

Ecological Communications Corporation Austin, TX

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ABSTRACT

Ecological Communications Corporation (EComm) conducted biological data collection and analysis as part of an impairment verification monitoring project on the Nueces River (Segment 2104). The lower 25 miles of Segment 2104 appear on the State of Texas' 303(d) list as impaired for high aquatic life based on low dissolved oxygen concentrations previously reported by or to the Texas Commission on Environmental Quality (TCEQ) or its predecessor agencies. Due to an insufficient amount of data to support a re-assessment, this water body remained on the draft 2002 303(d) list. The objective of EComm's data assessment was to assemble enough information on the water body to support a use attainability analysis if it was determined that the designated aquatic life use was incorrect.

A separate but related assessment was simultaneously conducted by the Texas Engineering Experiment Station (TEES) and the Conrad Blucher Institute for Surveying and Science (CBI) to facilitate the objective. The TEES/CBI effort included physical and chemical data collection and analysis in an attempt to provide a comprehensive assessment of the water quality within the stream segment. As part of the overriding TMDL project (TCEQ Contract 582-4-58897), the combined biological, physical, and chemical data collection and analytical activities will result in one of four outcomes:

- 1. Removal of the water body from the 303(d) list,
- 2. An evaluation of applicable water quality standards (aquatic life use impairments only),
- 3. Development of a TMDL, or
- 4. Additional monitoring to better characterize the impairment.

Based on data collected by EComm and TEES from 2002 to 2004, this water body was found to be meeting the dissolved oxygen criteria for high aquatic life use, and will be recommended for delisting.

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2004						

1.0 INTRODUCTION

In 2000 the Texas Commission on Environmental Quality (TCEQ) initiated a study to investigate water quality impairments in 11 water bodies in Basin Groups D & E identified through the 1999 305(b) Water Quality Inventory as part of a total daily maximum load (TMDL) program. The



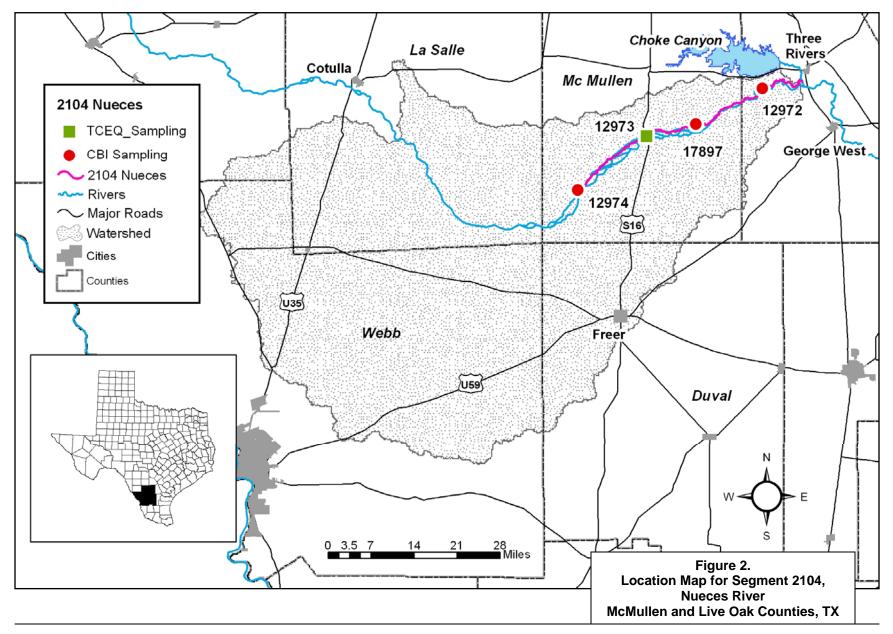
Figure 1. Station 17897

segments are included on the 1999 State of Texas Clean Water Act 303(d) list as impaired due to concentrations of dissolved oxygen or bacteria or both which exceed established criteria. One of these waterbodies was Nueces River (Segment 2104), and is included on the State's 303(d) list as impaired for its high aquatic life use designation. The impairment to this portion of Segment 2104 was caused by an exceedance of the established dissolved oxygen criteria within the lower 25 miles of the segment. As an initial phase for TMDL development, Segment 2104 was assessed to verify the aquatic life impairment using the latest sampling techniques. This initial assessment was performed so that resources within the program can be

efficiently utilized for truly impaired waterbodies, preventing TMDL development for a waterbody that may be delisted or subject to a water quality standards revision at a later date. Chemical, physical, and biological data were collected at three sites within the segment in an effort to determine what course of action, if any, needed to be taken to address impairments. Data collection activities would result in one of four outcomes:

- 1) Removal of the water body from the 303(d) list,
- 2) An evaluation of applicable water quality standards (aquatic life use impairments only),
- 3) Development of a TMDL, or
- 4) Additional monitoring to better characterize the impairment.

Segment 2104 begins at Holland Dam in central La Salle County and flows for approximately 105 miles through McMullen County into western Live Oak County, to the confluence of the Frio River. The watershed is sparsely populated and, as typical of the South Texas Brush Country, it dominated by grasses, mesquite, prickly pear cacti, and other thorny shrubs. The major land use in this watershed is agriculture. A location map of the segment is provided in Figure 2. Site 12972 is located in Live Oak County below Three Rivers at FM 1042. Site 17897 is on the private Smith lease near the southern end of Ranch Road 99 in McMullen County. Site 12974, also located in McMullen County, is located at SH 624. All three sites fall within Ecoregion 31 – Southern Texas Plains (TPWD 2002).



2.0 BIOLOGICAL AND HABITAT METHODOLOGY

Biological data (including fish, benthic macroinvertebrates, and habitat) were collected under strict interpretation of the Biological Component and Stream Physical Habitat Component

sections of the Receiving Water Assessment (RWA) Procedures Manual (Texas Natural Resource Conservation Commission [TNRCC] 1999b). As specified in the RWA manual, EComm evaluated fish sampled in accordance with statewide criteria of Indices of Biotic Integrity (IBI). Additionally, EComm generated IBI for all stations using regional criteria developed by the Texas Parks and Wildlife Department (2002). The regional criteria consider differences in landforms, soil types, vegetation, climatic conditions, and zoogeographic factors among the ecoregions and thus "provide a better representation of the



Figure 3. Station 12972

integrity of fish assemblage" as compared to statewide criteria.

Also, in addition to data collection via RWA guidelines and TCEQ Surface Water Quality Monitoring (SWQM) Procedures Manual (TNRCC 1999a), EComm captured data for 14 previously uncoded biological and habitat parameters. These parameters include: the various metrics used in determining regional IBI scores; the final scores for aquatic life use values for both statewide and regional IBI criteria; the final scores for Rapid Bioassessment Protocol (RBP) for benthic macroinvertebrates; and the final scores for Habitat Quality Indices (HQIs). All 14 parameters were assigned unique STORET codes in an effort to create maximum efficiency for data management. The new STORET codes and descriptions, along with other STORET codes captured for this segment, are provided in Table 1.

Segment 2104 had not previously been designated as a segment requiring either a Use Attainability Analysis (UAA) or an Aquatic Life Assessment (ALA). Although the main purpose of the physical/chemical component of the study was to verify the impairment, a biological sampling regime satisfying the minimum UAA data requirements was attempted for this segment to be used if it was determined that a UAA was the correct course of action. UAA requirements include at least three complete sampling events over two consecutive index periods. One event is required in the early portion (before April 30) of the Index Period (March 15 – October 15) in either Year 1 or Year 2, and the other two efforts must be conducted during the Critical Period (July 1 – September 30), including one sampling event during Year 1 and the other during Year 2. Biological sampling for Segment 2104 was conducted in September 2003 and August 2004. Consistently high flows during the study years prevented additional sampling events.

STORET Code*	Description	STORET Code	Description
89832	Number of lateral transects	90008	EPT index
89847	Average bank slope	98009	Total number of sucker species
89846	Average bank erosion potential	98010	Total number of intolerant species
89845	Percent of substrate that is gravel or larger	98016	Percent individuals as tolerants (fish)
800	Channel flow status	98017	Percent individuals as omnivores
89844	Dominant substrate	98021	Percent individuals as insectivores
89843	Total number of riffles	98022	Percent individuals as piscivores
89842	Number of poorly defined stream bends	98023	Total number of individuals in fish sample
89841	Number of moderately defined stream bends	98024	Percent individuals as hybrid
89840	Number of well defined stream bends	98030	Percent with disease
812	Statewide IBI	98003	Number of fish species
833	Habitat Quality Index	89905	Number of minutes debris was sampled
84161	Stream order	89851	Percent grass
84159	Percent instream cover	89854	Percentage tree canopy
813	Number of cyprinidae species	89859	Drainage area
814	Number of benthic invertebrates	89860	Length of reach
72052	Streambed slope	89861	Average stream width
816	Percent that are tolerant species, excluding G.affinis	89862	Average stream depth
817	Number of individuals per seine haul	89864	Maximum pool width
818	Number of individuals per minute electroshocking	89865	Maximum pool depth
819	Percentage of individuals as non-native	89866	Average width of riparian vegetation
820	Regional IBI	90010	Dominant functional feeding group percenta
832	Total RBP score	89899	Biological rpt unit
89853	Percent other as riparian vegetation	90009	Number of functional feeding groups
89839	Total number of stream bends	89906	Number of individuals in RBA sample
98008	Total number of sunfish species	89941	Seine length
90025	Percentage benthic gatherers	89943	Electrofishing method
90030	Percentage benthic filterers	89944	Electrofishing duration
90035	Percentage benthic shredders	89946	Average mesh size
90036	Percentage benthic predators	89948	Number of seine hauls
834	Percentage benthic scrapers	89950	Benthic sampling code
90042	Percentage benthic inverts individuals in dominant taxon	89961	Texas ecoregion
90050	Ratio of intolerant to tolerant taxa	89976	Area seined
90052	Number of non-insects	90007	Hilsenhoff biotic index
90054	Percentage of Elmidae	89849	Percent trees
92266	Percentage of Trichoptera that are Hydropsychidae	89867	Aesthetics
92491	Percent Chironomidae	835	Benthic invertebrate taxa richness
89850	Percent as shrubs	836	Number instream cover types
98004	Total number of darter species	89904	Minutes spent kicknetting

Table 1. STORET Codes (New STORET codes captured are temporarily assigned to the "00800" series (in italics))

* STORET Codes beginning with 8 have yet to be formally established

Benthic Macroinvertebrate Collections

Collection of benthic macroinvertebrates in the field was conducted using a 12-inch D-frame



Figure 4. Macroinvertebrate Collection

kicknet in riffle areas traveling a zigzag pattern across the bed in five-minute intervals. Intervals were repeated until the minimum sample size of 100 specimens was approached, met, or exceeded. All individuals collected within the net were transferred and stored in 70% ethanol for lab analysis and identification. The collection of all individuals within a sample assured that no biases were present for larger, more active, or otherwise more obvious species captured in the net. Most individuals were identified to genus, or as otherwise suggested by the RWA manual. Collections from sites were analyzed using the 12 metrics defined in the Rapid Bioassessment Protocol in Appendix B of the RWA manual. These metrics include parameters such as

species diversity and composition, trophic structure, and species tolerance to adverse environmental conditions.

Nekton Collections

Collection of fish in the field was conducted using both electrofishing and seine methods to ensure a representative sample was collected at each site. Electrofishing was conducted using Smith-Root LR-24 backpack electrofishing gear powered by either 7 amp-hour or 12 amp-hour 24 volt deep-cycle batteries. Each sampling team consisted of three field personnel, including a field director and two technicians. One team member served as the backpack operator while the other two flanked the operator with dip nets. Collected fish were temporarily placed in a five gallon plastic bucket partially filled with water for later identification. Sampling teams moved in an upstream direction, focusing pulses on snags, along vegetated banks, within large boulders or gravel-based riffles, and any other location most likely to contain fish. Active sampling (instances when current was applied to the water) was conducted for a minimum of 900 seconds. Field teams used best judgment to gauge if enough active sampling had been conducted to collect an accurate representation of present species; therefore, the minimum sampling time was exceeded at some sites. Maximum active sampling time for any site was approximately 1,000 seconds. Upon completion of electrofishing, fish were immediately identified, recorded, and returned to the water in order to minimize mortality. Any fish that could not be identified in the field was preserved in either formalin solution or ethanol. If more than one fish exhibiting the same characteristics could not be field identified, then only one representative specimen was preserved for later lab identification. Additionally, one individual from each field-identified species was retained as a voucher specimen.

Electrofishing collections were complemented by seining at all sites where seining was possible. A straight seine measuring 30' x 4' with 1/8" mesh was used. Six seine hauls, each approximately 10 meters long, were taken during each sampling event. Only successful seine hauls were counted. Those that encountered obstacles that could have resulted in the escape of fish (heavy snags or rocks that prevented, or otherwise significantly impaired the lead line from traveling across the bottom substrate) were not included. After each successful haul, collected specimens were identified, recorded, and immediately returned to the stream in an effort to minimize mortality. Species which could not be field-identified were handled in the manner described in the electrofishing section.

Collections were analyzed using metrics defined by TNRCC 1999 to generate Statewide IBI. Regional IBI were also calculated using the TPWD 2002 criteria. Both calculations use metrics that capture parameters such as species diversity and composition, community trophic structure, and fish abundance and condition.

Habitat Assessment

Various habitat data were collected at each site, including primary attributes (instream channel measurements), secondary attributes (stream morphology), and tertiary attributes (riparian environment) of each site. Data were used to generate a Habitat Quality Index (HQI), which serves the same function as the RBP for macroinvertebrates and IBIs for fish.



Figure 5. Station 12974

Descriptions of the various data collected are provided in Table 1.

Several subjective habitat parameters were evaluated as required by the RWA manual (TNRCC 1999). These include bank erosion potential, aesthetics, dominant types of riparian vegetation, and to a lesser degree, percent instream cover and percent gravel or larger. For the purpose of this project, EComm attempted to standardize such measurements by using the same crews for each segment during as many sampling events as possible. Because this was not always possible, and because individuals within a crew may have different duties for any given sampling event, a training session was

conducted prior to fieldwork to help ensure that all crew members were given identical background and similar interpretation of the subjective measurements.

3.0 **RESULTS**

Aquatic life use determinations were based upon scores for each of the three ecosystem components (fish, benthic macroinvertebrates, and habitat) analyzed for Segment 2104. The fish component resulted in Statewide and Regional IBI scores, the macroinvertebrate component

resulted in a RBP score, and the habitat resulted in a HQI score. The scores from each of these calculations in turn relates to a given Aquatic Life Use designation: limited, intermediate, high, or exceptional (Table 2). The Aquatic Life Use designation is used to assess existing uses according to the health of the sampled biological communities as compared to established water quality standards. The calculated scores of the Statewide IBI may fall in between two range subcategories (see ranges in Table 2). In these cases, subcategories were assigned as an intermediary between the two subcategories. For example, if a site received a Statewide IBI score of 38, it would fall between the "Limited" and "Intermediate" subcategories, and would be considered to have a "Limited-Intermediate" Aquatic Life Use subcategory.

Subcategory	Statewide IBI	Regional IBI (Region 31)	RBP	HQI
Limited	<34	<25	<22	<14
Intermediate	40-44	25-36	22-28	14-19
High	48-52	37-41	29-36	20-25
Exceptional	58-60	>41	>36	26-31

Table 2. Ranges and Subcategories for each component

Results of the biological and habitat analyses for the three sites over the two sampling events are provided in Table 3. Raw data are provided in Appendix A.

Table 3. Results of Biological and Habitat Sampling for Segment 2104, Nueces River

Event 1				
Station (region)	Statewide IBI	Regional IBI	RBP	HQI
12972 (31)	38 - Limited-Intermediate	33 - Intermediate	22 - Intermediate	18 - Intermediate
17897 (31)	40 - Intermediate	31 - Intermediate	27 - Intermediate	18 - Intermediate
12974 (31)	30 - Limited	29 - High	23 – Intermediate	17 - Intermediate
Event 2				
Station (region)	Statewide IBI	Regional IBI	RBP	HQI
12972 (31)	40 - Intermediate	37 - High	30 - High	17 - Intermediate
17897 (31)	38 - Limited-Intermediate	33 - Intermediate	31 - High	18 - Intermediate
12974 (31)	32 - Limited	35 - Intermediate	24 - Intermediate	16 - Intermediate

For each component, an average score was calculated using scores from every sampling event. Scores for sampling events for each component that scored within the subcategory "High" agreed with the designated aquatic life use value for the segment. A subcategory of "Limited", "Limited-Intermediate", "Intermediate", or "Intermediate-High" was considered substandard, as it reflects a poorer level of water quality than that for which the segment is designated. A subcategory of "Exceptional" would be considered exceeding standards for Segment 2104. Statewide IBI scores averaged approximately 36 (Intermediate-Limited) across all sites over both sampling events. This result was in poor agreement with the designated aquatic life use, which was determined as "High" (0% overall). Regional IBI scores averaged 33 for the three sites and represented a higher agreement with the standard (33%; 67% below standard). RBP scores

averaged approximately 26 (Intermediate), a 33% agreement (67% below standard), while HQI averaged 17 (Intermediate) in 0% agreement with the aquatic life use (100% below standard).

4.0 **DISCUSSION**

Average scores of all components generally reflected poor agreement with the high aquatic life use designation for Segment 2104. However, dissolved oxygen concentrations throughout the study were generally above criteria. Stream morphology and hydrology may have played a role in reducing sampling effectiveness, as the river channel is deep and is wadeable only in certain areas. Further, periods of high flow and flooding dominated the segment preceding sampling on both occasions, most likely disrupting the natural vegetative structure of the segment and temporarily dispersing local fish and benthic macroinvertebrate populations.

Segment 2104 did show some spatial and temporal variation in aquatic life use scores among and within sites. EComm is currently investigating the causes for this, but it is hypothesized that several factors may contribute, including flows, time of day, time of year, temperature, and dissolved oxygen levels.

5.0 CONCLUSION

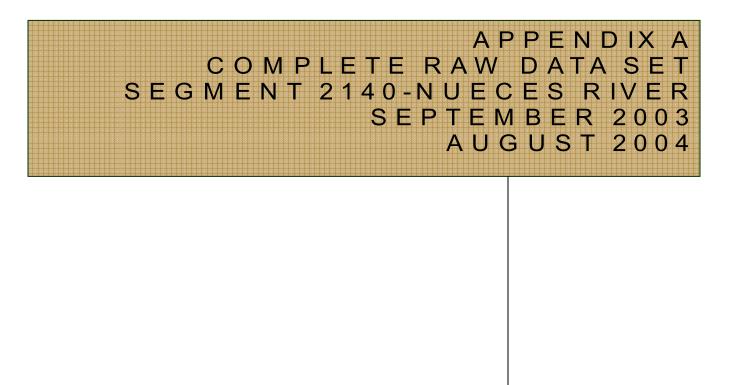
Based on the Regional IBI, RBP, and HQI scores, the biological and habitat data appear to support the conclusion that existing aquatic life uses are below the established standards, despite the acceptable dissolved oxygen levels.

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Ecological Communications Corporation Austin, TX

BIOTIC ASSESSMENT – BENTHIC MACROINVERTEBRATES

Species Lists and Preliminary Data Manipulation



Benthic Macroinvertebrates - Kick Sample (Qualitative)

Date: 9/30/03 Argia 7 6 P 0.73684210 Location: 12974 Enallagma 2 6 P 0.21052631 % Fallceon 1 4 SCR/CG 0.07017543 P 14.285714 Curicta 1 - - - SCR 27.040816 Belostoma 1 10 P 0.17543859 CG 29.591837 Hydrometrus 1 - - - FC 0 Dineutus (A) 1 5 P 0.08771929 SHR 29.081633 Tropisternus (L) 1 9 P 0.15789473 100 Cyphon (L) 39 SCR/CG/SHR - P-Predator Hydaticus (A) 1 - P - CG-Collector//Gatherer Hydaticus (A) 1 - P -	6 9 6 8 7
% Fallceon 1 4 SCR/CG 0.07017543 P 14.285714 Curicta 1 -	9 6 8 7
P 14.285714 Curicta 1 - - - - SCR 27.040816 Belostoma 1 10 P 0.17543859 CG 29.591837 Hydrometrus 1 - - - FC 0 Dineutus (A) 1 5 P 0.08771929 SHR 29.081633 Tropisternus (L) 1 9 P 0.15789473 100 Cyphon (L) 39 - SCR/CG/SHR - SCR-Scraper Hydaticus (A) 1 - P - CG-Collector/Gatherer Coptotomus (A) 1 - P -	6 8 7
SCR 27.040816 Belostoma 1 10 P 0.17543859 CG 29.591837 Hydrometrus 1 -	8 7
CG 29.591837 Hydrometrus 1 -	8 7
FC 0 Dineutus (A) 1 5 P 0.08771929 SHR 29.081633 Tropisternus (L) 1 9 P 0.15789473 100 Cyphon (L) 39 - SCR/CG/SHR - P-Predator Hydaticus (A) 1 - P - SCR-Scraper Coptotomus (A) 1 - P -	7
SHR 29.081633Tropisternus (L)19P0.15789473100Cyphon (L)39-SCR/CG/SHR-P-PredatorHydaticus (A)1-P-SCR-ScraperCoptotomus (A)1-P-	7
100Cyphon (L)39-SCR/CG/SHR-P-PredatorHydaticus (A)1-P-SCR-ScraperCoptotomus (A)1-P-	
P-PredatorHydaticus (A)1-P-SCR-ScraperCoptotomus (A)1-P-	_
SCR-Scraper CG-Collector/Gatherer CG-Collector/Gatherer	_
CG-Collector/Gatherer Coprotornus (A) 1 - P -	_
	-
FC-Filtering Collector Physella 13 9 SCR 2.05263157	9
SHR-Shredder Hyalella 26 8 CG/SHR 3.64912280	7
Paleomontes 5 4 CG/SHR 0.35087719	3
HBI-Hisenhoff Biotic Index= sum(nt/N) 57 0 14 7 4912280	
n=number of individuals of a	7
particular taxa	
t=tolerance value of that taxa	
N=total number of organisms in a sample	
Sample	
Stream: Nueces Species N= Tolerance FFG HBI	
Date: 9/29/03 Argia 1 6 P 0.05769230	8
Location: 17897 Stenonema 4 4 SCR/CG 0.15384615	
Sciencienta 4 4 500000 0.100000 0.1000000 0.1000000 0.10000000 0.10000000 0.10000000 0.10000000 0.100000000 0.100000000 0.100000000 0.100000000 0.100000000 0.100000000 0.100000000 0.100000000 0.100000000 0.100000000 0.1000000000 0.1000000000 0.1000000000 0.1000000000 0.100000000000000 0.100000000000000000000000000000000000	
P 1.9230769 Farrodes 4 2 SCR/CG 0.07692307	
SCR 30.288462 Tricorythodes 19 5 CG 0.91346153	
CG 49.519231 Isonychia 3 3 FC 0.08653846	
FC 18.269231 Cheumatopsyche 3 6 FC 0.17307692	
SHR 0 Smicridea 1 4 FC 0.03846153	
100 Berosus (L) 1 9 P 0.08653846	
Stenelmis (A) 6 7 SCR/CG 0.40384615	
Microcylloepus (L) 1 2 SCR/CG 0.01923076	
Simulium 12 4 FC 0.46153846	
Paleomontes 1 4 CG 0.03846153	
104 8.45454545 4.35576923	
Stream: Nueces Species N= Tolerance FFG HBI	
Date: 9/23/03 Enallagma 3 6 P 0.17647058	8
Location: 12972 Fallceon 31 4 SCR/CG 1.21568627	
% Caenis 32 7 CG/SCR 2.19607843	
P 11.746032 Tricorythodes 14 5 CG 0.6862745	I
SCR 36.666667 Hydrometrus	
CG 48.412698 Dineutus (L) 1 5 P 0.04901960	8
FC 2.2222222 Berosus (A) 3 9 P 0.26470588	2
SHR 0.952381 Coptotomus (A) 3 - P -	
100 Peltodytes (A) 2 8 SHR/P 0.15686274	5
Chironomidae 4 6 P/FC/CG 0.23529411	
Physella 7 9 SCR 0.61764705	
Corbicula 1 6 FC 0.05882352	9
Cambaridae 4 5 CG 0.19607843	
102 0.96153846 5.85294117	6

Benthic Macroinvertebrates - Kick Sample (Qualitative)

Stream: Nueces			Species	N=	Tolerance	FFG	HBI
Date: 8/10/2004			Argia	1	6	Р	0.081081081
Location: 12974			Hetaerina	6	6	Р	0.486486486
		%	Tricorythodes	1	5	CG	0.067567568
	Ρ	22.131148	Thraulodes	27	2	CG/SCR	0.72972973
S	SCR	20.355191	Belostoma	3	10	Р	0.405405405
	CG	34.289617	Dineutus	3	5	Р	0.202702703
	FC	4.0983607	Scirtes	26	-	SCR/CG/SHR	-
S	SHR	19.125683	Cyphon	8	-	SCR/CG/SHR	-
		100	Celina (A)	7	-	Р	-
			Laccophilus(A)	1	-	Р	-
			Laccodytes (A)	6	-	Р	-
			Palaemonetes	4	4	CG	0.216216216
			Corbicula	5	6	FC	0.405405405
			Hyalella	24	8	CG/SHR	2.594594595
		_		74	0.8974359		5.189189189
Stream: Nueces			Species	N=	Tolerance	FFG	HBI
Date: 8/11/04			Argia	4	6	P	0.184615385
-ocation: 17897			Hetaerina	2	6	P	0.092307692
		%	Erpetogomphus	1	1	P	0.007692308
	Р	5.6410256	Tricorythodes	3	5	ĊG	0.115384615
9	SCR	21.153846	Fallceon	43	4	SCR/CG	1.323076923
	CG	32.179487	Isonychia	29	3	FC	0.669230769
	FC	40.769231	Thraulodes	23	2	CG/SCR	0.030769231
q	SHR	0.2564103	Cheumatopsyche	3	6	FC	0.138461538
C		100	Smicridea	15	4	FC	0.461538462
P-Predator			Nectopsyche	1	3	SHR/CG/P	0.023076923
SCR-Scraper			Stenelmis (A)	9	7	CG/SCR	0.484615385
CG-Collector/Gatherer			Stenelmis (L)	1	7	CG/SCR	0.053846154
FC-Filtering Collector SHR-Shredder			Simulium	1	4	FC	0.030769231
Shireddei			Palaemonetes	11	4	CG	0.338461538
HBI-Hisenhoff Biotic Inc	dex=		Corbicula	5	4 6	FC	0.230769231
sum(nt/N)		-	Condicula	130	4.45405983	10	4.184615385
n=number of individuals particular taxa t=tolerance value of tha N=total number of organ sample	t taxa	a					
Stream: Nueces			Species	N=	Tolerance	FFG	HBI
Date: 8/10/04			Argia	1	6	Р	0.06
ocation: 12972			Hetaerina	3	6	Р	0.18
		%	Brechmorhoga	2	6	Р	0.12
	Ρ	16.666667	Erpetogomphus	10	1	Р	0.1
S	SCR	28.5	Tricorythodes	4	5	CG	-
	CG	33.166667	Fallceon	39	4	SCR/CG	1.56
	FC	21.666667	Isonychia	18	3	FC	0.54
S	SHR	0	Cheumatopsyche	1	6	FC	-
		100	Smicridea	2	4	FC	0.08
					7		1.26
			Stenelmis (A)	18	7	CG/SCR	1.20
			Stenelmis (A) Chironomidae	18 2	6	P/CG/FC	0.12

BIOTIC ASSESSMENT – BENTHIC MACROINVERTEBRATES

Rapid Bioassessment Protocol



Stream: Nueces Date: 9/30/03 Location: 12974	County: Live	Oak
Metric	Value	Score
1. Taxa Richness	14	2
2. EPT Taxa Abundance	1	1
3. Biotic Index (HBI)	7.49	1
4. % Chironomidae	0	1
5. % Dominant Taxon	39	2
6. % Dominant FFG	29.59183673	4
7. % Predators	14.28571429	4
8. Ratio of Intolerant:Tolerant Taxa	0.14	1
9. % of Total Trichoptera as Hydropsychidae	NoTrichoptera	1
10. # of Non-insect Taxa	3	2
11. % Collector-Gatherers	29.59183673	3
12. % of Total Number as Elmidae	0	1
Aqautic Life Use: INTERMEDIATE	Total Score:	23

Stream: Nueces Date: 9/29/03 Location: 17897	County: McMullen		
Metric	Value	Score	
1. Taxa Richness	13	2	
2. EPT Taxa Abundance	7	3	
3. Biotic Index (HBI)	4.36	3	
4. % Chironomidae	0	1	
5. % Dominant Taxon	30.18867925	3	
6. % Dominant FFG	63.61904762	1	
7. % Predators	11.74285714	4	
8. Ratio of Intolerant:Tolerant Taxa	4.1	3	
9. % of Total Trichoptera as Hydropsychidae	100	1	
10. # of Non-insect Taxa	1	1	
11. % Collector-Gatherers	49.51923077	1	
12. % of Total Number as Elmidae	6.603773585	4	
Aqautic Life Use: INTERMEDIATE	Total Score:	27	

Stream: Nueces Date: 9/23/03 Location: 12972	County: McMu	ıllen
Metric	Value	Score
1. Taxa Richness	13	2
2. EPT Taxa Abundance	3	1
3. Biotic Index (HBI)	5.85	1
4. % Chironomidae	3.773584906	4
5. % Dominant Taxon	30.18867925	3
6. % Dominant FFG	63.61904762	1
7. % Predators	11.74285714	4
8. Ratio of Intolerant:Tolerant Taxa	0.96	1
9. % of Total Trichoptera as Hydropsychidae	NoTrichoptera	1
10. # of Non-insect Taxa	3	2
11. % Collector-Gatherers	48.40952381	1
12. % of Total Number as Elmidae	0	1
Aqautic Life Use: INTERMEDIATE	Total Score:	22

Stream: Nueces Date: 8/10/04 Location: 12974	County: Live	Dak
Metric	Value	Score
1. Taxa Richness	14	2
2. EPT Taxa Abundance	2	1
3. Biotic Index (HBI)	5.19	2
4. % Chironomidae	0	1
5. % Dominant Taxon	22.13114754	4
6. % Dominant FFG	34.28688525	4
7. % Predators	22.13114754	3
8. Ratio of Intolerant:Tolerant Taxa	0.9	1
9. % of Total Trichoptera as Hydropsychidae	NoTrichoptera	1
10. # of Non-insect Taxa	3	2
11. % Collector-Gatherers	34.28688525	2
12. % of Total Number as Elmidae	0	1
Aqautic Life Use: INTERMEDIATE	Total Score:	24

Stream: Nueces Date: 8/11/04 Location: 17897	County: McMu	illen
Metric	Value	Score
1. Taxa Richness	15	3
2. EPT Taxa Abundance	7	3
3. Biotic Index (HBI)	4.18	3
4. % Chironomidae	0	1
5. % Dominant Taxon	33.07692308	2
6. % Dominant FFG	40.76923077	3
7. % Predators	5.615384615	4
8. Ratio of Intolerant:Tolerant Taxa	4.45	3
9. % of Total Trichoptera as Hydropsychidae	94.73684211	1
10. # of Non-insect Taxa	2	2
11. % Collector-Gatherers	32.17692308	2
12. % of Total Number as Elmidae	7.692307692	4
Aqautic Life Use: HIGH	Total Score:	31

Stream: Nueces Date: 8/10/04 Location: 12972	County: McM	ullen
Metric	Value	Score
1. Taxa Richness	11	2
2. EPT Taxa Abundance	5	2
3. Biotic Index (HBI)	4.02	3
4. % Chironomidae	2	4
5. % Dominant Taxon	39	2
6. % Dominant FFG	33.16	3
7. % Predators	16.67	3
8. Ratio of Intolerant:Tolerant Taxa	2.7	2
9. % of Total Trichoptera as Hydropsychidae	33.33333333	3
10. # of Non-insect Taxa	0	1
11. % Collector-Gatherers	33.16	2
12. % of Total Number as Elmidae	18	3
Aqautic Life Use: HIGH	Total Score:	30

BIOTIC ASSESSMENT – FISH

Species Lists and Preliminary Data Manipulation



FISH COLLECTED

Stream: Nueces	Species	N=	Туре	Method	Tolerance	Trophic Gp.
Date: 9/23/03	Bluegill	3	SF	Е	Т	IF
Location: 12972	Bullhead Minnow	5	CY	Е		IF
	Gizzard Shad	3		Е	Т	0
	Green Sunfish	11	SF	Е	Т	Р
	Lepomis sp.	5	SF	Е		
* 1 RGC with infection	Longear Sunfish	5	SF	Е		IF
	Rio Grande Cichlid	2		Е		IF
	Sailfin Molly	5		Е	Т	0
	Texas Shiner	1	CY	Е		IF
	Warmouth	5	SF	Е	Т	Р
	Western Mosquitofish	21		Е	Т	IF
		66			48	37
Stream: Nueces	Species	N=	Туре	Method	Tolerance	Trophic Gp.
Date: 9/30/03	Bluegill	2	SF	E	Т	IF
Location: 12974	Western Mosquitofish	4		E	Т	IF
		6				
Stream: Nueces	Species	N=	Туре	Method	Tolerance	Trophic Gp.
Date: 9/30/03	Bluegill	6	SF	Е	Т	IF
Location: 17897	Bullhead Minnow	4	CY	Е		IF
	Channel Catfish	1		Е	Т	0
	Green Sunfish	5	SF	Е	Т	Р
	Lepomis sp.	1	SF	S		-
	Longear Sunfish	17	SF	Е		IF
	Longear Sunfish	1	SF	S		IF
	Mexican Tetra	1		S		IF
	Red Shiner	69	CY	Е	Т	IF
	Red Shiner	47	CY	S	Т	IF
	Rio Grande Cichlid	4		Е		IF
	Sailfin Molly	7		Е	Т	0
	Sailfin Molly	17		S	т	0
	Western Mosquitofish	7		Е	Т	IF
	Western Mosquitofish	79		S	Т	IF
		266		146	152	235

FISH COLLECTED

Stream: Nueces	Species	N=	Туре	Method	Tolerance	Trophic Gp.
Date: 8/10/04	Amazon Molly	2		S		0
Location: 12972	Bullhead Minnow	15	CY	Е		IF
	Bullhead Minnow	37	CY	S		IF
	Channel Cat	3		Е	Т	0
	Channel Cat	1		S	Т	0
	Gizzard Shad	1		S	Т	0
	Green Sunfish	3	SF	Е	Т	Р
	Longear Sunfish	4	SF	Е		IF
	Longear Sunfish	1	SF	S		IF
	Red Shiner	4	CY	Е	т	IF
	Red Shiner	71	CY	S	Т	IF
	Sailfin Molly	4		Е	Т	0
	Sailfin Molly	2		S	Т	0
	Texas Shiner	5	CY	S		IF
	Warmouth	2	SF	Е	т	Р
	Western Mosquitofish	53		S	Т	IF
	Western Mosquitofish	34		Е	Т	IF
		242				
Stream: Nueces	Species	N=	Туре	Method	Tolerance	Trophic Gp.
Date: 8/10/04	Bluegill	2	SF	Е	Т	IF
Location: 12974	Western Mosquitofish	5		Е	Т	IF
	Green Sunfish	2	SF	Е	Т	Р
	Green SF x Warmouth	1	SF	Е	Т	Р
	Warmouth	5	SF	Е	Т	Р
	Bullhead Catfish	1		V		0
	Gar	1		V	Т	Р
	Cyrprinid 1	2	CY	Е		IF
	Cyprinid 2	2	CY	Е		IF
		21				
Stream: Nueces	Species	N=	Туре	Method	Tolerance	Trophic Gp.
Date: 8/11/04	Bullhead Minnow	1	CY	S		IF .
Location: 17897	Dulling a d Mile a sur					
	Bullhead Minnow	16	CY	Е		IF
			CY		т	
	Channel Catfish	4	-	Е	т т	IF O P
	Channel Catfish Green Sunfish		SF	E E		0
	Channel Catfish Green Sunfish Green SF x Bluegill	4 3 1	SF SF	E E E	Т	0 P -
	Channel Catfish Green Sunfish Green SF x Bluegill Longear Sunfish	4 3 1 1	SF	E E E	Т	O P - IF
	Channel Catfish Green Sunfish Green SF x Bluegill Longear Sunfish Flathead Catfish	4 3 1 1	SF SF	E E E E	Т	O P IF P
	Channel Catfish Green Sunfish Green SF x Bluegill Longear Sunfish Flathead Catfish Mexican Tetra	4 3 1 1 1 4	SF SF SF	E E E E E	T T	O P IF P
	Channel Catfish Green Sunfish Green SF x Bluegill Longear Sunfish Flathead Catfish Mexican Tetra Red Shiner	4 3 1 1 4 8	SF SF SF CY	E E E E E	т т	O P IF IF IF
	Channel Catfish Green Sunfish Green SF x Bluegill Longear Sunfish Flathead Catfish Mexican Tetra Red Shiner Red Shiner	4 3 1 1 4 8 1	SF SF SF CY CY	E E E E E S	T T	O P IF IF IF
	Channel Catfish Green Sunfish Green SF x Bluegill Longear Sunfish Flathead Catfish Mexican Tetra Red Shiner Red Shiner Texas Shiner	4 3 1 1 4 8 1 6	SF SF SF CY	E E E E S S	т т т	O P IF IF IF IF
	Channel Catfish Green Sunfish Green SF x Bluegill Longear Sunfish Flathead Catfish Mexican Tetra Red Shiner Red Shiner Texas Shiner Sailfin Molly	4 3 1 1 4 8 1 6 2	SF SF SF CY CY	E E E E S S E	T T T T	O P IF IF IF IF O
	Channel Catfish Green Sunfish Green SF x Bluegill Longear Sunfish Flathead Catfish Mexican Tetra Red Shiner Red Shiner Texas Shiner Sailfin Molly Sailfin Molly	4 3 1 1 4 8 1 6 2 39	SF SF SF CY CY CY	E E E E E S S E S	т т т	O P IF IF IF IF O O
	Channel Catfish Green Sunfish Green SF x Bluegill Longear Sunfish Flathead Catfish Mexican Tetra Red Shiner Red Shiner Texas Shiner Sailfin Molly Sailfin Molly Darter	4 3 1 1 4 8 1 6 2 39 1	SF SF CY CY CY D	E E E E E S S E S E	T T T T	O P IF IF IF IF O
	Channel Catfish Green Sunfish Green SF x Bluegill Longear Sunfish Flathead Catfish Mexican Tetra Red Shiner Texas Shiner Sailfin Molly Sailfin Molly Darter Sucker	4 3 1 4 8 1 6 2 39 1 1	SF SF SF CY CY CY	E E E E E S S E S E E	т т т т т	O P IF F IF IF O O IF -
	Channel Catfish Green Sunfish Green SF x Bluegill Longear Sunfish Flathead Catfish Mexican Tetra Red Shiner Red Shiner Texas Shiner Sailfin Molly Sailfin Molly Darter	4 3 1 1 4 8 1 6 2 39 1	SF SF CY CY CY D	E E E E E S S E S E	T T T T	O P IF IF IF IF O O

BIOTIC ASSESSMENT – FISH

Indices of Biotic Integrity – Statewide Criteria



Quantitative Biological Scoring for Evaluating Aquatic Life Use Subcategories Based on Fish - Statewide Criteria

Stream: Nueces	Date: 9/23/03	Location: 12972		County: Live Oa	ak
Category		Metric		Value	Score
Species Richness and Composition	1. Total # of fish speci	es		11	3
	2. Number of darter sp	pecies		0	1
	3. Number of sunfish s	species (exc. bass)		5	5
	4. Number of sucker s	pecies		0	1
	5. Number of intoleran	5. Number of intolerant species		0	1
	6. Percentage of indiv	iduals as tolerants		78.68852459	1
	7. Percentage of indiv	iduals as omnivores		13.1147541	5
Trophic Composition	8. Percentage of indiv	iduals as insectivores		60.6557377	3
	9. Percentage of indiv	iduals as piscivores		26.2295082	5
	10. Number of individu	uals in sample		66	3
Fish Abundance and Condition	11. Percentage of individuals as hybrids			0	5
12. Percentage of ind		viduals with disease/anomolies		0	5
	Aquatic Life Use: LIMI	TED-INTERMEDIATE		Total Points:	38

Stream: Nueces	Date: 9/30/03	Location: 12974		County:McMulle	en
Category		Metric		Value	Score
Species Richness and Composition	1. Total # of fish specie	S		2	1
	2. Number of darter spe	ecies		0	1
	3. Number of sunfish sp	becies (exc. bass)		1	3
	4. Number of sucker sp	ecies		0	1
	5. Number of intolerant	5. Number of intolerant species		0	1
	6. Percentage of individ	luals as tolerants		100	1
	7. Percentage of individ	luals as omnivores		0	5
Trophic Composition	8. Percentage of individ	luals as insectivores		100	5
	9. Percentage of individ	luals as piscivores		0	1
	10. Number of individua	als in sample		6	1
Fish Abundance and Condition	11. Percentage of individuals as hybrids			0	5
	12. Percentage of individuals with disease/anomolies		0	5	
	Aquatic Life Use: LIMIT	ED		Total Points:	30

Stream: Nueces	Date: 9/30/03	Location: 17897	County: McMul	len
Category		Metric	Value	Score
Species Richness and Composition	1. Total # of fish species		11	3
	2. Number of darter spec	ies	0	1
	3. Number of sunfish spe	ecies (exc. bass)	4	5
	4. Number of sucker spe	cies	0	1
	5. Number of intolerant s	5. Number of intolerant species		1
	6. Percentage of individu	als as tolerants	89.81132075	1
	7. Percentage of individu	als as omnivores	9.433962264	5
Trophic Composition	8. Percentage of individu	als as insectivores	88.67924528	5
	9. Percentage of individu	als as piscivores	1.886792453	3
	10. Number of individuals	s in sample	266	5
Fish Abundance and Condition	11. Percentage of individ	uals as hybrids	0	5
	12. Percentage of individ	uals with disease/anomolies	0	5
	Aquatic Life Use: INTER	MEDIATE	Total Points:	40

Quantitative Biological Scoring for Evaluating Aquatic Life Use Subcategories Based on Fish - Statewide Criteria

Stream: Nueces	Date: 8/10/04	Location: 12972	County: Live Oa	ak
Category	Metric		Value	Score
Species Richness and Composition	1. Total # of fish spe	ecies	11	3
	2. Number of darter	species	0	1
	3. Number of sunfis	h species (exc. bass)	3	5
	4. Number of sucke	r species	0	1
	5. Number of intoler	ant species	0	1
	6. Percentage of inc	lividuals as tolerants	73.55371901	1
	7. Percentage of inc	lividuals as omnivores	5.371900826	5
Trophic Composition	8. Percentage of inc	lividuals as insectivores	92.56198347	5
	9. Percentage of inc	lividuals as piscivores	2.066115702	3
	10. Number of indivi	iduals in sample	242	5
Fish Abundance and Condition	11. Percentage of in	ndividuals as hybrids	0	5
	12. Percentage of individuals with disease/anomolies		0	5
	Aquatic Life Use: N	TERMEDIATE	Total Points:	40

Stream: Nueces	Date: 8/10/04	Location: 12974		County: McMull	en
Category		Metric		Value	Score
Species Richness and Composition	1. Total # of fish species	3		9	3
	2. Number of darter spe	cies		0	1
	3. Number of sunfish sp	ecies (exc. bass)		4	5
	4. Number of sucker spe	ecies		0	1
	5. Number of intolerant	5. Number of intolerant species			1
	6. Percentage of individu	6. Percentage of individuals as tolerants			1
	7. Percentage of individu	uals as omnivores		4.761904762	5
Trophic Composition	8. Percentage of individu	uals as insectivores		52.38095238	3
	9. Percentage of individu	uals as piscivores		42.85714286	5
	10. Number of individua	ls in sample		21	1
Fish Abundance and Condition	11. Percentage of individ	duals as hybrids		4.761904762	1
	12. Percentage of individ	duals with disease/anomolies		0	5
	Aquatic Life Use: LIMITE	ED		Total Points:	32

Stream: Nueces	Date: 8/11/04	Location: 17897	County: McMull	en
Category	Metric		Value	Score
Species Richness and Composition	1. Total # of fish species	3	14	3
	2. Number of darter spe	cies	1	3
	3. Number of sunfish sp	ecies (exc. bass)	3	5
	4. Number of sucker sp	ecies	1	3
	5. Number of intolerant	5. Number of intolerant species		1
	6. Percentage of individ	uals as tolerants	73.7704918	1
	7. Percentage of individ	uals as omnivores	38.33333333	3
Trophic Composition	8. Percentage of individ	uals as insectivores	58.33333333	3
	9. Percentage of individ	uals as piscivores	3.333333333	3
	10. Number of individua	ls in sample	120	3
Fish Abundance and Condition	11. Percentage of indivi	duals as hybrids	0.819672131	3
	12. Percentage of individuals with disease/anomolies		0	5
	Aquatic Life Use: LIMIT	ED-INTERMEDIATE	Total Points:	38

BIOTIC ASSESSMENT – FISH

Indices of Biotic Integrity – Regional Criteria



1*

Stream: Nueces (31) Date: 9/23/03 Location: 12972	County: Live Oa	k
Metric	Value	Score
1. Total # of fish species	11	3
2.Total Number of cyprinid species	2	1
3. Number of benthic species	0	1
4. Number of sunfish species (exc. bass)	5	5
5. Percentage of individuals as tolerants (exc. G.affinis)	36.06557377	3
6. Percentage of individuals as omnivores	13.1147541	3
7. Percentage of individuals as insectivores	60.6557377	3
8. Percentage of individuals as piscivores	26.2295082	5
9. Number of individuals in sample		~
a. Number of individuals/seine hual	0	1
b. Number of individuals/min. electroshocking	4.4	3
10. Percentage of individuals as non-native species	0	5
11. Percentage of individuals with disease/anomolies	1.515151515	1
Aquatic Life Use: INTERMEDIATE	Total Points:	33

*Based solely on electroshocking score

Drainage area upstream of Station 12972 = 22,463 sq. km.

Stream: Nueces (31) Date: 9/30/03 Location:12974	County: McMulle	en
Metric	Value	Score
1. Total # of fish species	2	1
2.Total Number of cyprinid species	0	1
3. Number of benthic species	0	1
4. Number of sunfish species (exc. bass)	1	1
5. Percentage of individuals as tolerants (exc. G.affinis)	33.33333333	3
6. Percentage of individuals as omnivores	0	5
7. Percentage of individuals as insectivores	100	5
8. Percentage of individuals as piscivores	0	1
9. Number of individuals in sample		~
a. Number of individuals/seine hual	0	1
b. Number of individuals/min. electroshocking	0.4	1
10. Percentage of individuals as non-native species	0	5
11. Percentage of individuals with disease/anomolies	0	5
Aquatic Life Use: INTERMEDIATE	Total Points:	29

*Based solely on electroshocking score

Drainage area upstream of Station 12974 = 20,555 sq. km.

Stream: Nueces (31) Date: 9/30/03 Location: 17897	County: McMulle	en
Metric	Value	Score
1. Total # of fish species	11	3
2.Total Number of cyprinid species	2	1
3. Number of benthic species	1	1
4. Number of sunfish species (exc. bass)	4	3
5. Percentage of individuals as tolerants (exc. G.affinis)	57.35849057	1
6. Percentage of individuals as omnivores	9.433962264	3
7. Percentage of individuals as insectivores	88.67924528	5
8. Percentage of individuals as piscivores	1.886792453	1
9. Number of individuals in sample		~
a. Number of individuals/seine hual	24.33333333	3
b. Number of individuals/min. electroshocking	8	3
10. Percentage of individuals as non-native species	0	5
11. Percentage of individuals with disease/anomolies	0	5
Aquatic Life Use: INTERMEDIATE	Total Points:	31

*Average of 9a and 9b

Drainage area upstream of Station 17897 = 21,886 sq. km.

Stream: Nueces (31) Date: 8/10/04 Location: 12972	County: Live Oa	k
Metric	Value	Score
1. Total # of fish species	11	3
2.Total Number of cyprinid species	3	3
3. Number of benthic species	1	1
4. Number of sunfish species (exc. bass)	3	3
5. Percentage of individuals as tolerants (exc. G.affinis)	37.60330579	3
6. Percentage of individuals as omnivores	5.371900826	5
7. Percentage of individuals as insectivores	92.56198347	5
8. Percentage of individuals as piscivores	2.066115702	1
9. Number of individuals in sample		~
a. Number of individuals/seine hual	28.83333333	3
b. Number of individuals/min. electroshocking	4.6	3
10. Percentage of individuals as non-native species	0	5
11. Percentage of individuals with disease/anomolies	0	5
Aquatic Life Use: HIGH	Total Points:	37

1*

*Average of 9a and 9b

Drainage area upstream of Station 12972 = 22,463 sq. km.

Stream: Nueces (31) Date:8/10/04 Location:12974	County: McMulle	en
Metric	Value	Score
1. Total # of fish species	9	3
2.Total Number of cyprinid species	2	1
3. Number of benthic species	1	1
4. Number of sunfish species (exc. bass)	4	3
5. Percentage of individuals as tolerants (exc. G.affinis)	52.38095238	1
6. Percentage of individuals as omnivores	4.761904762	5
7. Percentage of individuals as insectivores	52.38095238	3
8. Percentage of individuals as piscivores	42.85714286	5
9. Number of individuals in sample		~
a. Number of individuals/seine hual	0	1
b. Number of individuals/min. electroshocking	1.4	1
10. Percentage of individuals as non-native species	0	5
11. Percentage of individuals with disease/anomolies	0	5
Aquatic Life Use: INTERMEDIATE	Total Points:	33

*Based solely on electroshocking score

Drainage area upstream of Station 12974 = 20,555 sq. km.

Stream: Nueces (31) Date: 8/11/04 Location: 17897	County: McMulle	en		
Metric	Value	Score		
1. Total # of fish species	14	5		
2.Total Number of cyprinid species	3	3		
3. Number of benthic species	3	5		
4. Number of sunfish species (exc. bass)	3	3		
5. Percentage of individuals as tolerants (exc. G.affinis)	48.76033058	3		
6. Percentage of individuals as omnivores	38.33333333	1		
7. Percentage of individuals as insectivores	58.33333333	3		
8. Percentage of individuals as piscivores	3.333333333	1		
9. Number of individuals in sample		~		
a. Number of individuals/seine hual	13.33333333	1		
b. Number of individuals/min. electroshocking	2.8	1		
10. Percentage of individuals as non-native species	0	5		
11. Percentage of individuals with disease/anomolies	0	5		
Aquatic Life Use: INTERMEDIATE	Total Points:	35		

*Average of 9a and 9b

Drainage area upstream of Station 17897 = 21,886 sq. km.

HABITAT ASSESSMENT

Part I – Stream Physical Characteristics Worksheet



		50m down	C Q	Location of Transect	whome be	C		Location of Transect	Table B-12. Part 1. St Observers: <u>TN MS</u> Date: Stream: <u>Nucce</u> Location Stream Segment No.:_ Obse Stream Type (Circle One): <u>p</u> Channel Obstructions/Modif Riparian Vegetation (%): Left Bank: Trees_ Right Bank: Trees_
		- 3		* e	bend			f of	B-12. Part 1. Stream. B-12. Part 1. Stream. Stream No.:_ Date <u>9123</u> Stream No.:_ Observed Str Structions/Modifications: Destructions/Modifications: Vegetation (%): Left Bank: Trees_ Shrubs Right Bank: Trees_ Shrubs
Abundant Co Rare Absent	Algne or Macrophytes	Habitat Type-(Circle One) Riffie Run Glitle Pool	ANT -	Stream Width (m)	Algae or Macrophytes (Circle One) Abundant Common Rarfe Absent	Habitat Type (Circle One) Riffle Run Glide Pool	11.9.	Stream Width (m)	rt 1. Stream Physica Date: 1/23 Phine: We Location of site: We Location of site: We Cone) (perenuia) or intern s/Modifications: Trees_Shrubs_Grasses, t: Trees_Shrubs_Grasses,
Common	crophytes	Circle	1000	Left Bank Slope (*)	orophytes	Run	20°	Left Bank Slope	hysical Chai 12:30 :Weather cor :Weather cor :No. of F Grasses, ForbsNo. of F
LB: RB:	Wldth of Natural Buffer	Dontinant Substrate Type	90	Left Bank Erosion Potential (%)	Width of Natural Buffer Vegetation (m) LB: RB;	Dominant Substrate Type	So	Left Bank Erosion Potential (%)	Stream Physical Characteristics Worksheet Part I - Stream nee <u>flas</u> Time:Weather conditions: tion of site: <u></u> Length of stream reach: <u></u> bserved Stream Uses: <u></u> Aesthetics (circle one): (1) v (perennia) or intermittent w/ perennial pools Stream Be difications:No. of Riffles: Channel Flow Statt sNo. of Riffles: Channel Flow Statt difications:No. of Riffles: Channel Flow Statt
6	l Buffer	Substrate Type	1,04 1,24 1,	D AD Thalweg Depth:		nte Type	1.461.40 1	D AV Thalweg Depth:	Worksheet Worksheet urt I - Stream Pl
overhans, ves, rours, snass		Dominant Types Riparlan Vegetation: Left Bank: 30 the 30 shrub 50 Right Bank: 30 the 30 shrub 40	121 021 021 021 101 101 101 101 10	Stream Depths (m) at Points Across Transect Depth:	Instream Cover Types: Orerhang res. snow	Dominant Types Riparian Vegetation: Left Bank: 30 Yree 10 Strub 50 Co Right Bank: 15 Yree 15 Strub 50 Co	1,40 1.ac 1.05.82 ,79 ,76 ,76 ,70	Stream Depths (m) at Points Across Transect Depth:	Table B-12. Part 1. Stream Physical Characteristics Worksheet Part I - Stream Physical Characteristics Worksheet Observers: IN MB_ Date: [123] Thre: Wenther conditions: Stream: Mac Location of site: [277.2] Length of stream reach: Stream Segment No.: Observed Stream Uses: Aesthetics (circle one): (1) whiderness (2) matural (3) common (4) offensive Stream Type (Circle One): perennial or intermittent w/ perennial pools Stream Bends: No. Well Defined_ ; No. Moderately Defined_ ; No. Poor Channel Obstructions/Modifications: No. of Riffies: Channel Flow Status (circle one): high moderate low no flow Riparian Vegetation (%): Left Bank: Trees_ Shrubs_ Grasses, Forbs_ Cult, Fields_ Other
250	rel, where le	stack 10 atus	14 45	Right Bank Slope	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Forber au other	,20 600	Right Bank Slope	. No. Poorly Defined_
206	% Instream Cover	% Gravel or Larger	of	Right Bank Erosion Potential (%)	% Instream Cover	% Gravel or Larger	35	Right Bank Érosion Potential (%)	- Il (well defined)
	Ŧ	. <u>6</u>	105/17	Тгее Сапору (%)		H	L1/5'01	Tree Canopy (%)	Fixed)

20 M S 5 3 50m dows 54 mag From U3 50m U2 thom uu PIPEline Location of Transect Location of Transect Transect Location of Transect Sow down Habitat Type (Sircle One) Riffle Run Glide Pool Algae or Macrophyles (Chele One) . Abundant Common (Rare Absent Algae or Macrophytes (Circle One) Abardant Common Rare Absent Algae or Macrophytes (Clicle One) Abundant Common Rare Absent Abundant Common Rare Absent Habitat Type tokele One) Riffle Run Glide Pool Glide Pool Algae or Macrophytes (Circle One) 2.5 Habitat Type (Circle One) Riffle Run Glide Pool Vyjdili (mt) 149 Shreann Wildth (m) Stream Width (m) 4 Stream) Width (m) on on 100 Len Bank Slope 8 Left Slope Left Bank Slope Bank Slope | Bank Erosion Potential || (%) Width of Natural Buffer Vegetation (m) LB: O RB: O Width of Natural Buffer Vegetation (m) LB: RB: 73-0 Wildth of Nanual Buffer Vegetation (m) LB: >>BB: >>> Left Bank Brosion Potential (%) Width of Natural Buffer Vegetation (191) LB: RB: Left Bank Eroston Potential (%) Left Bank Brosion Potential (%) Dominant Substrate Type Dominant Substrate Type Dominant Substrate Type Dominant Substrate Type go 20 \$ 5 Sravel bedrack SPANEL 7 0.20 8 0.65 1.11 5 5 1.16 Thalweg Depth Thalweg Depth: Finlweg Depth halweg JL, 3 Depth Instream Cover Types: Instream Cover Types: Instream Cover Types: Instream Cover Types: JI 563 5 3 Dominunt Types Riparlan Vegetalion: Left Bauk: 75 SverSS 25 ofter Stream Depths (n) at Paints Across Transect Right Bank: Snass Right Bank: Dominant Types Ripartian Vegetation: Left Bank: 00 typel 00 500 rws Strenun Depths (111) at Points Across Transect Right Bank: 20 tree Doulnant Types Riparian Verention: Left Bank: 20 Free 5 Shrwb Stream Depths (m) at Points Across Transect Dominant Types Riparian Vegetation: Left Bank: Right Bank: 75 Stass Stream Depths (m) at Points Across Transect 196 00 bh'i QS'I Ch'I Le'I Cravel 22 J. MACTO, Chernan's overhans veri sinai a Trace .90 20 Colopie, 10 shrub 5 Shilino 25-25 attor 26 Stewe Vers. 12. 45° 1.6) 600 Macro, snass Saveron on 220 USCS 1.60 30 Prides 50 Ŋ roots 200 é cé 04 2004 400 w w Right Hank Slope Bank Slope Right Balik Slope 50 Right Bank Slope T. 10. S C あい Right Bank Erosion Potential (%) Se Gravel or Lauger Right Bank Erosion Potential (%) & Gravel or Larger Right Bank Broslon Potential (%) & Gravel or Larger Right Bank Erosion Potential (3-) The Instrumin Cover % Instream Cover % Insuream Cover The Oravel or Larger & Instream Cover 10 50% 4000 0 di O 10%0 0 O 0 d Canopy ((%) 2 5/17 Tree Canopy (%) Tree Canopy (%) Tree Canopy (%) C

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Location of	Riparian Vegenuion (%): Left Bauk: Trees_ Shrubs_ Grasses, Forbs_ Cult, Fields_ Other_ Right Bank: Trees_ Shrubs_ Grasses, Forbs_ Cult, Fields_ Other_	Channel Obstructions/Modifications:_	Stream Type (Circle One):	Stream Segment No .: Observed Stream Uses:	Stream: Nickey Location of site: 12974 Length of stream reach: 450	Deservers: JWMB Date: 1/30/03 91:30 cum Pa	Table B-12. Part 1. Stream Physical Characteristics Worksheet	121	
Strenn	Shrubs Gi s Shrubs (lifications:	perennial or i	served Stream	ion of site: 120	e: 9/30/07 91	Stream Phy	12/26/03	
Left	rasses, Foi Grasses, Fi	No.	intermitte	Uses:	974 Lei	Weathe	vsical C		
Left	orbs_ Cult, Fields orbs_ Cult, Field	of Riffles: Ch	nt w/ peremial j	Aesthetics (ngth of stream rea	P: r conditions:	haracteristic.	er en se	
	Cother	No. of Riffles: Channel Flow Status (circle one): high moderate low no flow	Stream Type (Circle One): perenuial or intermittent w/ perennial pools Stream Bends: No. Well Defined_; No. Moderately Defined_; No. Poorly Defined_	Aesthetics (circle one): (1) wilderness (2) natural (3) common (4) offensive	neh: 450	Part I - Stream Physical Characteristics Worksheet	s Worksheet		
Dialit			orly Defined_					bend -	0001
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Location of Transect	250 m UP Carele One) Errom bridge Abundant Co Rare Absent	atsnas		Location of Transect	
Stream Width	Algae or Macrophytes (Circle One) Abundant Common Rare Absent	Habitat Type (Circle One) RdHte Run Glide Pool	9,65	Stream Width (m)	
Left Bank	rophytes	(Circle	22	Left Bauk Slope	- 100001 +
Left Bank Eroslon	Width of Natural Buffer Vegetation (m) LB: RB: >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	Dominant Substrate Type	95	Left Bank Erosion Potential (%)	Curi vion
GI'I	1 Buffer	at Substrate Type	185: HO.	(.0 Thalweg Depth:	
5 Stream Depths (m) at Points Across Transect	Instream Cover Types: MARUND , 150ACS	Dominant Types Riparian Vegetation: Left Bank: 20 tree 30 Shrub 30grass 200th Right Bank: 5 tree 30 grass 15 street	1.04 1.20 1.50 1.55 1.401.34 1.30 1.04 1.12	Stream Depths (m) at Points Across Transect Depth:	
Right Bank		(113)	50	Right Bank Slope (?)	
Right Bank Erosion	% Instream Cover 30	% Gravel or Larger	35	t Right Bank Erosion Porential (%)	
Тгее Салору		E F	רוה	Tree Canopy (%)	
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NHUM down	all un clowin		Location of Transect	Erom bridge Abundant Common
Algae or Macrophytes (Chrole One). Abundant Common Rare(Absent	Habitat Type (Circle One) 141114 Run Glidk Pool	12.25	Stream Width (m)	Abundant Co Rare Absent
rophytes ວາງນາງວກ	(Clicle	08	Left Bank Slope	nomuto
Width of Natural Buffer Vegetation (m) LB:>26	Donuinant Substrate Type	35	Left Bank Eroslon Potential (%)	LB. RB. 320
ıl Buffer	rate Type	106,60 1.40 2,0 2,10 2,101,48 1.24.	L.V. Thalweg I	6
Listrean		1.40	L.V Thalweg Depth:	
Instream Cover Types:	Dominant ? Left Bank: Right Bank	2,02,1	Stream Dep	Marr
55 1.40	Fypes Riparia	0/2,10	ths (m) at Po	Mauro, snass
over Types: SMass leaf pall,	Dominant Types Riparlan Vegetation: Left Bank: 5 free 15 shrwb Right Bank: 0 free 10 shrwb	1.48 1.2	Stream Depths (m) at Points Across Transect	Ś
	0 0	14,90	fransect	
artificial, overhans	no cruss 2000me	,90 ,54 ,06		
verhans	Sotre	45	Right Bank Slope (^)	
% Instream Cover	% Gravel or Larger	36	Right Bank Erosion Potential (%)	30
, E	6et:	11/17	Тгее Сапору (%)	

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KAPW CO	Som down	06	Location of Transect	from U-1	gom down	Ń	Location of Transteet	Tom US	m cho		Location of Transect	CO MON	go m down	U3	Location of Transect
Algae or Macrophytes (Circle One) Abuydant Common Rang Absen)	Habitat Type (Circle One) Bittle Run Glide Pool	15,0 1	Stream) Width (m)	Algae or Macrophytes (Circle One) Abuudant Comman Rare Absent	Habitat Type (Circle One) Ruifle Run Glide Pool	10,95 2	Stream Width (m)	Algae or Macrophyles (Clicle One) Abundant Sommon Rare Absen)	Habitat Type (Circle One) Anthe Itun Gilide Pool	11.2	23	Algae or Maarophytes (Clicle One) Algandian Common Ruce Absent	Habitat Type (Circle One) Riffe Run Glide Peol	12.3 7	Sheann Veidilt S
ohytes imou	ircle	00	Left Bank Slope	1	rcle	50	Left Bank Slope (~)	hytes mon	rele	TV I	Left Bank Slope	 hytes	rcle	T	Len Bank Slope (*)
Width of Natural Buffer Vegetation (m) LB: >2.0	Dominant Substrate Type 5117	-95	Left Bank Brosion Potential (%)	Width of Natural Buffer Vegetation (at) LB: RB: >20	Dominant Substrate Type	S.	LeA Dank Erosion Potential (%)	Width of Naunal Buffer Vegetation (m) LB: NB: >20	Daminant Substrate Type	95	Left Bank Eroston Potential (Sa)	Width of Natural Buffer Vegetation (11) LB: RB: > 20	Dominant Substrate Type	95.	Left Bank Eiosion Potential (%)
al Buffer 2. T	T Type	591 011	L. Thai	ilural Buffer an) >20	rate Type	54 201	D Thal	l Bulfer 20	strate Type	49 92	1.2 Thalves	(Buffer	rate Type.	50.1 05	1.2(Thalwe
Instream		144	1.1 Thalweg Depth	ໂມຣແຕລານ		189	b.aa Thalweg Depth:	Lustream		5.5	1.A Thalweg Depth:	Instream		11	, P(Thalweg Depth:
Instream Cover Types: smabs, artificial, roots, overhan	Donalizant Types Riparian Vegenalou: Left Bank: 3 Tree 80 Sruss 15 51/er Kiphi Bank: 30 tree 20 cruss 50 atver	1,00,181,00,100,120,101,12	Stream Depilis (m) at Points Aeross Transect	Instream Cover Types: MALVAD, ROSTS, SMALS	Dominant Types Ripation Vereshium: Left Bank: 25 tree 35 Srr45 40 other Right Bank: 20 tree 50 grass 30 other	1,001,101,341,441,001,901,34,87	Strenm Depuits (m) at Points Across Transect	Instream Cover Types: SMOSS, NOOTS, ONORMONS Nes.		2.202215225225225225225220119115	Stream Depths (111) at Points Across Transect	roots, overhans	Dominant Types Riparlan Vegennium 70 Sruss 15- Left Bank: 10 Free 10 Shrub US crass 10.	1.55 210 210 1.801 25 35 .45 .04	Stream Depths (m) at Paints Across Transect
sing	~	f	Right Bank Slope			5	Right Bank Slope		30 other	10	Right Bauk Slope		15 other	40	Right Hank Slope
🕾 İnsırcam Covei	& Chavel or Larger	200	Right Dank Erosion Potential	% Instream Cover	% Gravel or Larger	25	Right Bank Broslon Potential	& Instraut Cover	% Gravel or Lauger	95	Right Bank Erosfort Potential (%)	% Instream Cover	& Ginvel or Lauger	95	Right Bank Erosion Potential (%)
E.	3er.	10/17	Ттее Сапору (%)		ier.	16.5/17	Tree Canepy (%)		ict.	1/30	Tree Canopy (%)		E.	L/M	Tree Canopy (%)

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prick.	U-shaped und in river	Location of Transect	Observers: <u>Jou</u> <u>MS</u> Date: <u>Jul</u> Th Stream: <u>Nucces</u> Location of site: Stream Segment No.:_ Observed Str Stream Type (Circle One): <u>perennial</u> Channel Obstructions/Modifications: Riparian Vegetation (%): Left Bank: Trees_ Shrubs Right Bank: Trees_ Shrubs	$\left(\mathcal{N} \left(\mathcal{V} \left(e^{2\pi i r} \right)^{2} \right) \right)$
Stream Left Width Stope (m) (3) 9,0 45 Habitat Type (Siccle One) Riffle Run Glide Pool Algae or Macrophytes (Circle One). Algae Algae at Common	Habitat Type (Circle One) Riffe Run Glide Pool Algae or Macrophytes (Circle One) Abundant Common Rare Absent	Stream Width (m)	Date:Def Time: PWeather conditions: Location of site:o & Length of stream Observed Stream Uses:Aesthet One Perennial or intermittent w/ perenr SModifications:No. of Riffles: sModifications:No. of Riffles: "TreesShrubsGrasses, ForbsCult. Fig TreesShrubsGrasses, ForbsCult. Fig	Stream Ph
Left Bank Slope (5) 45 45 un vophytes	(Circle hin tophytes hinnon	Left Bank Slope (°) 30	Image: An intermittent weather compared by the set of the	ysical C
Left Bank Erosion (%) Dominant Substrate Type Crownel Width of Natural Buffer Vegetation (m) LB RB: > 20	Dominant Substrate Type	Left Bank Erosion (%) (%) (%)	Part ather conditions: <u>S</u>	Aluale 7 17897
0.34 Thalweg1 .05.	ň	D No Thalweg Depth .04 .49 .58	art I - Stream Pi nch: <u>500</u> % circle one): (1) wild pools Stream Bends pools Stream Bends innel Flow Status (1 <u>Cother</u>	s Worksheet
Stream Depths (m) at Points Across Transect Pepth: SA .54 .50 .46 .45 .42 .35 .28 .02 Dominant Types Riparian Vegetation: Left Bank: 10 tree 80 grass 25 other Right Bank: 10 tree 05 grass 25 other Sravel, Shars, 10 other	Dominant Types Riparian Vegetation: Left Bank: 10 free 20 stass 10 o frev Right Bank: 10 free 20 stass 10 offer Instream Cover Types: Sravel, Mauro, shass	Stream Depths (m) at Points Across Transect Septh:	Part I - Stream Physical Characteristics Worksheet Observers: <u>Jw MB</u> Date: <u>Date: 1000B</u> Length of stream conditions: <u>Stream: Worksheet</u> Stream: <u>Works</u> Location of site: <u>1000B</u> Length of stream reach: <u>Sour</u> Stream: <u>Works</u> Location of site: <u>1000B</u> Length of stream reach: <u>Sour</u> Stream Segment No.: <u>Observed Stream Uses:</u> <u>Aesthetics</u> (circle one): (1) wilderness (2) <u>naturals</u> (3) common (4) offensive Stream Type (Circle One): <u>Perennial</u> or intermittent w/ perennial pools Stream Bends: No. Well Defined_; No. Moderately Defined_: No. Poorly Defined_ Channel Obstructions/Modifications: <u>No.</u> No. of Riffles: <u>Channel Flow Status</u> (circle one): <u>high moderate low no flow</u> Riparian Vegetation (%): Left Bank: Trees_ Shrubs_ Grasses, Forbs_ Cult. Fields_ Other_ Right Bank: Trees_ Shrubs_ Grasses, Forbs_ Cult. Fields_ Other Right Bank: Trees_ Shrubs_ Grasses, Forbs_ Cult. Fields_ Other	
Right Bank (7)		Right Bank (?)	ined	rice be
Right Bank Erosion (%) Potential (%) % Gravel or Larger (%) % Instream Cover	% Gravel or Larger 555 % Instream Cover	Right Bank Erosion Potential (%)		bend- 1 poor rifele-1 run -1
Tree Canopy (%) ar		Canopy Canopy (%) S/17 14		3

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B-29

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g 204 000 Jomup 15 m up from bridge IS 3 UP From D.3 15m from Da From OH Location of Transect Location of Transect Location of Transect Location of Transect Algae or Macrophytes (Clicke One) Abundant Common Rare Absent Algae or Macrophytes (Circle One) Abundant Common Rare Absent Habitat Type (Circle One) Riffic Run Glide Pool Algae or Macrophytes (Circle One) Anndant Common (Rare Absent Habitat Type (Circle One) Itilite Run Gliffe Pool Algae or Macrophytes (Circle One) . Abundant Common Rare Absent Habitat Type (Clicle One) Pittle Run Gliffe Pool 16.1 Habitat Type (Circle One) Riffle Yun Glide Prof Stream Width (m) Stream Width (m) Siceann Width (m) Stream Vyidth (m) 00 50 S 08 5 Slope Left Bank Slope on UN Left Bank Slope Left Bank Slope Bank Erosion Petential (%) I Bank Erosien Potential Width of Natural Buffer Vegetation (m) LB: RB: 220 Left Bank Erosion Potential (%) Width of Natural Buffer Vegetation (m) LB: RB: Dominant Substrate Type Dominant Substrate Type Dominant Substrate Type Width of Natural Buffer Vegetation (m) LB:_____RB:_____ Left Bank Erosion Potential (%) Dominant Substrate Type 20 5117 NO d ٩ 00 ĨC. 2.1 Thalweg Depth 3572.5 Thalweg Depth Thalweg Depth. 800 Thalweg Depth .00 0.15 d ide Instream Cover Types: Instream Cover Types: Instream Cover Types: Instream Cover Types: U) 2.22 22.5 Right Bank: Dominant Types Riparian Vegetation: Left Bank: Right Bank: 5 Yree Dominant Types Riparian Vegetation: Left Bank: 5 11-0 70 5rd,5 25 04 100 Dominant Types Riparian Vegetation: Left Bank: 5 Yree 85 Sr w55 Stream Depths (m) at Points Across Transect malro, overhans ves Stream Depths (m) at Points Across Transect Dominant Types Riparian Vegetation: Left Bank: Stree 70 Stass Right Bank: Stree 70 Stass Stream Depths (m) at Points Across Transect Stream Depths (m) at Points Across Transect 0 Right Bank: snass, uver haves gravel, cobble, boulder, artificial 222 272 272 272 272 272 272 285 0 72.572.512,52,52,52,52,01 70 crash as other IN 5000 in o sas other 2007 10 o Nier Smarls 6 55 5 1 60 5 Right Bank Slope Right Slope Right Bank Slopc Right Bank Slope ch % Instream Cover Right Bank Erosion Potential (%) Right Bank Eroston Potential (%) % Instream Cover % Instream Cover % Gravel or Larger % Gravel or Larger % Gravel or Larger Right Bank Erosion Potential (%) % Instream Cover Right Bank Erosion Potential (%) % Gravel or Larger 3 0 CA T 9 80 0 Tree Canopy (%) Canopy (%) 6 して Tree Canopy (%) Canopy (%)

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able B-12. Part 1. Stream Physical Characteristics Worksheet

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Observers: Jw BH Date: Wather conditions Part I - Stream Physical Characteristics Worksheet

Stream: Nices Location of site: 1277 Length of stream reach: 2504

Stream Segment No .: Observed Stream Uses: Aesthetics (circle one): (1) wilderness (2) natural (3) common (4) offensive

Stream Type (Circle One): perennial or internuttent w/ perennial pools Stream Bends: No. Well Defined_; No. Moderately Defined_; No. Poorly Defined_

Channel Obstructions/Modifications: No. of Riffles: ___ Channel Flow Status (circle one): high moderate low no flow

Riparian Vegetation (%): Left Bank: Trees_Shrubs_Grasses, Forbs_Cult. Fields_Other_ Right Bank: Trees_Shrubs_Grasses, Forbs_Cult. Fields_Other_

Transect Width (m) Bank Slope Bank Erist Potential Potential U1 78 12.5 16 75% Habitat Type (Circle One-Rum Circle One) Dominant Substrate Type Circle One) Dominant Substrate Type Circle One) Algae or Macrophytes (Circle One) Width of Natural Buffer Vegetation (m) Abundant One) Width of Natural Buffer Vegetation (m) Bank Erosion Location of Width Transeer Stream Width (m) Left Sope (%)	Stream
Bank Erosion Potential (%) Dominant Subst User Con- Vegetation (m) LB: 72, B: 71 Bank Erosion (%)	
Bank Erosion Potential (%) Dominant Subst User Con- Vegetation (m) LB: 72, B: 71 Bank Erosion (%)	
Bank Erosion Potential (%) Dominant Subst Cra Width of Natura Vegetation (m) LB; 72, B: 72 Left Bank Erosion Potential	-
	1 2.0
Stream Depths (m) at Points Across Transect Thalweg Depth: 0.45 0.55 0.60 0.56 0.76 0.75 $0.$	
Right Bank (°) <i>M</i>	
Right Bank Erosion (%) FOK % Gravel or Larger 75% % Instream Cover 8% Right Bank Erosion	
Tree Canopy (%) Tree Canopy (%)	

Ul - Godson from UI 9.5m Habitat Type (Circle One)-Riffie Run Glide Bool Algae or Macrophytes (Circle One) Abundant Common 200 Width of Natural Buffer Vegetation (m) LB: RB; Dominant Substrate Type 96% SLORB: 5 - AN 20 0.11 1.32 Instream Cover Types: 122 Dominant Types Riparlan Vegetation: Left Bank: [5%7:1075: (0% \$ 65% 0 tight Bank: 5% 5 6 1.25 1.30 S vai 1.10 0.56 6.54 0.05 LealRack 260 0 8 % Instream Cover % Gravel or Larger 200 5% 5% 10.51

B-29

- Sine

Transect	Stream Width (m)	Left Bank Siope (`).	Dank Erosion Pointial (5) Left Transect Stream Depths (m) at Points Across Transect (5) 7007/0 0.04 0.35 0.31 0.30	Right Bank (,) (,) (,) (,) (,)	Right Bank Erosion Potential (%)	Thee Canopy (%)
	Habitat Type (Circle One) Riffie Run Glide Tool)	(Circle Run	Dominant Substrate Type Converted Dominant Types Riparian Vegetation: Convert		% Gravel or Larger	
	Algae or Macrophytes (Chiele One) Abundhurt Common Rare Absent	crophytes	Width of Natural Buffer Vegetation (11) LB: RB: Cravel ; Swar, CAMC		% Instream Cover	
	Stream Width (m)	Left Bank Slope	Left Bank Erosion Potential (%) Thalweg Depth:	Right Bauk Signe	Right Bank Erosion Potentink	Tree Cunopy (%)
	Em	900	75% 0.00 0.84 1.26 1.20 1.08 1.05 0.33 0.86 0.82 0.	0.50 0.05 310	92%	21/3
	Habitat Type (Circle One-Riffle Run Gild Pool	(Circle Run	Dominum Substrate Type Loft Bank: 157 127, 157, 157, 51	the 55% other	% Gravel or Larger	
pipelin	Algae or Macrophytes (Chrele One) Abundart Common Rary Absen	crophytes common	Width of Natural Buffer Vegetation (11) 1.B: 70 1.B: 70 Cenel Swar ; Overham 7		% Instream Cover	
	Stream Width (m)	Left Bank Slope	Left Bank Broston Potenial (%) Thalwer Dooth:	Right Bank Slope Slope	Right Bunk Evosion Potential	Tree Canopy (%)
Γ	(0	I	22'0	10.013	100%	13.5/12
	Habitat Type (Circle Guer Riffle Run Gilda yool	Run	Dominant Substrate Types Dominant Types Ripartian Vegetatiou: S. H. Right Bank: 2014 5 10 10 4	40% 01/11	% Gravel or Larger	
	Algae or Manuphytes (Circle One) adminint Common Rung Absent		Width of Natural Buffer Vegetation (11) LB3, 2, 18: 7, 10 LB3, 2, 11 i Ard i Arc. ii ()	2	% Insureaun Cover	
	Stream Width (at)	Left Bank Slope (7)	Left Bank Broston Potential (%) Thatwee Depth:	Right Bank Slope	Right Bank Erosion Potential (%)	Tree Canopy (%)
	1					
a ge	Habitat Type (Circle One) Riffle Run Glide Pool	(Circle Run	Dominant Substrate Type Left Bank: Right Bank:	*	% Chavel or Larger	
	Algae or Macrophytes (Circle One) Abundant Common Rure Absent	crophytes	Width of Matural Buffer Vegetation (m) LB: RB: LB:	*	% Instream Cover	a ident
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April	- 40 m down	U1- 70m 11	Location of Transect		1	the man	Ul D tendo	- Location of Transect	Left Bank: Trees Right Bank: Trees	Stream Type (Circle One): perennial or internittent w/ perennial pools Stream Bends: No. Well Defined_; No. Moderately Defined Channel Obstructions/Modifications:No. of Riffles: Channel Flow Status (circle one): highmoderately low no flow Riparian Vegenation (%):	Stream: <u>Nocces</u> Local Stream Segment No.: Ob	HR. Ju BH	Table B-12. Part 1.			
Algae or Macrophytes (Circle One) Abundant Common Rare Absent	Habitat Type (Circle One) Riffie Run Glide Pool	9m	Stream Width (m)	Abundaut Common Rare (Absent)	Algae or Macrophytes	Habitat Type (Circle One) Riffle Run Glide Pool	wein	Stream Width (m)	Shrubs Shrubs	perennial or lifications:	Location of site: 12771 Lenge :_ Observed Stream Uses: Pecc	Date: 3/10/04 Time:	Stream Ph			
	(Circle un	920	Left Bank Slope (*)	tounuo	prophytes	(Circle Run	67.	Left Bank Slope (°)	Grasses, Forbs Grasses, Forbs	intermitte No.	1 Uses: Re	Weathe	ysical (19	
Width of Natural Buffer Vegetation (m) LB: Mom ^{RB} : 7Lour	Dominant Substrate Type 5 i l+	90%	Left Bank Erosion Polential (%)	LB: RB: 7/0 ~ 7/0 m	Width of Natural	Dominant Substrate Type	25%	Left Bank Erosion Potential (%)	bs_Cult. Fields orbs_Cult. Fields	ittent w/ perennial p No. of Riffles: Ch	Length of stream reach. 4500	Pa Weather conditions:	Stream Physical Characteristics Worksheet		4	
Buffer	ite Type		Thatweg Depth:	Day	Buffer	ate Type	0.00 0.53	Thalweg Depth:	other	ial pools Stream Bends: No. Well Defined, ; No. Moderately I Channel Flow Status (circle one): high(noderate) low no flow	of stream reach.450~ Aesthetics (circle one): (1) wilderness (2) natural	Part I - Stream Physical Characteristics Worksheet	s Worksheet	et		
Instream Cover Types:	Dor Left Rig			Surg, O	II Right Bank: Listream Cover Types:	Do	0.75 1.4			ıds: No, Well s (circle one):	ilderness (2)	Physical C				
Ar	Dominant Types Riparian Vegetation; Left Bank: 40%7 50 Right Bank: 40%7 60	51	Stream Depths (m) at Points Across Transect	10	Cover Types:	Dominant Types Riparian Vegetation: Left Bank: 25% () 26% ()	1.5+ -	Stream Depths (m) at Points Across Transect		Defined_; No. highmoderat	natural (3) co	haracteristic				
fificad ()	arian Vegetation; T 50%	1.3 0.76	t Points Across T	Artificiai(T, 20%, T		It Points Across 7		Moderately De	(1) common (4) offensive	s Workshee				1
leaf Pack	% 0 % 0	16 0.4 0.30	ransect			0 %25	0 4	fransect		fined_; No. P	nsive					4.8
		0 0.07					0.61 0.01			L; No. Poorly Defined_			-	e		
Underst		210	Right Bank Slope				420	Right Bank Slope		ed						
% Instream Cover 25%	% Gravel or Larger	9,5b	Right Bank Erosion Potential	% Instream Cover	0/0	% Gravel or Larger	95%	Right Bank Erosion Potential	•				Pur -	Peol - 1	8-1	M-11
	er	t1/9/	Tree Canopy (%)				t1/5.11	Tree Canopy (%)								

	Abdamy	06	Location of Transect		to an Jawa	U5 .	Location of Transect		france -	Dadown	4	Location of Transect	tin P	Alex down	C 33	Location of Transect
Algae or Macrophytes (Circle One) Abaudant Common Rare Absent	Habitat Type (Circle One) Rittle Run Glide Con	10,31	Stream) Width (m) S	Algae or Macrophytes (Curcle One) Algundam Common Rare Abgen?	Habital Type (Circle One) Riffic Run Glide (100)	9.5m	Stream Width (m)	I have been a second and provide a	Algae or Macrophytes (Circle One) Abundant Common Rare Absen	Habital Type (Circle One) Blena Run Clide Pool	9.3m 3		Algae or Macrophytes (Chiele Ong) Abunduat Common Raree Absent	Habilat Type (Circle One) Ruffa Run Glide Yoo)	10.5 430	Stream Width (m) S
Width of Ni Vegetation (LB', Z. RB:	Dominant Substrate Type	38° 95%	Left Bank Slope (')		Dominant Sub		Left Bank Slope (*) Bank Erosion Potential (%)		hytes Width of Natural Buffer non LB ² , RB: 700	rcle Dominant Substrate Type	20° 95%	Left Bauk Slope (°)		Dominant Subs	3° 85%	Left Bank Slope (*)
	strate Type	0.07 0	Thulweg Depth:	al Buffer Lo	strate Type	8.0 14.0 10.0	Tholweg Depth		uffer	strate Type	0.05 0.62 0.45	Thalweg Depth	al Buffer 20	strate Type	0.04 0.25 1.5	Thalweg Depth:
histreann Cover Types: Algari S	Right Bank: 10/.T , 105			Instream Cover Types: Art: I.c.	Dominant Types Riparian Vegenion: TLeft Bank: 1570 H. 1077			0	Instream Cover Types: Rost Sura J	Dominant Types Ripating Vegetation Left Bank: 10% ; 10%			Instream Cover Types: Smay : A.H. :	Right Bank: 257/ 10%0 /	St	
		1.2+0	Stream Depths (m) at Points Across Transect	Port Sum			Stream Depths (m) at Points Across Transect		rtificial ;	1	1.5	Stream Depths (m) at Points Across Transect	Rivil, Overhan	parian Vegeniion:		Stream Depths (m) at Points Across Transect
· · ·	40%0	20.0 8.0560	-		15% 5 ; 60%	- 1.5+ 0.03			Underert	2020	15+ 0:27 0:38			+ 50%0	> 0.85 0.17	
		28°	Right Bank Slope		0	.62	Right Bank Slope				the	Righu Bank Slope			39 "	Right Bank Slope
% Instream Cover	% Ciravel or Larger O_{1}	95%	Right Bank Exosion Potential (%)	% Instream Cover 10%	% Gravel or Larger	9,52	Right Bank Erosion Potential (%)		% Instream Cover 57	% Oravel or Larger	75%	Right Bank Erosion Potential (%)	% Instream Cover	% Gravel or Larger	95%	Right Bank Exosion Potential (%)
	аг.	41/0	Tree Canopy (%)	0	ci.	4/41	Tree Canopy (%)		, ,	сł.	11/17	Tree Canopy (%)		er	16/17	Тусе Санору (%)

11.67							R ~ O D L	Burd W.	1-1-1	
Table B-12. Part 1. Stream Physical Characteristics Worksheet	Stream Ph	ysical C	haracteristic.	s Worksheet						
Observers: Jw, BH Date Stream: N.e.25 Locati	Date: 8 11 Time: We We	weather	Weather conditions: PC Length of stream reach: 2004	art I - Stream	Physica	Part I - Stream Physical Characteristics Worksheet				
Stream Segment No.: Observed Stream Uses: Stream Type (Circle One): perennial or intern	served Strean perennial or	n Uses: internitter	Aesthetics (c nt w/ perennial p	circle one): (1) w pools Stream Ben	rilderness nds: No. V	Stream Segment No.:_ Observed Stream Uses: Aesthetics (circle one): (1) wilderness (2) natural (3) common (4) offensive Stream Type (Circle One): perennial or intermittent w/ perennial pools Stream Bends: No. Well Defined_; No. Moderately Defined_; No. Poorly Defined_	ve ted_; No. Poorly Define	-		
Channel Obstructions/Modifications: Riparian Vegetation (%): Left Bank: Trees ShrubsC Right Bank: Trees ShrubsC	iffications:	No. of Ri Grasses, Forbs_ (Grasses, Forbs_ (ffles:	annel Flow Statu Other	s (circle o	Channel Flow Status (circle one): high moderate low no flow idsOther				
- Location of Transect	Stream Width (m)	Left Bank Slope (°)	Left Bank Erosion Potential (%)	Thalwe	Thalweg Depth:	Stream Depths (m) at Points Across Transect	nsect	Right Bank Slope	Right Bank Erosion Potential (%)	Tree Canopy (%)
	Bm	290	age	0.15 0.76	1.00	1.15 1.19 1.16 1.16 1:06	0.55 0.31 0.02	046	100%	11/51
DI - 155m	Habitat Type (Circle One) Riffle Run GlidefPool	e (Circle Run	Dominant Substrate Type	rate Type		Dominant Types Riparian Vegetation:	0%0 0%0		% Gravel or Larger 10^{6}	
dans	Algae or Macrophytes (Circle One) Abundane Rare@bsent	ncrophytes	Width of Natural Buffer Vegetation (m) LB: 770	al Buffer o	Instream	Instream Cover Types: Overhang Very Surg		1	% Instream Cover	
Location of Transect	Stream Width (m)	Left Bank Slope (*)	Left Bank Erosion Potential (%)	Thalwe	Thalweg Depth:	Stream Depths (m) at Points Across Transect	insect	Right Bank Slope	Right Bank Erosion Potential (%)	Tree Canopy (%)
0 1000	gw	690	90%	6011 11.03	57:1	1:22 1.68 1.03 6.13 0.86	Diele 0.44 0.01	200	92%	4.5/14
The Row	Habitat Type (Circle One) Riffle Run Glide Pool	e (Circle Run	Dominant Substrate Type	trate Type		Dominant Types Riparlan Vegetation: Left Bank: 45 to 70 th 74 Right Bank: 45 to 157	no por		% Gravel or Larger	
>	Algae or Macrophytes (Circle One) Abundant Common Rare (Dsent	Acrophytes	Width of Natural Buffer Vegetation (m) LB: RB: 710	al Buffer	Instrear	Instream Cover Types: Carel Sonny, Roods	45		% Instream Cover	

1							192	7	(r			-	a 100000	× *		
			Location of Transect		4d	Arst	Location of Transect			Ram	40 yr OF	1.ocation of Transact	30772812	15 rio bare	03	Location of Transect
Algae or Macrophytes (Chrile One) Abundant Common Rure Absent	Habitai Type (Cirele One) Riffe Run Glide Pool		Stream) Width (m)	Algae or Macrophytes (Chrole One) Abundant Common Rare (Absen)	Habital Type (Circle One) Rime Run Glide Paol	10m L	Sireann Width (m) S	(Algae or Macrophyles (Chrile One) Abundant Common Ruye Absent)	Habitat Type (Circle One) Rime Run Glide Coos	h sti		Algae or Macrophytes (Chele One) Abunduut Common Rare Absent	Habitat Type (Circle One) Riffle Run Clint Pool	16m :	Stream Width (m)
hytes	rele		Left Bank Slope (*)		rele	400	Left Bank Slope	1	non	rc]e	ello.	0.7	1	rcle	the	Left Bank Slope (*)
Width of Natural Buffer Vegetation (m) LB; RB;	Dominant Substrate Type		Left Bank Broston Potential (%)	Width of Natural Buffer Vegetation (m) LB-72, RB: 720	Dominant Substrate Type	20%	Left Bank Erosion Potential (%)		Width of Natural Buffer Vegetation (m) 1.B: TRB: 7 20	Dominant Substrate Type	70%	Left Bank Erosion Potential (%)	Width of Natural Buffer Vegetation (m) LB:70 RB: 720	Dominant Substrate Type	95%	Left Bank Erosion Polential (%)
d Buffer	trate Type			tural Buffer (m) 7 6 0	Trate Type	0.06	1.5	A State of the second sec	d Buffer 20	hrate Type	0.20	~	mal Buffer n) 720	trate Type	0.15	
			Thalwa			13	Thalw				1	Thalw			0.72	Thalweg Depth
Instream			Thalweg Depth:	lustreat			Thalweg Depth:		Instream	5		halweg Depth:	Instream		0:41	g Depth:
Instream Cover Types;	Dominant Types Riparian Vegeration: Left Bank: Right Bank:		Stream Depths (m) at Points Across Transect	Instream Cover Types: Party Sura	Dominant Types Riparian Vegetation: Left Bank: 157 850 Right Bank: 717 8004	1.5+ 0.08	Stream Depths (m) at Points Across Transact	0,	Instream Cover Types	Left Bank: 15T SH So Off	< 15t 1.4m 0.06	Sticam Depths (m) at Points Aeross Transect	Instream Cover Types: Sung (Grand) (Cathle, Boulder	Dominant Types Riparian Vegginiton: Left Bank: 604 44 004 Right Bank: 67 304 1 650460	0.26 0.34 0.43 0.42 abi 0.64 0.60 0.00	Stream Depths (11) at Points Across Transect
		-	Right Bank Slope			400	Right Bank Slope				430	Right Bank Slope			·bh	Right Bailk Slope
% Instream Cover	% Gravel or Larger		Right Bank Erosion Potential (%)	% Instream Cover 5%	% Gravel or Larger	90%	Right Bank Erosion Potential (%)		% Instream Cover	% Gravel or Larger 5%	100%	Right Bank Eroslon Potential (%)	% Instream Cover	% Gravel or Larger	45%	Right Bank Erosion Polential (%)
	ţu.		Tree Canopy (%)	7	3er.	11/11	Tree Canopy (%)	and the second second	Y	3cr	t125/17	Tice Canopy (%)	SI.	ger,	4/4	"Русе Санору (%)

HABITAT ASSESSMENT

Part II – Summary of Physical Characteristics of Water Body



Stream name	Nueces 12974
Date of assessment	9/30/2003
Stream bed slope over evaluated reach	0.002
Approximate drainage area above transect furthest downstream	20,555
Stream order	5
Length of stream evaluated	0.45km
Number of lateral transects made	6
Average stream width	11.9m
Average stream depth	1.19m
Instantaneous flow	
Indicate flow measurement method	Current Meter
Channel flow status	Moderate
Maximum pool width	15m
Maximum pool depth	>2.5m
Total number of stream bends	3
Number of well defined bends	2
Number of moderately defined bends Number of poorly defined bends	<u> </u>
Total number of riffles	0
Dominant substrate type	Silt
Average percent of substrate gravel sized or larger	0%
Average percent instream cover	13%
Number of stream cover types	6
Average percent stream bank erosion potential	95%
Average stream bank slope	54
Average width of vegetative buffer	>20m
Average riparian vegetation percent composition by:	
Trees Shrubs	<u> </u>
Grasses/Forbes	54.0%
Cultivated Fields Other	24%
Average percent tree canopy coverage	71%
Overall aesthetic appraisal of stream	Natural

Stream name	Nueces 17897
Date of assessment	9/30/2003
Stream bed slope over evaluated reach	0.003
Approximate drainage area above transect furthest downstream	21,886
Stream order	5
Length of stream evaluated	0.3km
Number of lateral transects made	5
Average stream width	12.7m
Average stream depth	1m
Instantaneous flow	
Indicate flow measurement method	Current Meter
Channel flow status	Moderate
Maximum pool width	19m
Maximum pool depth	>2.5m
Total number of stream bends	1
Number of well defined bends	0
Number of moderately defined bends Number of poorly defined bends	0 1
Total number of riffles	1
Dominant substrate type	Gravel
Average percent of substrate gravel sized or larger	39%
Average percent instream cover	11%
Number of stream cover types	8
Average percent stream bank erosion potential	93%
Average stream bank slope	46
Average width of vegetative buffer	>20m
Average riparian vegetation percent composition by:	
Trees Shrubs	<u> </u>
Grasses/Forbes	76%
Cultivated Fields	
Other	17%
Average percent tree canopy coverage	28%
Overall aesthetic appraisal of stream	Natural

Stream name	Nueces 12972
Date of assessment	9/23/2003
Stream bed slope over evaluated reach	0.004
Approximate drainage area above transect furthest downstream	22,463
Stream order	5
Length of stream evaluated	0.25km
Number of lateral transects made	5
Average stream width	11.6m
Average stream depth	0.88m
Instantaneous flow	
Indicate flow measurement method	Current Meter
Channel flow status	Moderate
Maximum pool width	15m
Maximum pool depth	1.5m
Total number of stream bends	2
Number of well defined bends	2
Number of moderately defined bends Number of poorly defined bends	0
Total number of riffles	0
Dominant substrate type	Gravel
Average percent of substrate gravel sized or larger	62%
Average percent instream cover	8%
Number of stream cover types	6
Average percent stream bank erosion potential	90%
Average stream bank slope	58
Average width of vegetative buffer	>20m
Average riparian vegetation percent composition by:	
Trees Shrubs	<u> </u>
Grasses/Forbes	52%
Cultivated Fields	
Other	22%
Average percent tree canopy coverage	44%
Overall aesthetic appraisal of stream	Natural

Stream name	Nueces 12974
Date of assessment	8/10/2004
Stream bed slope over evaluated reach	0.002222222
Approximate drainage area above transect furthest downstream	20,555
Stream order	5
Length of stream evaluated	0.45km
Number of lateral transects made	6
Average stream width	10.0m
Average stream depth	>1m
Instantaneous flow	
Indicate flow measurement method	Current Meter
Channel flow status	Moderate
Maximum pool width	15m
Maximum pool depth	>2.5m
Total number of stream bends	4
Number of well defined bends	1
Number of moderately defined bends Number of poorly defined bends	2
Total number of riffles	0
Dominant substrate type	Silt
Average percent of substrate gravel sized or larger	0%
Average percent instream cover	11%
Number of stream cover types	6
Average percent stream bank erosion potential	90%
Average stream bank slope	37
Average width of vegetative buffer	>20m
Average riparian vegetation percent composition by:	
Trees Shrubs	<u>21.00%</u> 10%
Grasses/Forbes	5.0%
Cultivated Fields	
Other	64%
Average percent tree canopy coverage	70%
Overall aesthetic appraisal of stream	Common

Stream name	Nueces 17897
Date of assessment	8/11/2004
Stream bed slope over evaluated reach	0.003333333
Approximate drainage area above transect furthest downstream	21,886
Stream order	5
Length of stream evaluated	0.3km
Number of lateral transects made	5
Average stream width	12m
Average stream depth	1m
Instantaneous flow	
Indicate flow measurement method	Current Meter
Channel flow status	Moderate
Maximum pool width	17m
Maximum pool depth	>2.5m
Total number of stream bends	1
Number of well defined bends	0
Number of moderately defined bends Number of poorly defined bends	<u> </u>
Total number of riffles	1
Dominant substrate type	Silt
Average percent of substrate gravel sized or larger	35%
Average percent instream cover	8%
Number of stream cover types	5
Average percent stream bank erosion potential	94%
Average stream bank slope	47
Average width of vegetative buffer	>20m
Average riparian vegetation percent composition by:	
Trees Shrubs	<u> </u>
Grasses/Forbes	15%
Cultivated Fields	
Other	75%
Average percent tree canopy coverage	39%
Overall aesthetic appraisal of stream	Natural

Stream name	Nueces 12972
Date of assessment	8/10/2004
Stream bed slope over evaluated reach	0.004
Approximate drainage area above transect furthest downstream	22,463
Stream order	5
Length of stream evaluated	0.25km
Number of lateral transects made	5
Average stream width	10.4m
Average stream depth	0.84m
Instantaneous flow	
Indicate flow measurement method	Current Meter
Channel flow status	Moderate
Maximum pool width	12.5m
Maximum pool depth	>1.5m
Total number of stream bends	2
Number of well defined bends Number of moderately defined bends	1
Number of poorly defined bends	0
Total number of riffles	0
Dominant substrate type	Gravel
Average percent of substrate gravel sized or larger	40%
Average percent instream cover	6%
Number of stream cover types	6
Average percent stream bank erosion potential	93%
Average stream bank slope	39
Average width of vegetative buffer	>20m
Average riparian vegetation percent composition by: Trees	9%
Shrubs	7%
Grasses/Forbes Cultivated Fields	16%
Other	68%
Average percent tree canopy coverage	46%
Overall aesthetic appraisal of stream	Natural

HABITAT ASSESSMENT

Part III – Habitat Quality Indices



Habitat Parameter	Scoring Category		Location: 12974	Date: 9/30/03
Available Instream Cover	Abundant >50% of substrate favorable for colonization and fish cover; good mix of several stable (not new fall or transient) cover types such as snags, cobble, undercut banks, macrophytes	Common 30-50% of substrate supports a stable habitat; adequate habitat for maintenance of populations; may be limited in the number of different habitat types	Rare 10-29.9% of substrate supports stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed	Absent <10% of substrate supports stable habitat; lack of habitat is obvious; substrate unstable or lacking
Score: 2	4	3	2	1
Bottom Substrate Stability	Stable >50% gravel or larger substrate, i.e., gravel, cobble, boulders; dominant substrate type is gravel or larger	Moderately Stable 30-50% gravel or larger substrate; dominant substrate type is mix of gravel with some finer sediments	Moderately Unstable 10-29.9% gravel or larger substrate; dominant substrate type is finer than gravel, but may still be in mix of sizes	Unstable <10% gravel or larger substrate; substrate is uniform sand, silt, clay, or bedrock
Score: 1	4	3	2	1
Number of Riffles To be counted, riffles must extend >50% the width of the channel and be at least as long as the channel width		Common 2-4 riffles	Rare 1 riffle	Absent No riffles
Score: 1	4	3	2	1
Dimensions of Largest Pool	Large Pool covers more than 50% of the channel width; maximum depth is > 1m	Moderate Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5-1	Small Pool covers approximately 25% of the channel width; maximum depth is <0.5 meter	Absent No existing pools; only shallow auxillary pockets
Score: 3	3	2	1	0
Channel Flow Status	High Water reaches the base of both the lower banks; <5% of channel substrate is exposed	Moderate Water fills <75% of the channel; or <25% of channel substrate is exposed	Low Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed	No Flow Very little water in the channel and mostly present in standing pools; or stream is dry
Score: 2	3	2	1	0
Bank Stability	Stable Little evidence (<10%) of erosion bank failure; bank angles average <30°	Moderately Stable Some evidence (10- 29.9%) of erosion or bank failure; small areas of erosion mostly healed over; bank angles average 30-39.9°	Moderately Unstable Evidence of erosion bank failure is common (30-50%); high potential of erosion during flooding; bank angles average 40-60°	Unstable Large and frequent evidence (>50%) of erosion or bank failure; raw areas frequent along steep banks; bank angles average >60°
Score: 0	3	2	1	0
Channel Sinuosity	High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present	Moderate 1 well-defined bend OR ≥3 moderately-defined bends present	-	None Straight channel; may be channelized
Score: 3	3	2	1	0
Riparian Buffer Vegetation	Extensive Width of natural buffer is >20 meters	Wide Width of natural buffer is 10.1-20 meters	Moderate Width of natural buffer is 5- 10 meters	Narrow Width of natural buffer is <5 meters
Score: 3	3	2	1	0
Aesthetics of Reach	Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional	Natural Area Tree and/or native vegetation common; some development evident (from fields, pastures, dwellings); water clarity may be slightly turbid		Offensive Stream does not enhance the aesthetics of the area; cluttered; highly developed; may be a dumping area; water clarity is usually turbid or discolored
Score: 2	3	2	1	0
	-	-		

Habitat Parameter	Scoring Category		Location: 17897	Date: 9/30/03
Available Instream Cover	Abundant >50% of substrate favorable for colonization and fish cover; good mix of several stable (not new fall or transient) cover types such as snags, cobble, undercut banks, macrophytes	Common 30-50% of substrate supports a stable habitat; adequate habitat for maintenance of populations; may be limited in the number of different habitat types	Rare 10-29.9% of substrate supports stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed	Absent <10% of substrate supports stable habitat; lack of habitat is obvious; substrate unstable or lacking
Score: 2	4	3	2	1
Bottom Substrate Stability	Stable >50% gravel or larger substrate, i.e., gravel, cobble, boulders; dominant substrate type is gravel or larger	Moderately Stable 30-50% gravel or larger substrate; dominant substrate type is mix of gravel with some finer sediments	Moderately Unstable 10-29.9% gravel or larger substrate; dominant substrate type is finer than gravel, but may still be in mix of sizes	Unstable <10% gravel or larger substrate; substrate is uniform sand, silt, clay, or bedrock
Score: 3	4	3	2	1
Number of Riffles To be counted, riffles must extend >50% the width of the channel and be at least as long as the channel width	Abundant ≥5 riffles	Common 2-4 riffles	Rare 1 riffle	Absent No riffles
Score: 2	4	3	2	1
Dimensions of Largest Pool	Large Pool covers more than 50% of the channel width; maximum depth is > 1m	Moderate Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5-1 meter	Small Pool covers approximately 25% of the channel width; maximum depth is <0.5 meter	Absent No existing pools; only shallow auxillary pockets
Score: 3	3	2	1	0
Channel Flow Status	High Water reaches the base of both the lower banks; <5% of channel substrate is exposed	Moderate Water fills <75% of the channel; or <25% of channel substrate is exposed	Low Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed	No Flow Very little water in the channel and mostly present in standing pools; or stream is dry
Score: 2	3	2	1	0
Bank Stability	Stable Little evidence (<10%) of erosion bank failure; bank angles average <30°	Moderately Stable Some evidence (10-29.9%) of erosion or bank failure; small areas of erosion mostly healed over; bank angles average 30- 39.9°	Moderately Unstable Evidence of erosion bank failure is common (30-50%); high potential of erosion during flooding; bank angles average 40-60°	Unstable Large and frequent evidence (>50%) of erosion or bank failure; raw areas frequent along steep banks; bank angles average >60°
Score: 0	3	2	1	0
Channel Sinuosity	High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present	Moderate 1 well-defined bend OR ≥3 moderately-defined bends present	Low <3 moderately-defined bends OR only poorly- defined bends present	None Straight channel; may be channelized
Score: 1	3	2	1	0
Riparian Buffer Vegetation	Extensive Width of natural buffer is >20 meters	Wide Width of natural buffer is 10.1- 20 meters	Moderate Width of natural buffer is 5- 10 meters	Narrow Width of natural buffer is <5 meters
Score: 3	3	2	1	0
Aesthetics of Reach	Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional	Natural Area Tree and/or native vegetation common; some development evident (from fields, pastures, dwellings); water clarity may be slightly turbid	Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored	Offensive Stream does not enhance the aesthetics of the area; cluttered; highly developed; may be a dumping area; water clarity is usually turbid or discolored
Score: 2	3	2	1	0
Total Score: 18	INTERMEDIATE			

Habitat Parameter	Scoring Category		Location: 12972	Date: 9/23/03
Available Instream Cover	Abundant >50% of substrate favorable for colonization and fish cover; good mix of several stable (not new fall or transient) cover types such as snags, cobble, undercut banks, macrophytes	Common 30-50% of substrate supports a stable habitat; adequate habitat for maintenance of populations; may be limited in the number of different habitat types	Rare 10-29.9% of substrate supports stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed	Absent <10% of substrate supports stable habitat; lack of habitat is obvious; substrate unstable or lacking
Score: 1	4	3	2	1
Bottom Substrate Stability	Stable >50% gravel or larger substrate, i.e., gravel, cobble, boulders; dominant substrate type is gravel or larger	Moderately Stable 30-50% gravel or larger substrate; dominant substrate type is mix of gravel with some finer sediments	Moderately Unstable 10-29.9% gravel or larger substrate; dominant substrate type is finer than gravel, but may still be in mix of sizes	Unstable <10% gravel or larger substrate; substrate is uniform sand, silt, clay, or bedrock
Score: 4	4	3	2	1
Number of Riffles To be counted, riffles must extend >50% the width of the channel and be at least as long as the channel width	Abundant ≥5 riffles	Common 2-4 riffles	Rare 1 riffle	Absent No riffles
Score: 1	1	3	2	1
Dimensions of Largest Pool	Large Pool covers more than 50% of the channel width; maximum depth is > 1m	Moderate Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5-1 meter	Small Pool covers approximately 25% of the channel width; maximum depth is <0.5 meter	Absent No existing pools; only shallow auxillary pockets
Score: 2	3	2	1	0
Channel Flow Status	High Water reaches the base of both the lower banks; <5% of channel substrate is exposed	Moderate Water fills <75% of the channel; or <25% of channel substrate is exposed	Low Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed	No Flow Very little water in the channel and mostly present in standing pools; or stream is dry
Score: 2	3	2	1	0
Bank Stability	Stable Little evidence (<10%) of erosion bank failure; bank angles average <30°	Moderately Stable Some evidence (10-29.9%) of erosion or bank failure; small areas of erosion mostly healed over; bank angles average 30- 39.9°	Moderately Unstable Evidence of erosion bank failure is common (30-50%); high potential of erosion during flooding; bank angles average 40-60°	Unstable Large and frequent evidence (>50%) of erosion or bank failure; raw areas frequent along steep banks; bank angles average >60°
Score: 0	3	2	1	0
Channel Sinuosity	High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present	Moderate 1 well-defined bend OR ≥3 moderately-defined bends present	Low <3 moderately-defined bends OR only poorly- defined bends present	None Straight channel; may be channelized
Score: 3	3	2	1	0
Riparian Buffer Vegetation	Extensive Width of natural buffer is >20 meters	Wide Width of natural buffer is 10.1- 20 meters	Moderate Width of natural buffer is 5- 10 meters	Narrow Width of natural buffer is <5 meters
Score: 3	3	2	1	0
Aesthetics of Reach	Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional	Natural Area Tree and/or native vegetation common; some development evident (from fields, pastures, dwellings); water clarity may be slightly turbid	Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored	Offensive Stream does not enhance the aesthetics of the area; cluttered; highly developed; may be a dumping area; water clarity is usually turbid or discolored
Score: 2	3	2	1	0
Total Score: 18	INTERMEDIATE			

Habitat Parameter	Scoring Category		Location: 12974	Date: 8/10/2004
Available Instream Cover	Abundant >50% of substrate favorable	Common 30-50% of substrate supports a stable habitat; adequate habitat for maintenance of populations; may be limited in the number of different habitat types	Rare 10-29.9% of substrate supports stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed	Absent <10% of substrate supports stable habitat; lack of habitat is obvious; substrate unstable or lacking
Score: 2	4	3	2	1
Bottom Substrate Stability	Stable >50% gravel or larger substrate, i.e., gravel, cobble, boulders; dominant substrate type is gravel or larger	Moderately Stable 30-50% gravel or larger substrate; dominant substrate type is mix of gravel with some finer sediments	Moderately Unstable 10-29.9% gravel or larger substrate; dominant substrate type is finer than gravel, but may still be in mix of sizes	Unstable <10% gravel or larger substrate; substrate is uniform sand, silt, clay, or bedrock
Score: 1	4	3	2	1
Number of Riffles To be counted, riffles must extend >50% the width of the channel and be at least as long as the channel width	Abundant ≥5 riffles	Common 2-4 riffles	Rare 1 riffle	Absent No riffles
Score: 1	4	3	2	1
Dimensions of Largest Pool	Large Pool covers more than 50% of the channel width; maximum depth is > 1m	Moderate Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5-1 meter	Small Pool covers approximately 25% of the channel width; maximum depth is <0.5 meter	Absent No existing pools; only shallow auxillary pockets
Score: 3	3	2	1	0
Channel Flow Status	High Water reaches the base of both the lower banks; <5% of channel substrate is exposed	Moderate Water fills <75% of the channel; or <25% of channel substrate is exposed	Low Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed	No Flow Very little water in the channel and mostly present in standing pools; or stream is dry
Score: 2	3	2	1	0
Bank Stability	Stable Little evidence (<10%) of erosion bank failure; bank angles average <30°	Moderately Stable Some evidence (10- 29.9%) of erosion or bank failure; small areas of erosion mostly healed over; bank angles average 30-39.9°	Moderately Unstable Evidence of erosion bank failure is common (30-50%); high potential of erosion during flooding; bank angles average 40-60°	Unstable Large and frequent evidence (>50%) of erosion or bank failure; raw areas frequent along steep banks; bank angles average >60°
Score: 1	3	2	1	0
Channel Sinuosity	High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present	Moderate 1 well-defined bend OR ≥3 moderately-defined bends present	,	None Straight channel; may be channelized
Score: 2	3	2	1	0
Riparian Buffer Vegetation	Extensive Width of natural buffer is >20 meters	Wide Width of natural buffer is 10.1-20 meters	Moderate Width of natural buffer is 5- 10 meters	Narrow Width of natural buffer is <5 meters
Score: 3	3	2	1	0
Aesthetics of Reach	Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional	Natural Area Tree and/or native vegetation common; some development evident (from fields, pastures, dwellings); water clarity may be slightly turbid	1 /	Offensive Stream does not enhance the aesthetics of the area; cluttered; highly developed; may be a dumping area; water clarity is usually turbid or discolored
Score: 1	3	2	1	0

Habitat Parameter	Scoring Category		Location: 17897	Date: 8/11/2004
Available Instream Cover	Abundant >50% of substrate favorable for colonization and fish cover; good mix of several stable (not new fall or transient) cover types such as snags, cobble, undercut banks, macrophytes	habitat for maintenance of populations; may be limited in the number of different habitat types	Rare 10-29.9% of substrate supports stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed	Absent <10% of substrate supports stable habitat; lack of habitat is obvious; substrate unstable or lacking
Score: 1	4	3	2	1
Bottom Substrate Stability	Stable >50% gravel or larger substrate, i.e., gravel, cobble, boulders; dominant substrate type is gravel or larger	Moderately Stable 30-50% gravel or larger substrate; dominant substrate type is mix of gravel with some finer sediments	Moderately Unstable 10-29.9% gravel or larger substrate; dominant substrate type is finer than gravel, but may still be in mix of sizes	Unstable <10% gravel or larger substrate; substrate is uniform sand, silt, clay, or bedrock
Score: 3	4	3	2	1
Number of Riffles To be counted, riffles must extend >50% the width of the channel and be at least as long as the channel width	Abundant ≥5 riffles	Common 2-4 riffles	Rare 1 riffle	Absent No riffles
Score: 2	4	3	2	1
Dimensions of Largest Pool	Large Pool covers more than 50% of the channel width; maximum depth is > 1m	Moderate Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5-1 meter	Small Pool covers approximately 25% of the channel width; maximum depth is <0.5 meter	Absent No existing pools; only shallow auxillary pockets
Score: 3	3	2	1	0
Channel Flow Status	High Water reaches the base of both the lower banks; <5% of channel substrate is exposed	Moderate Water fills <75% of the channel; or <25% of channel substrate is exposed	Low Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed	No Flow Very little water in the channel and mostly present in standing pools; or stream is dry
Score: 2	3	2	1	0
Bank Stability	Stable Little evidence (<10%) of erosion bank failure; bank angles average <30°	Moderately Stable Some evidence (10-29.9%) of erosion or bank failure; small areas of erosion mostly healed over; bank angles average 30- 39.9°	Moderately Unstable Evidence of erosion bank failure is common (30-50%); high potential of erosion during flooding; bank angles average 40-60°	Unstable Large and frequent evidence (>50%) of erosion or bank failure; raw areas frequent along steep banks; bank angles average >60°
Score: 1	3	2	1	0
Channel Sinuosity	High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present	Moderate 1 well-defined bend OR ≥3 moderately-defined bends present	Low <3 moderately-defined bends OR only poorly- defined bends present	None Straight channel; may be channelized
Score: 1	3	2	1	0
Riparian Buffer Vegetation	Extensive Width of natural buffer is >20 meters	Wide Width of natural buffer is 10.1- 20 meters	Moderate Width of natural buffer is 5- 10 meters	Narrow Width of natural buffer is <5 meters
Score: 3	3	2	1	0
Aesthetics of Reach	Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional	Natural Area Tree and/or native vegetation common; some development evident (from fields, pastures, dwellings); water clarity may be slightly turbid	Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored	Offensive Stream does not enhance the aesthetics of the area; cluttered; highly developed; may be a dumping area; water clarity is usually turbid or discolored
Score: 2	3	2	1	0

Habitat Parameter	Scoring Category		Location: 12972	Date: 8/10/04
Available Instream Cover	Abundant >50% of substrate favorable for colonization and fish cover; good mix of several stable (not new fall or transient) cover types such as snags, cobble, undercut banks, macrophytes	habitat for maintenance of populations; may be limited in the number of different habitat types	Rare 10-29.9% of substrate supports stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed	Absent <10% of substrate supports stable habitat; lack of habitat is obvious; substrate unstable or lacking
Score: 1	4	3	2	1
Bottom Substrate Stability	Stable >50% gravel or larger substrate, i.e., gravel, cobble, boulders; dominant substrate type is gravel or larger	Moderately Stable 30-50% gravel or larger substrate; dominant substrate type is mix of gravel with some finer sediments	Moderately Unstable 10-29.9% gravel or larger substrate; dominant substrate type is finer than gravel, but may still be in mix of sizes	
Score: 3	4	3	2	1
Number of Riffles To be counted, riffles must extend >50% the width of the channel and be at least as long as the channel width	Abundant ≥5 riffles	Common 2-4 riffles	Rare 1 riffle	Absent No riffles
Score: 1	1	3	2	1
Dimensions of Largest Pool	Large Pool covers more than 50% of the channel width; maximum depth is > 1m	Moderate Pool covers approximately 50% or slightly less than the channel width; maximum depth is 0.5-1 meter	Small Pool covers approximately 25% of the channel width; maximum depth is <0.5 meter	Absent No existing pools; only shallow auxillary pockets
Score: 3	3	2	1	0
Channel Flow Status	High Water reaches the base of both the lower banks; <5% of channel substrate is exposed	Moderate Water fills <75% of the channel; or <25% of channel substrate is exposed	Low Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed	No Flow Very little water in the channel and mostly present in standing pools; or stream is dry
Score: 2	3	2	1	0
Bank Stability	Stable Little evidence (<10%) of erosion bank failure; bank angles average <30°	Moderately Stable Some evidence (10-29.9%) of erosion or bank failure; small areas of erosion mostly healed over; bank angles average 30- 39.9°	Moderately Unstable Evidence of erosion bank failure is common (30-50%); high potential of erosion during flooding; bank angles average 40-60°	Unstable Large and frequent evidence (>50%) of erosion or bank failure; raw areas frequent along steep banks; bank angles average >60°
Score: 0	3	2	1	0
Channel Sinuosity	High ≥2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) are present	Moderate 1 well-defined bend OR ≥3 moderately-defined bends present	Low <3 moderately-defined bends OR only poorly- defined bends present	None Straight channel; may be channelized
Score: 2	3	2	1	0
Riparian Buffer Vegetation	Extensive Width of natural buffer is >20 meters	Wide Width of natural buffer is 10.1- 20 meters	Moderate Width of natural buffer is 5- 10 meters	Narrow Width of natural buffer is <5 meters
Score: 3	3	2	1	0
Aesthetics of Reach	Wilderness Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional	Natural Area Tree and/or native vegetation common; some development evident (from fields, pastures, dwellings); water clarity may be slightly turbid	Common Setting Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored	Offensive Stream does not enhance the aesthetics of the area; cluttered; highly developed; may be a dumping area; water clarity is usually turbid or discolored
Score: 2	3	2	1	0