10%	11-25%	11-25%	11-25%	11-25%	17
GA	02318500	VI	Sand	No	26-50%	0-10%	Mass Wasting	Fluvial	11-25%	0-10%	0-10%	11-25%	11-25%	26-50%	17
FL	02320500	VI	Sand	No	76-100%	0-10%	Fluvial	None	0-10%	0-10%	51-75%	51-75%	76-100%	76-100%	7.5
FL	02326838	II	Sand	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	51-75%	51-75%	7
FL	02329000	VI	Sand	No	51-75%	0-10%	None	None	0-10%	0-10%	51-75%	51-75%	76-100%	76-100%	7.5
GA	02341800	V	Sand	No	0-10%	0-10%	Mass Wasting	Mass Wasting	51-75%	26-50%	11-25%	26-50%	76-100%	76-100%	20
GA	02349500	VI	Sand	No	11-25%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	10.5
GA	02350080	V	Sand	No	11-25%	11-25%	Mass Wasting	Mass Wasting	51-75%	51-75%	0-10%	11-25%	76-100%	76-100%	21.5
GA	02350600	V	Sand	No	51-75%	0-10%	Fluvial	Fluvial	11-25%	11-25%	26-50%	11-25%	26-50%	51-75%	15
GA	02352500	VI	Bedrock	Bed Protection	26-50%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	5.5
GA	02353000	VI	Bedrock	No	26-50%	0-10%	Mass Wasting	Fluvial	11-25%	26-50%	26-50%	11-25%	76-100%	76-100%	11.5
GA	02353500	I	Gravel	Bed Protection	51-75%	11-25%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	6
GA	02356980	VI	Sand	No	0-10%	0-10%	None	None	0-10%	0-10%	26-50%	51-75%	76-100%	76-100%	11
GA	02357000	VI	Sand	No	26-50%	0-10%	Fluvial	Fluvial	11-25%	0-10%	0-10%	11-25%	76-100%	76-100%	13.5
GA	02358000	III	Boulder/Cobble	No	76-100%	0-10%	Fluvial	Fluvial	0-10%	0-10%	26-50%	26-50%	51-75%	51-75%	9
GA	2359000	V	Sand	No	76-100%	0-10%	Mass Wasting	None	26-50%	0-10%	26-50%	76-100%	51-75%	26-50%	12.5
FL	2368000	I	Sand	No	76-100%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	4
AL	2369800	VI	Sand	No	51-75%	26-50%	None	None	0-10%	0-10%	76-100%	76-100%	51-75%	76-100%	9
FL	2375500	V	Sand	No	76-100%	0-10%	Mass Wasting	None	26-50%	0-10%	26-50%	76-100%	26-50%	76-100%	12
AL	2376500	VI	Sand	No	76-100%	26-50%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	7.5
AL	02420000	VI	Silty sand	No	76-100%	0-10%	Fluvial	None	0-10%	0-10%	76-100%	76-100%	51-75%	76-100%	7.5
AL	02423000	VI	Sand	No	26-50%	0-10%	Fluvial	Fluvial	0-10%	0-10%	51-75%	51-75%	26-50%	26-50%	12.5
AL	02424590	V	Silty sand	No	26-50%	0-10%	Mass Wasting	Mass Wasting	51-75%	51-75%	26-50%	26-50%	51-75%	51-75%	19.5
AL	02427470	-	-	-	-	-	-	-	-	-	-	-	-	-	-

State	Station identification	Stage of channel evolution	Bed material	Bed or bank protection	Incision	Constriction	Streambank erosion		Streambank instability		Woody vegetative cover		Bank accretion		Channel stability index
							Left	Right	Left	Right	Left	Right	Left	Right	
AL	02427511	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AL	02429500	V	Sand	No Bed, 2 Banks	11-25%	0-10%	Mass Wasting	Mass Wasting	26-50%	26-50%	11-25%	11-25%	76-100%	76-100%	22
MS	02430000	VI	Silt/Clay	2 Banks	76-100%	0-10%	None	None	0-10%	0-10%	0-10%	0-10%	0-10%	0-10%	16.5
MS	02430500	VI	Silty sand	1 Bank	76-100%	0-10%	Fluvial	Mass Wasting	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	10
MS	02430680	V	Silty sand	2 Banks	26-50%	11-25%	Fluvial	Mass Wasting	11-25%	51-75%	51-75%	51-75%	76-100%	76-100%	18.5
MS	02430690	V	Sand	No	26-50%	0-10%	Mass Wasting	Mass Wasting	51-75%	51-75%	51-75%	51-75%	76-100%	76-100%	17
MS	02431000	V	Silty sand	No	51-75%	0-10%	Mass Wasting	Mass Wasting	76-100%	76-100%	26-50%	26-50%	26-50%	26-50%	20.5
MS	02431410	V	Silty sand	No	26-50%	0-10%	Mass Wasting	Mass Wasting	76-100%	76-100%	11-25%	11-25%	51-75%	51-75%	21.5
MS	02433500	V	Sandy Gravel	1 Bank	51-75%	0-10%	Fluvial	Mass Wasting	26-50%	51-75%	51-75%	51-75%	76-100%	76-100%	15
MS	02436500	V	Silty sand	2 Banks	26-50%	11-25%	Mass Wasting	Mass Wasting	51-75%	76-100%	26-50%	26-50%	76-100%	76-100%	22
MS	02437500	VI	Silt/Clay	2 Banks	51-75%	0-10%	Fluvial	Fluvial	0-10%	0-10%	26-50%	26-50%	11-25%	11-25%	16.5
MS	02439400	-	Sandy Gravel	-	-	-	-	-	-	-	-	-	-	-	?
MS	02441498	VI	Silty sand	No	51-75%	0-10%	Mass Wasting	Fluvial	26-50%	11-25%	26-50%	26-50%	11-25%	11-25%	16.5
MS	02443500	V	Sand	2 Banks	?	0-10%	Fluvial	Mass Wasting	11-25%	51-75%	51-75%	51-75%	51-75%	51-75%	16
AL	02444157	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AL	02444500	V	Silty sand	Bed Protection	26-50%	0-10%	Mass Wasting	Mass Wasting	76-100%	76-100%	0-10%	0-10%	11-25%	11-25%	23.5
AL	02447008	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AL	02447010	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MS	02448000	VI	Silty sand	No	51-75%	0-10%	Fluvial	Fluvial	0-10%	0-10%	11-25%	11-25%	76-100%	76-100%	12
AL	02449000	V	Silty sand	No	26-50%	0-10%	Mass Wasting	Mass Wasting	51-75%	51-75%	11-25%	11-25%	26-50%	26-50%	21.5
AL	02464035	IV	Bedrock	No	26-50%	0-10%	Mass Wasting	Mass Wasting	51-75%	51-75%	26-50%	11-25%	11-25%	11-25%	-
AL	02465000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AL	02466031	V	Sand	No	51-75%	11-25%	Mass Wasting	Mass Wasting	51-75%	51-75%	51-75%	26-50%	26-50%	26-50%	19.5
AL	02468500	VI	Silt/Clay	No	51-75%	0-10%	None	None	0-10%	0-10%	51-75%	26-50%	76-100%	51-75%	9.5
AL	02469525	V	Sand	No	26-50%	0-10%	Mass Wasting	Mass Wasting	51-75%	26-50%	26-50%	51-75%	51-75%	51-75%	18
AL	02469762	V	Sand	Bed Protection	51-75%	0-10%	Mass Wasting	None	76-100%	0-10%	0-10%	51-75%	0-10%	0-10%	2
AL	02470040	V	Sand	No	26-50%	0-10%	Mass Wasting	None	51-75%	0-10%	26-50%	51-75%	51-75%	51-75%	15
MS	02472373	V	Sand	1 Bank	51-75%	0-10%	Mass Wasting	Mass Wasting	26-50%	11-25%	11-25%	26-50%	51-75%	51-75%	18
MS	02472880	V	Sand	1 Bank	26-50%	11-25%	Mass Wasting	Mass Wasting	76-100%	76-100%	0-10%	0-10%	76-100%	76-100%	23
MS	02473260	V	Sand	1 Bank	26-50%	0-10%	Mass Wasting	Mass Wasting	26-50%	26-50%	26-50%	26-50%	26-50%	11-25%	20.5
MS	02473460	V	Silt/Clay	No	76-100%	0-10%	Mass Wasting	Mass Wasting	11-25%	11-25%	51.75%	51-75%	51-75%	51-75%	15
MS	02473490	V	Silty sand	No	51-75%	0-10%	Mass Wasting	Fluvial	26-50%	26-50%	11-25%	11-25%	51.75%	76-100%	17
MS	02474740	V	Sandy Gravel	No	11-25%	0-10%	Fluvial	Mass Wasting	11-25%	26-50%	26-50%	11-25%	76-100%	76-100%	16.5
MS	02477492	VI	Silty sand	No	26-50%	0-10%	Fluvial	Fluvial	11-25%	11-25%	51.75%	51.75%	76-100%	76-100%	12
MS	02478500	VI	Sand	No	51-75%	0-10%	Fluvial	Fluvial	11-25%	11-25%	51.75%	51.75%	76-100%	76-100%	10.5
MS	02479020	VI	Sand	No	76-100%	0-10%	Fluvial	Fluvial	11-25%	11-25%	76-100%	76-100%	76-100%	76-100%	8.5

State	Station identification	Stage of channel evolution	Bed material	Bed or bank protection	Incision	Constriction	Streambank erosion		Streambank instability		Woody vegetative cover		Bank accretion		Channel stability index
							Left	Right	Left	Right	Left	Right	Left	Right	
MS	02479155	VI	Gravel	No	11-25%	11-25%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	51-75%	51.75%	11.5
MS	02479560	V	Sand	No	26-50%	0-10%	Mass Wasting	Mass Wasting	51-75%	51.75%	11-25%	11-25%	76-100%	76-100%	19
AL	02479945	V	Sand	No	26-50%	0-10%	Mass Wasting	Mass Wasting	11-25%	11-25%	26-50%	51.75%	76-100%	76-100%	15.5
AL	02479948	V	Sand	No	11-25%	0-10%	Fluvial	Fluvial	11-25%	11-25%	11-25%	11-25%	76-100%	76-100%	16
AL	02479950	I	Sand	No	76-100%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	6
AL	02479980	VI	Sand	No	26-50%	0-10%	Fluvial	Fluvial	0-10%	0-10%	11-25%	11-25%	76-100%	76-100%	12.5
AL	02480002	VI	Sand	No	11-25%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	10.5
MS	02481510	VI	Sandy Gravel	1 Bank	26-50%	0-10%	Fluvial	Fluvial	11-25%	0-10%	76-100%	76-100%	76-100%	76-100%	10.5
MS	03592800	VI	Silt/Clay	2 Banks	51-75%	0-10%	None	None	0-10%	0-10%	0-10%	0-10%	0-10%	0-10%	17.5
TN	03593005	II	?	1 Bank	76-100%	0-10%	None	None	0-10%	0-10%	0-10%	0-10%	0-10%	0-10%	11
TN	07024300	V	Sand	No	11-25%	0-10%	Mass Wasting	Fluvial	11-25%	0-10%	26-50%	26-50%	26-50%	26-50%	17.5
TN	07029410	VI	Sand	No	51-75%	0-10%	Fluvial	Fluvial	0-10%	0-10%	51.75%	51.75%	76-100%	76-100%	9.5
MS	07274235	V	Sand	No	0-10%	26-50%	Fluvial	Mass Wasting	0-10%	26-50%	26-50%	26-50%	26-50%	26-50%	21
MS	07274237	V	Sand	No	26-50%	0-10%	Mass Wasting	Mass Wasting	76-100%	76-100%	11-25%	11-25%	76-100%	76-100%	20
MS	07274245	V	Sand	Bed Protection	0-10%	0-10%	Mass Wasting	Mass Wasting	51-75%	26-50%	11-25%	11-25%	0-10%	0-10%	23.5
MS	07274247	V	Sand	Bed Protection	0-10%	0-10%	Mass Wasting	Mass Wasting	11-25%	11-25%	51.75%	51.75%	0-10%	0-10%	20
MS	07274251	II	Silty sand	Bed Protection	0-10%	11-25%	None	Mass Wasting	0-10%	11-25%	0-10%	0-10%	76-100%	76-100%	16
MS	07274252	V	Sand	2 Banks	0-10%	0-10%	Mass Wasting	Mass Wasting	51-75%	51.75%	11-25%	11-25%	76-100%	76-100%	23
MS	07277000	V	Sand	No	0-10%	0-10%	Mass Wasting	Mass Wasting	51-75%	51.75%	26-50%	51.75%	0-10%	11-25%	23
MS	07282000	V	Sand	No	11-25%	0-10%	Mass Wasting	Mass Wasting	11-25%	76-100%	26-50%	26-50%	76-100%	76-100%	18.5
MS	07282100	V	Sand	2 Banks	26-50%	0-10%	Mass Wasting	Mass Wasting	26-50%	26-50%	26-50%	26-50%	76-100%	76-100%	19
VA	0204228301	VI	Sand	No	26-50%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	11-25%	11-25%	12.5
NC	0210782005	I	Sand	No	76-100%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	4
NC	0210787855	I	Sand	No	76-100%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	4
NC	0210788875	I	Sand	No	76-100%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	0-10%	0-10%	8
NC	0210789100	I	Sand	No	76-100%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	0-10%	0-10%	8
NC	0210789120	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AL	323642087541800	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AL	323653087540800	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AL	323704087542400	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AL	325645088100700	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MS	332030088212200	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MS	332100088224500	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MS	332112088223500	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MS	332751088261000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MS	332929088273300	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Rapid Geomorphic Assessments (RGA's) carried out in Ecoregion 65, The Southeastern Plains during the 2004 study period. These gages are those that are located within the Pascagoula River Basin and were visited in 2001.

Gage	Stage of channel evolution	Bed material	Bed or bank protection	Incision	Constriction	Streambank erosion		Streambank instability		Woody vegetative cover		Bank accretion		Channel stability index
						Left	Right	Left	Right	Left	Right	Left	Right	
02472373	V	Sand	No	11-25%	0-10%	None	Mass Wasting	0-10%	51-75%	76-100%	26-50%	76-100%	51-75%	15
02472880	V	Sand	1 bank	11-25%	0-10%	Fluvial	Mass Wasting	11-25%	51-75%	76-100%	11-25%	76-100%	0-10%	19.5
02473260	V	Sand	No	51-75%	0-10%	None	Mass Wasting	0-10%	51-75%	26-50%	26-50%	76-100%	11-25%	15
02473460	V	Sand	No	26-50%	0-10%	Fluvial	Fluvial	11-25%	11-25%	51-75%	26-50%	51-75%	51-75%	14.5
02473490	IV	Silt Clay	No	11-25%	0-10%	Mass Wasting	None	76-100%	11-25%	26-50%	51-75%	0-10%	11-25%	21.5
02474740	III	Sand	No	26-50%	0-10%	Fluvial	Fluvial	0-10%	26-50%	76-100%	76-100%	51-75%	11-25%	13
02477492	V	Sand	No	11-25%	0-10%	Mass Wasting	Fluvial	26-50%	11-25%	76-100%	51-75%	51-75%	26-50%	16.5
02478500	VI	Sand	No	26-50%	0-10%	Fluvial	Mass Wasting	0-10%	26-50%	76-100%	76-100%	76-100%	76-100%	11.5
02479020	V	Sand	No	26-50%	0-10%	Mass Wasting	Mass Wasting	76-100%	76-100%	51-75%	51-75%	26-50%	26-50%	20
02479155	VI	Sand/Gravel	No	26-50%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	51-75%	51-75%	10
02479560	V	Sand	No	26-50%	0-10%	Mass Wasting	Mass Wasting	26-50%	51-75%	51-75%	26-50%	51-75%	51-75%	18

Appendix I. Rapid Geomorphic Assessments (RGA's) carried out in Ecoregion 75, The Southern Coastal Plains. Data are organized by gage station identification.

State	Station identification	Stage of channel evolution	Bed material	Bed or bank protection	Incision	Constriction	Streambank erosion		Streambank instability		Woody vegetative cover		Bank accretion		Channel stability index
							Left	Right	Left	Right	Left	Right	Left	Right	
GA	02198500	V	Sand	No	51-75%	0-10%	Fluvial	Mass Wasting	11-25%	0-10%	76-100%	76-100%	0-10%	0-10%	15.5
GA	02202500	VI	Sand	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	0-10%	0-10%	10.5
GA	02226000	VI	Sand	1 Bank	26-50%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	6.5
GA	02226100	I	Sand	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	4
GA	02226160	I	Sand/Silt	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	4.5
GA	02227500	VI	Sand	No	51-75%	0-10%	Fluvial	None	0-10%	0-10%	51-75%	51-75%	51-75%	26-50%	10
GA	02228000	V	Sand	No	51-75%	0-10%	Mass Wasting	None	26-50%	0-10%	26-50%	51-75%	26-50%	51-75%	13
FL	02229000	I	Sand	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	4
FL	02231000	V	Sand	No	51-75%	0-10%	Mass Wasting	None	26-50%	0-10%	26-50%	11-25%	26-50%	76-100%	15.5
FL	02236000	VI	Sand	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	5.5
FL	02240000	I	Silt/Clay	No	51-75%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	7
FL	02244450	I	Sand	1 Bank	26-50%	0-10%	None	Fluvial	0-10%	0-10%	0-10%	76-100%	76-100%	76-100%	8
FL	02248000	VI	Sand	No	51-75%	26-50%	Fluvial	Fluvial	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	12.5
FL	02253000	II	Bedrock	No	51-75%	0-10%	Fluvial	Fluvial	0-10%	0-10%	51-75%	26-50%	0-10%	0-10%	12.5
FL	02256500	VI	Sand	No	51-75%	26-50%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	8.5
FL	02273000	Dam	-	-	-	-	-	-	-	-	-	-	-	-	-
FL	02296750	V	Sand	No	51-75%	0-10%	Fluvial	Mass Wasting	0-10%	51-75%	51-75%	26-50%	26-50%	76-100%	17
FL	02298830	VI	Sand	No	51-75%	0-10%	None	None	0-10%	0-10%	26-50%	11-25%	76-100%	76-100%	10
FL	02300700	II	Sand	No	51-75%	0-10%	Fluvial	Fluvial	0-10%	0-10%	51-75%	26-50%	76-100%	51-75%	12
FL	02301500	V	Bedrock	No	51-75%	0-10%	Fluvial	Mass Wasting	11-25%	51-75%	51-75%	11-25%	26-50%	0-10%	18
FL	02303000	VI	Sand	1 Bank	26-50%	0-10%	Fluvial	Fluvial	0-10%	0-10%	51-75%	51-75%	26-50%	26-50%	12.5
FL	02313000	VI	Sand	No	51-75%	0-10%	Fluvial	Fluvial	0-10%	0-10%	76-100%	51-75%	51-75%	76-100%	8.5
GA	02314500	I	Sand	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	4
GA	02317500	VI	Sand	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	5.5
FL	02321500	VI	Sand	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	5.5
FL	02324000	VI	Sand	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	5.5
FL	02326512	VI	Sand	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	26-50%	51-75%	7
FL	02326900	I	Sand	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	4
FL	02327100	VI	Sand	No	51-75%	0-10%	Fluvial	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	7.5
FL	02359170	I	Sand	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	4
FL	02359500	I	Sand	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	4
FL	02366500	I	Sand	No	51-75%	0-10%	None	None	0-10%	0-10%	76-100%	76-100%	76-100%	76-100%	4
LA	02492000	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix J. Bed material size classes for IBI sites in the Pascagoula River Basin. Samples collected during 2004 field work in the study region.

Site	ER level IV	Stage of channel evolution	Percentage class sizes				D_{50} in millimeters	Critical shear stress (τ_c) in Pa
			Bedrock/Hard Clay/Cemented Sands/Boulders/Cobbles > 64.0 mm	Gravel 2.00 - 64.0 mm	Sand 0.063 - 1.99 mm	Silt and clay < 0.062 mm		
310	-	VI	0.00	0.00	63.9	36.1	0.210	0.204
312	-	VI	0.00	0.00	88.4	11.6	0.350	0.340
313	-	VI	0.00	0.00	61.7	38.3	0.149	0.145
328	65r	III	0.00	15.0	81.3	3.74	0.645	0.626
329	65r	III	0.00	19.6	79.6	0.821	0.933	0.906
331	65d	VI	0.00	0.00	99.3	0.676	0.217	0.211
332	65d	VI	0.00	0.262	99.4	0.336	0.300	0.291
335	65d	VI	0.00	0.00	99.3	0.683	0.210	0.204
336	65q	VI	100	0.00	0.00	0.00	Bedrock	> 100
337	65d	V	0.00	0.00	93.2	6.78	0.114	0.111
338	65d	VI	40.0	3.07	56.9	0.00	0.620	0.602
339	65d	V	0.00	0.00	100	0.00	0.312	0.303
341	65q	I	100	0.00	0.00	0.00	Bedrock	> 100
343	65d	VI	0.00	0.311	99.0	0.667	0.209	0.203
349	65d	VI	0.00	0.715	99.3	0.00	0.380	0.369
350	65d	VI	0.00	0.00	100	0.00	0.400	0.388
393	65d	VI	0.00	0.00	69.8	30.2	0.139	0.135
394	65d	V	0.00	9.50	90.5	0.00	0.412	0.400
399	65d	V	0.00	0.00	97.0	3.00	0.250	0.243
400	65d	VI	30.0	8.52	61.5	0.00	0.860	0.835
401	65d	V	0.00	0.00	87.3	12.71	0.170	0.165
403	65d	VI	0.00	0.97	99.0	0.00	0.300	0.291
404	65d	III	0.00	0.00	99.3	0.678	0.309	0.300
405	65d	VI	0.00	2.41	97.6	0.00	0.400	0.388
406	65d	V	0.00	0.343	99.7	0.00	0.480	0.466
407	65d	V	0.00	0.319	99.3	0.336	0.401	0.389
408	65d	IV	55.0	31.0	14.0	0.00	Hard Clay	> 100
409	65d	III	0.00	0.00	100	0.00	0.307	0.298
410	65d	V	0.00	0.00	99.7	0.332	0.190	0.185
412	65r	VI	0.00	0.66	99.3	0.00	0.440	0.427
413	65d	V	0.00	0.00	98.3	1.68	0.436	0.423
414	65d	VI	0.00	0.00	99.3	0.673	0.301	0.292
416	65d	V	0.00	0.00	100	0.00	0.301	0.292
417	65d	VI	0.00	1.69	98.0	0.332	0.217	0.211

Site	ER level IV	Stage of channel evolution	Percentage class sizes				D_{50} in millimeters	Critical shear stress (τ_c) in Pa
			Bedrock/Hard Clay/Cemented Sands/Boulders/Cobbles > 64.0 mm	Gravel 2.00 - 64.0 mm	Sand 0.063 - 1.99 mm	Silt and clay < 0.062 mm		
418	65d	V	0.00	0.0160	100	0.00	0.279	0.271
419	65d	I	100	0.00	0.00	0.00	Hard Clay	> 100
420	65d	VI	0.00	0.07	99.9	0.00	0.290	0.282
421	65d	VI	0.00	14.0	86.0	0.00	0.490	0.476
422	65d	VI	0.00	0.49	99.5	0.00	0.399	0.388
423	65d	V	0.00	17.8	82.2	0.00	0.497	0.483
424	65d	V	0.00	0.00	99.7	0.339	0.209	0.203
474	65d	V	60.0	31.0	9.00	0.00	Hard Clay	> 100
475	65f	VI	0.00	0.0298	100	0.00	0.320	0.311
476	65f	V	0.00	50.0	50.0	0.00	2.00	1.942
477	65f	I	0.00	0.00	99.7	0.336	0.301	0.292
478	65p	V	0.00	4.04	96.0	0.00	0.600	0.583
480	65f	VI	49.0	51.0	0.00	0.00	30.00	29.136
481	65f	VI	0.00	0.00	99.3	0.673	0.202	0.196
482	65f	I	0.00	0.00	100	0.00	0.308	0.299
483	65f	VI	0.00	30.0	66.5	3.50	0.220	0.214
484	65f	V	0.00	60.0	39.7	0.270	9.00	8.741
485	65f	VI	0.00	0.381	99.3	0.338	0.300	0.291
487	65d	V	0.00	0.00	96.6	3.41	0.148	0.144
489	65f	VI	0.00	0.00	99.0	1.02	0.300	0.291
492	65f	VI	0.00	1.32	94.3	4.35	0.208	0.202
493	65p	V	0.00	60.0	40.0	0.00	11.00	10.683
494	65p	VI	0.00	0.567	99.4	0.00	0.190	0.185
495	65f	V	0.00	80.0	19.9	0.0673	21.3	20.686
496	65f	III	0.00	0.00	83.9	16.1	0.457	> 100
497	65f	V	0.00	0.0441	100	0.00	0.401	0.389
498	65f	VI	0.00	58.0	42.0	0.00	8.90	8.644
500	65f	III	65.0	2.21	32.8	0.00	Hard Clay	> 100
502	65f	V	0.00	0.379	97.6	2.03	0.260	0.253
504	65f	VI	0.00	0.0838	99.6	0.339	0.312	0.303
505	65p	VI	0.00	0.00	98.0	2.02	0.168	0.163
506	65f	VI	0.00	1.25	97.1	1.69	0.309	0.300
507	65f	VI	0.00	0.00	99.7	0.338	0.300	0.291
522	65f	V	0.00	0.474	99.5	0.00	0.345	0.335
523	65f	V	0.00	0.00	99.0	1.02	0.175	0.170
524	65f	V	0.00	1.11	98.9	0.00	0.270	0.262
525	65f	V	0.00	50.0	50.0	0.00	2.00	1.942

Site	ER level IV	Stage of channel evolution	Percentage class sizes				D_{50} in millimeters	Critical shear stress (τ_c) in Pa
			Bedrock/Hard Clay/Cemented Sands/Boulders/Cobbles > 64.0 mm	Gravel 2.00 - 64.0 mm	Sand 0.063 - 1.99 mm	Silt and clay < 0.062 mm		
527	65f	IV	100	0.00	0.00	0.00	Hard Clay	> 100
538	65f	V	0.00	0.0509	99.9	0.00	0.325	0.316
539	65f	III	0.00	0.00	100.00	0.00	0.314	0.305
540	65f	V	0.00	0.0497	100	0.00	0.278	0.270
541	75a	VI	0.00	0.626	99.4	0.00	0.364	0.354
542	65f	VI	0.00	0.00	100	0.00	0.280	0.272
543	65f	V	0.00	0.00	100	0.00	0.303	0.294
544	75a	V	0.00	0.00	99.3	0.680	0.201	0.195
549	65d	V	0.00	50.0	49.8	0.162	2.00	1.942
550	65r	III	-	-	-	-	-	-
551	65f	V	0.00	0.00	99.7	0.338	0.327	0.318
709	65f	VI	0.00	1.28	98.7	0.00	0.400	0.388
710	65d	V	0.00	0.259	99.7	0.00	0.311	0.302
711	65f	V	49.0	0.194	50.8	0.00	1.00	0.971
713	65f	VI	0.00	30.0	68.8	1.16	0.340	0.330
714	65d	VI	0.00	0.00	98.6	1.35	0.255	0.248
715	65d	VI	0.00	0.00	99.0	1.01	0.260	0.253
716	65d	V	0.00	0.0261	100	0.00	0.248	0.241
718	65r	IV	85.0	0.00	15.0	0.00	Hard Clay	> 100
751	65p	V	0.00	71.0	28.3	0.690	9.00	8.741
847	65d	V	0.00	0.00	98.6	1.37	0.155	0.151
858	65p	V	0.00	60.0	39.9	0.134	16.00	15.539
859	65f	VI	0.00	2.00	98.0	0.00	0.346	0.336
860	65p	VI	0.00	40.0	60.0	0.00	0.633	0.615
861	65d	I	0.00	0.00	99.3	0.676	0.299	0.290
862	65d	VI	0.00	5.40	94.0	0.637	0.678	0.658
863	65d	V	0.00	0.00	100	0.00	0.203	0.197
864	65r	V	0.00	3.17	96.8	0.00	0.540	0.524
867	65f	VI	0.00	0.00	98.6	1.35	0.255	0.248
869 Jets	65d	III	0.00	0.00	91.5	8.47	0.190	> 100
869 Sand	65d	III	0.00	0.0941	99.9	0.00	0.380	0.369
870	65p	V	0.00	20.0	80.0	0.00	0.348	0.338
877	65d	V	0.00	0.352	99.0	0.669	0.211	0.205
878	65d	V	0.00	0.00	98.0	2.03	0.201	0.195
879	65d	V	0.00	0.225	99.4	0.335	0.204	0.198
880	65d	VI	0.00	0.00	99.0	1.01	0.180	0.175

Site	ER level IV	Stage of channel evolution	Percentage class sizes				D_{50} in millimeters	Critical shear stress (τ_c) in Pa
			Bedrock/Hard Clay/Cemented Sands/Boulders/Cobbles > 64.0 mm	Gravel 2.00 - 64.0 mm	Sand 0.063 - 1.99 mm	Silt and clay < 0.062 mm		
884	65d	VI	0.00	3.17	95.2	1.62	0.407	0.395
890	65d	V	0.00	2.67	97.0	0.333	0.300	0.291
891	65d	VI	0.00	10.1	89.9	0.00	0.352	0.342
892	65d	VI	0.00	0.0806	99.9	0.00	0.277	0.269
894	65d	V	1.00	42.0	57.0	0.00	0.740	0.719
904	65f	VI	0.00	1.42	98.6	0.00	0.412	0.400
941	65f	IV	0.00	0.00	98.6	1.36	0.300	0.291
942	65d	VI	0.00	0.00	99.7	0.340	0.311	0.302
943	65d	VI	0.00	0.00	99.7	0.342	0.300	0.291
946	65d	VI	0.00	1.57	98.4	0.00	0.309	0.300
952	65f	V	0.00	0.00	100	0.00	0.300	0.291

* IBI site 337 is also USGS gage 02476000
IBI site 339 is also USGS gage 02476600
IBI site 413 is also USGS gage 02473460
IBI site 498 is also USGS gage 02479155
IBI site 551 is also USGS gage 02479560

Appendix K. Bed material size classes for Ecoregion 65, The Southeastern Plains. Yellow highlighted cells represent gage stations that 15-minutes flow data is held for. Data are ordered by gage identification number.

State	ER Level IV	Station identification	Percentage class sizes			D50 in millimeters	Dominant material	Field or Historical Data	Field comments
			Gravel 2.00 - 64.0 mm	Sand 0.063 - 1.99 mm	Silt and clay < 0.062 mm				
MD	65n	01594000	-	-	-	-	-	-	Not Visited
MD	65n	01594440	-	-	-	-	-	-	Not Visited
MD	65n	01594526	-	-	-	-	-	-	Not Visited
MD	65n	01594670	-	-	-	-	-	-	Not Visited
MD	65n	01594705	-	-	-	-	-	-	Not Visited
MD	65n	01594710	-	-	-	-	-	-	Not Visited
MD		01594780	-	-	-	-	-	-	Not Visited
VA	65m	01668000	-	-	-	-	Boulder/Cobble	Field Data	No Sample
VA	65m	01673000	9.53	90.5	0.00	0.400	Sand	Field Data	Sample
VA	65m	01674500	0.510	99.5	0.00	0.600	Sand	Field Data	Sample
VA	65m	02038700	-	-	-	-	Sand	Field Data	No Sample
VA	65m	02041650	42.5	57.0	0.450	0.600	Sand	Field Data	Sample
VA	65m	02047000	16.8	83.2	0.00	1.25	Sand	Field Data	Sample
VA	65m	02052000	28.4	71.6	0.00	1.50	Sand	Field Data	Sample
NC	65m	02080500	-	-	-	-	Boulder/Cobble	Field Data	No Sample
NC	65p	02081000	0.320	99.7	0.00	0.550	Sand	Field Data	Sample
NC	65p	02083000	70.7	29.3	0.100	4.50	Gravels	Field Data	Sample
NC	65p	02083500	16.2	83.8	0.00	1.10	Sand	Field Data	Sample
NC	65p	02083833	4.28	95.7	0.00	0.300	Sand	Field Data	Sample
NC	65m	02087570	0.00	99.3	0.690	0.350	Sand	Field Data	Sample
NC	65p	02089500	0.780	99.2	0.00	0.500	Sand	Field Data	Sample
NC	65m	02090625	-	-	-	-	Sand/Fines	Field Data	No Sample
NC	65p	02091500	12.3	84.4	3.31	0.700	Sand	Field Data	Sample
NC	65m	02091700	10.2	89.5	0.310	0.710	Sand	Field Data	Sample
NC	65m	02102500	-	-	-	-	Boulder/Cobble	Field Data	No Sample
NC	65c	02102908	72.8	27.1	0.140	5.90	Gravels	Field Data	Sample
NC	65m	02106000	33.8	66.2	0.00	1.25	Sand	Field Data	Sample
NC	65p	02106500	11.00	96.9	0.00	0.490	Sand	Field Data	Sample
NC	65m	02106648	0.110	99.9	0.00	0.490	Sand	Field Data	Sample
NC	65m	02106681	52.6	47.1	0.00	2.90	Gravels	Field Data	Sample
NC	65c	02129000	-	-	-	-	Boulder/Cobble	Field Data	No Sample
SC	65p	02131000	4.15	95.9	0.00	0.550	Sand	Field Data	Sample
NC	65c	02133500	-	-	-	-	Sand	Field Data	No Sample
SC	65l	02135300	0.00	100	0.00	0.600	Sand	Field Data	Sample
SC	65c	02169500	53.2	46.8	0.00	2.10	Gravels	Field Data	Sample
SC	65c	02169570	23.6	76.4	0.00	1.40	Sand	Field Data	Sample
SC	65p	02171500	-	-	-	-	Sand	Field Data	No Sample
SC	65c	02197300	0.00	100	0.00	0.230	Sand	Field Data	Sample
GA	65k	02197830	2.32	93.1	4.57	0.470	Sand	Field Data	Sample
GA	65l	02198000	2.92	93.5	3.60	0.600	Sand	Field Data	Sample
GA	65l	02203000	1.39	95.6	2.97	0.430	Sand	Field Data	Sample
GA	65c	02213000	4.60	91.5	3.89	0.270	Sand	Field Data	Sample
GA	65l	02215100	66.9	33.0	0.114	9.30	Gravels	Field Data	Sample
GA	65p	02215260	1.16	89.6	9.29	0.600	Sand	Field Data	Sample
GA	65p	02215500	2.54	95.1	2.40	0.390	Sand	Field Data	Sample
GA	65p	02223500	5.36	92.0	2.60	0.810	Sand	Field Data	Sample
GA	65l	02225500	14.9	82.4	2.64	0.700	Sand	Field Data	Sample

State	ER Level IV	Station identification	Percentage class sizes			D50 in millimeters	Dominant material	Field or Historical Data	Field comments
			Gravel 2.00 - 64.0 mm	Sand 0.063 - 1.99 mm	Silt and clay < 0.062 mm				
GA	65l	02316000	0.830	95.5	3.65	0.410	Sand	Field Data	Sample
GA	65h	02317797	8.56	88.7	2.76	0.600	Sand	Field Data	Sample
GA	65h	02317830	6.20	89.1	4.69	0.320	Sand	Field Data	Sample
GA	65h	02318000	47.7	50.8	1.44	1.60	Sand	Field Data	Sample
GA	65h	02318500	16.2	81.6	2.24	0.400	Sand	Field Data	Sample
FL		02320500	-	-	-	-	-	-	Not Visited
FL		02326838	-	-	-	-	-	-	Not Visited
FL	65h	02329000	-	-	-	-	-	-	Not Visited
GA	65c	02341800	4.62	91.5	3.89	0.700	Sand	Field Data	Sample
AL	65p	02343801	-	-	-	-	-	-	Not Visited
GA	65p	02349500	13.5	83.0	3.50	0.560	Sand	Field Data	Sample
GA	65g	02350080	0.00	97.0	3.00	0.420	Sand	Field Data	Sample
GA	65c	02350600	0.00	78.7	21.3	0.00	Sand	Field Data	Sample
GA	65p	02352500	1.23	94.5	4.28	0.270	Sand	Field Data	Sample
GA	65p	02353000	18.0	82.0	1.00	1.30	Sand	Historical Data	Sample
GA	65g	02353500	79.8	19.2	0.984	14.0	Gravels	Field Data	Sample
GA	65g	02356980	-	-	-	-	Sand	Field Data	No Sample
GA	65g	02357000	1.70	94.7	3.60	0.670	Sand	Field Data	Sample
GA	65p	02358000	5.17	91.9	2.88	0.400	Sand	Field Data	Sample
GA	65p	02359000	-	-	-	-	-	-	Not Visited
FL	65p	02368000	-	-	-	-	-	-	Not Visited
AL	65f	02369800	-	-	-	-	-	-	Not Visited
FL	65p	02375500	-	-	-	-	-	-	Not Visited
AL	65f	02376500	-	-	-	-	-	-	Not Visited
AL	65p	02420000	1.52	94.5	3.94	0.210	Sand	Field Data	Sample
AL	65p	02423000	-	-	-	-	Sand	Field Data	No Sample
AL	65p	02424590	0.00	96.3	3.70	0.220	Sand	Field Data	Sample
AL	65p	02427470	-	-	-	-	-	-	No Access
AL	65p	02427511	-	-	-	-	-	-	No Access
AL	65p	02429500	0.300	97.0	2.70	0.190	Sand	Field Data	Sample
MS	65i	02430000	-	-	-	-	Fines	Field Data	No Sample
MS	65b	02430500	0.330	95.7	4.00	0.240	Sand	Field Data	Sample
MS	65a	02430680	0.00	96.7	3.33	0.340	Sand	Field Data	Sample
MS	65b	02430690	-	-	-	-	Sand	Field Data	No Sample
MS	65b	02431000	0.450	94.9	4.65	0.140	Sand	Field Data	Sample
MS	65b	02431410	0.0600	96.6	3.33	0.310	Sand	Field Data	Sample
MS	65p	02433500	54.3	43.9	1.85	4.10	Gravels	Field Data	Sample
MS	65a	02436500	0.00	99.0	1.00	0.362	Sand/Fines	Historical Data	No Sample
MS	65b	02437500	0.00	65.0	2.00	0.316	Fines	Historical Data	No Sample
MS	65i	02439400	57.0	41.6	1.45	5.00	Gravels	Field Data	Sample
MS	65a	02441498	32.0	66.0	2.00	0.225	Sand	Field Data	No Sample
MS	65b	02443500	1.25	96.4	2.31	0.250	Sand	Field Data	Sample
AL	65p	02444157	-	-	-	-	-	-	No Access
AL	65p	02444500	-	-	-	-	Sand/Fines	Field Data	No Sample
AL	65p	02447008	80.0	20.0	0.00	6.99	Gravels	Historical Data	No Access
AL	65p	02447010	0.00	99.0	0.00	0.346	Sand	Historical Data	No Access
MS	65a	02448000	0.00	61.0	2.00	0.54	Sand	Historical Data	No Sample
AL	65p	02449000	10.6	85.3	4.17	0.300	Sand	Field Data	Sample
AL	65i	02464035	1.81	58.2	40.0	0.490	Sand	Field Data	Sample
AL	65i	02465000	11.0	85.0	1.00	0.412	Sand	Historical Data	No Access
AL	65p	02466031	-	-	-	-	Sand	Field Data	No Sample
AL	65b	02468500	0.300	99.7	0.00	0.230	Sand	Field Data	Sample

State	ER Level IV	Station identification	Percentage class sizes			D50 in millimeters	Dominant material	Field or Historical Data	Field comments
			Gravel 2.00 - 64.0 mm	Sand 0.063 - 1.99 mm	Silt and clay < 0.062 mm				
AL	65p	02469525	-	-	-	-	Sand	Field Data	No Sample
AL	65p	02469762	-	-	-	-	Sand	Field Data	No Sample
AL	65p	02470040	-	-	-	-	Sand	Field Data	No Sample
MS	65f	02472373	0.00	96.3	3.67	0.310	Sand	Field Data	Sample
MS	65f	02472880	0.00	96.0	4.00	0.190	Sand	Field Data	Sample
MS	65p	02473260	0.00	96.0	4.00	0.330	Sand	Field Data	Sample
MS	65d	02473460	0.00	93.7	6.33	0.220	Sand	Field Data	Sample
MS	65d	02473490	0.00	96.7	3.33	0.180	Sand	Field Data	Sample
MS	65p	02474740	34.9	61.1	4.01	0.680	Sand	Field Data	Sample
MS	65d	02477492	0.00	91.6	8.45	0.127	Sand/Fines	Field Data	Sample
MS	65f	02478500	0.00	96.7	3.33	0.250	Sand	Field Data	Sample
MS	65p	02479020	1.98	98.0	0.00	0.34	Sand	Field Data	Sample
MS	65f	02479155	63.5	34.8	1.70	4.80	Gravels	Field Data	Sample
MS	65f	02479560	11.2	84.5	4.33	0.520	Sand	Field Data	Sample
AL	65f	02479945	0.837	94.9	4.30	0.350	Sand	Field Data	Sample
AL	65f	02479948	0.00	97.7	2.33	0.500	Sand	Field Data	Sample
AL	65f	02479950	0.0400	96.6	3.33	0.200	Sand	Field Data	Sample
AL	65f	02479980	4.42	89.9	5.74	0.390	Sand	Field Data	Sample
AL	65f	02480002	0.230	96.1	3.66	0.690	Sand	Field Data	Sample
MS	65f	02481510	55.6	43.6	0.822	2.70	Gravels	Field Data	Sample
MS	65i	03592800	-	-	-	-	Fines	Field Data	No Sample
TN	65e	03593005	-	-	-	-	-	-	-
TN	65e	07024300	1.44	98.6	0.00	0.290	Sand	Field Data	Sample
TN	65e	07029410	0.00	100	0.00	0.390	Sand	Field Data	Sample
TN	65e	07029425	-	-	-	-	-	-	Not Visited
TN	65e	07029500	1.00	98.0	1.00	0.392	Sand	Historical Data	Not Visited
MS	65e	07274235	1.17	95.9	2.96	0.490	Sand	Field Data	Sample
MS	65e	07274237	1.20	95.8	2.96	0.490	Sand	Field Data	Sample
MS	65e	07274245	0.00	97.3	2.67	0.310	Sand	Field Data	Sample
MS	65e	07274247	1.23	98.8	0.00	0.490	Sand	Field Data	Sample
MS	65e	07274251	0.150	96.2	3.66	0.260	Sand	Field Data	Sample
MS	65e	07274252	0.00	96.3	3.67	0.450	Sand	Field Data	Sample
MS		07277000							
MS		07282000							
MS		07282100							
VA	65m	0204228301	0.00	100	0.00	0.350	Sand	Field Data	Sample
NC	65m	0210782005	5.07	94.9	0.00	0.290	Sand	Field Data	Sample
NC	65m	0210787855	25.5	74.3	0.250	1.10	Sand	Field Data	Sample
NC	65m	0210788875	0.00	100	0.00	0.220	Sand	Field Data	Sample
NC	65m	0210789100	11.2	88.8	0.00	0.310	Sand	Field Data	Sample
NC	65m	0210789120	-	-	-	-	-	-	No Access
AL	65p	323642087541800	0.00	88.0	1.00	0.280	Sand	Historical Data	No Access
AL	65p	323653087540800	1.70	93.1	0.200	0.394	Sand	Historical Data	No Access
AL	65p	323704087542400	1.00	98.4	0.300	0.342	Sand	Historical Data	No Access
AL	65p	325645088100700	77.0	23.0	0.00	6.33	Gravels	Historical Data	No Access
MS	65p	332030088212200	82.0	18.0	0.00	8.61	Gravels	Historical Data	No Access
MS	65p	332100088224500	0.00	44.0	0.00	0.458	Sand	Historical Data	No Access
MS	65p	332112088223500	90.0	10.0	0.00	11.9	Gravels	Historical Data	No Access
MS	65p	332751088261000	6.60	92.4	0.00	0.379	Sand	Historical Data	No Access
MS	65p	332929088273300	61.0	39.0	0.00	4.70	Gravels	Historical Data	No Access