

Impairment Verification Monitoring
Biological and Habitat Components
Segment 1913, Middle Cibolo Creek, Texas
June 2005



Ecological Communications Corporation
Austin, TX



**Impairment Verification Monitoring-Volume 2: Biological and
Habitat Components
Segment 1913, Middle Cibolo Creek, Texas**

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Impairment Verification Monitoring -Biological and Habitat Components
Middle Cibolo Creek

ABSTRACT

Ecological Communications Corporation (EComm) conducted biological data collection and analysis as part of an impairment verification monitoring project for Middle Cibolo Creek (Segment 1913). Segment 1913 appears on the State of Texas' 303(d) list as partially supporting the limited aquatic life use due to 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.

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, 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 in 2002, this water body appears to be meeting the "Limited" aquatic life designated in the Texas Water Quality Standards (TCEQ 2000). However, due to depressed dissolved oxygen concentrations during sampling conducted by TEES/CBI from 2002 to 2004, Segment 1913 will remain on the 303(d) List of Impaired Waters and a TMDL will be scheduled.

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1.0 INTRODUCTION



Figure 1. Station 12927

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 segments were 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 water bodies was Middle Cibolo Creek (Segment 1913). The impairment to Segment 1913 was caused by depressed dissolved oxygen levels as indicated by data collected through the statewide

monitoring program. Because an insufficient number of 24-hour dissolved oxygen values were available in 2002 to determine if the aquatic life use criterion is supported, Segment 1913 remained on the impaired waters list. As an initial phase in TMDL development, the aquatic life use impairment to Segment 1913 was verified using the latest sampling techniques. The initial assessment was performed so that resources within the program can be efficiently utilized for truly impaired water bodies, preventing TMDL development for a water body 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) TMDL, or 4) Additional monitoring to better characterize the impairment.

Segment 1913 begins at the Missouri-Pacific Railroad Bridge in Comal County west of Bracken in Comal County. It flows for approximately 19 miles to a point 100 meters downstream of IH 10 in Bexar/Guadalupe County. A location map of the segment is provided in Figure 2. Site 12927 is located at the South end of River Road in East San Antonio. Site 12924 is located at Schaffer Road, three miles east of Randolph Air Force Base. Site 12921 is located at Weir Road, three miles upstream from IH 10.

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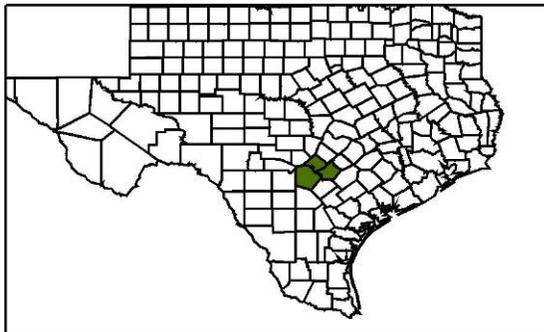
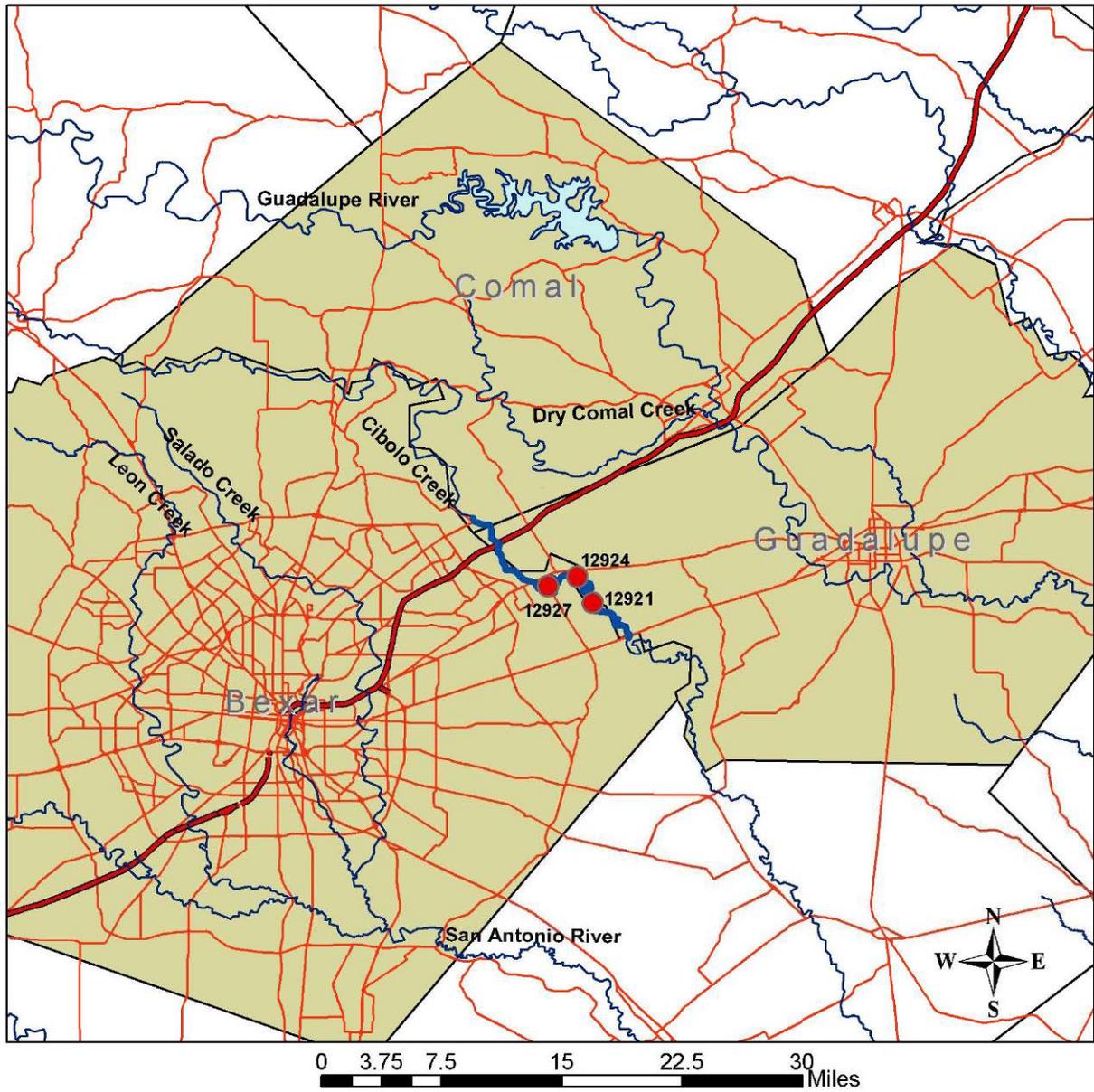


Figure 2. Location Map for Segment 1913, Mid Cibolo Creek

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 (IBIs). Additionally, EComm generated IBIs for all stations using regional criteria developed by 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 integrity of fish assemblage” as compared to statewide criteria.



Figure 3. Station 12924

In addition to data collection via RWA guidelines and TCEQ Surface Water Quality Monitoring (SWQM) Procedures Manual (TNRCC 1999a), EComm captured data for approximately 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.



Figure 4. Station 12921

Segment 1913 had not previously been designated as a segment requiring a standards change to reflect site specific conditions. Studies which examine site specific conditions and recommend changes to established or presumed uses are referred to as Use Attainability Analysis (UAA) and Aquatic Life Assessment (ALA), respectively. Biological UAAs are conducted on classified or unclassified water bodies for which aquatic life uses and dissolved oxygen criteria have been established in the Texas Surface Water Quality Standards. The purpose is to determine if existing designated aquatic life uses/dissolved oxygen criteria are appropriate and, if not, to

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develop designated use and/or criteria adjustment information. UAA minimum data requirements include at least three complete sampling events over two consecutive index periods. Nekton, benthos, and habitat data are collected and analyzed for each sampling event. One event must be conducted during the early portion (March 15 – April 30) of the Index Period (March 15 – October 15) in either Year 1 or Year 2. The other two sampling events must be conducted during the Critical Period (July 1 – September 30), including one in Year 1 and one during Year 2. Biological sampling for Segment 1913 was conducted in August 2002. Additional biological sampling to support a UAA was determined to be unnecessary, as the aquatic life use designation for Segment 1913 is “Limited,” the lowest possible designation, and was extremely unlikely to be changed. Therefore, in order to conserve resources, this segment was only sampled for biology during a single sampling event.

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

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)
<i>800</i>	<i>Channel flow status</i>	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
<i>812</i>	<i>Statewide IBI</i>	98003	Number of fish species
<i>833</i>	<i>Habitat Quality Index</i>	89905	Number of minutes debris was sampled
84161	Stream order	89851	Percent grass
84159	Percent instream cover	89854	Percentage tree canopy
<i>813</i>	<i>Number of cyprinidae species</i>	89859	Drainage area
<i>814</i>	<i>Number of benthic invertebrates</i>	89860	Length of reach
72052	Streambed slope	89861	Average stream width
<i>816</i>	<i>Percent that are tolerant species, excluding G.affinis</i>	89862	Average stream depth
<i>817</i>	<i>Number of individuals per seine haul</i>	89864	Maximum pool width
<i>818</i>	<i>Number of individuals per minute electroshocking</i>	89865	Maximum pool depth
<i>819</i>	<i>Percentage of individuals as non-native</i>	89866	Average width of riparian vegetation
<i>820</i>	<i>Regional IBI</i>	90010	Dominant functional feeding group percentage
<i>832</i>	<i>Total RBP score</i>	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
<i>834</i>	<i>Percentage benthic scrapers</i>	89950	Benthic sampling code

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STORET Code	Description	STORET Code	Description
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	<i>Benthic invertebrate taxa richness</i>
89850	Percent as shrubs	836	<i>Number instream cover types</i>
98004	Total number of darter species	89904	Minutes spent kicknetting

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

Benthic Macroinvertebrate Collections

Biological sampling included fish and benthic macroinvertebrate data collection at each site within the segment. A location map of the segment, as well as the three site locations within the segment, is provided in Figure 2. Collection of benthic macroinvertebrates in the field was conducted using a 12-inch D-frame kicknet in riffle areas traveling a zigzag pattern across the bed in five-minute intervals. In the event that no riffles were present, snags, leaf packs, and other debris were picked for macroinvertebrates. Intervals were repeated until the minimum sample size of 100 specimens was approached, met, or exceeded. All individuals collected within the net or through picking 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 electrofishers powered by either 7 amp-hour or 12 am-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 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

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for later lab identification. Additionally, one individual from each field-identified species was retained as a voucher.

Electrofishing was 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 and each site. 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.

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

Several other subjective habitat parameters were used as required by RWA Procedures 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 assure that all crewmembers 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 1913. 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 specific 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

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quality standards. It should be noted that 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.

Table 2. Ranges and Subcategories for each component

Subcategory	Statewide IBI	Regional IBI		
		(Region 32)	RBP	HQI
Limited	<34	<35	<22	<14
Intermediate	40-44	35-40	22-28	14-19
High	48-52	41-48	29-36	20-25
Exceptional	58-60	>48	>36	26-31

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

Table 3. Results of Biological and Habitat Sampling for Segment 1913-Middle Cibolo Creek

FY02	Statewide IBI	Regional IBI (32)	RBP	HQI
12927	40 - Intermediate	35 – Intermediate	28 – Intermediate	18 – Intermediate
12924	42 - Intermediate	41 - High	26 – Intermediate	20 - High
12921	42 - Intermediate	34 -Limited	30 - High	20 - High

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 “Limited” agreed with the designated aquatic life use value for the segment. A subcategory of “Limited-Intermediate”, “Intermediate”, or “Intermediate-High”, “High”, “High-Exceptional”, or “Exceptional” was considered above standard, as it reflects a improved level of water quality than that for which the segment is designated. All scores for each component were well above the standard. Statewide IBI scores averaged approximately 41.3 (Intermediate) across all sites over all sampling events, and indicated a poor agreement with the designated life use of “Limited” (0%, 100% above standard). Regional IBI scores averaged 36.7 (Intermediate), and represented a better agreement (33.3%; 66.6% above standard). RBP scores averaged 28 (Intermediate), a 0% agreement (100% above standard), while HQI averaged approximately 19.3 (Intermediate) in 0% agreement with the aquatic life use (100% above standard).

4.0 DISCUSSION

Average scores of all biological components appear to indicate a higher aquatic life use than the “Limited” aquatic life use designation for Segment 1913.

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5.0 CONCLUSION

Based on the Regional IBI, RBP, and HQI scores, the biological and habitat data suggests that aquatic life use of appears to be above the current standard of “Limited.” However, due to depressed dissolved oxygen concentrations during sampling conducted by TEES/CBI from 2002 to 2004, Segment 1913 will remain on the 303(d) List of Impaired Waters and a TMDL will be scheduled.

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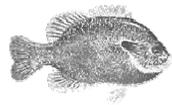
Appendix A
Complete Raw Data Set
Biological and Habitat Components
Segment 1913-Middle Cibolo Creek, Texas
August 2002



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BIOTIC ASSESSMENT – FISH

Species Lists and Preliminary Data Manipulation



FISH COLLECTED

Stream	Date	ID	Species	N=	Type	Method	Tolerance	Trophic Gp
M.Cibolo	8/26/02	12927	Black Bullhead	1		E	T	O
			Bluegill	10	SF	E	T	IF
			Bluegill	4	SF	S	T	IF
			Bullhead Minnow	8		E	-	IF
			Channel Catfish	1		E	T	O
			Gambusia affinis	2		E	T	IF
			Gambusia affinis	12		S	T	IF
			Green Sunfish	11	SF	E	T	P
			Green Sunfish	1	SF	S	T	P
			Longear Sunfish	2	SF	E	-	IF
			Mexican Tetra	1		E	-	IF
			Mimic Shiner	4		E	I	IF
			Redbreast Sunfish	2	SF	S	-	IF
			Redbreast Sunfish	2	SF	E	-	IF
			Red Shiner	5		E	T	IF
			Red Shiner	8		S	T	IF
			Rio Grande Cichlid	5		S	-	IF
			Yellow Bullhead	1		S	-	O
			Yellow Bullhead	1		E	-	O
Total				81				

**Abnormalities:
 1 Black Bullhead w/ sores on bell/chin
 1 Yellow Bullhead w/ shallow cuts on body, red sores on chin/belly
 1 Bluegill w/ puncture wound @ rear of body

KEY:
 SF Sunfish
 D Darter
 SU Sucker
 E Electroshock
 S Seine
 V Visually Observed
 I Intolerant
 T Tolerant
 - Intermediate
 O Omnivore
 IF Invertivore
 P Piscivore
 H Herbivore

Stream	Date	ID	Species	N=	Type	Method	Tolerance	Trophic Gp
M.Cibolo	8/27/02	12924	Bluegill	1	SF	E	T	IF
			Bluegill	1	SF	S	T	IF
			Bullhead Minnow	100		S	-	IF
			Bullhead Minnow	2		E	-	IF
			Channel Catfish	4		E	T	O
			Gambusia affinis	8		S	T	IF
			Gizzard Shad	1		E	T	O
			Green Sunfish	5	SF	E	T	P
			Largemouth Bass	2		S	-	P
			Longear Sunfish?	2	SF	E	-	IF
			Longear Sunfish	1	SF	S	-	IF
			Red Shiner	6		S	T	IF
			Redbreast Sunfish	1	SF	E	-	IF
			Rio Grande Cichlid	1		E	-	IF
			Rio Grande Cichlid	3		S	-	IF
			Yellow Bullhead	1		E	-	O
Total				139				

FISH COLLECTED

Stream	Date	ID	Species	N=	Type	Method	Tolerance	Trophic Gp
M.Cibolo	8/28/02	12921	Blacktail Shiner	8		S	-	IF
			Bluegill	25	SF	E	T	IF
			Bluegill	5	SF	S	T	IF
			Channel Catfish	4		E	T	O
			Channel Catfish	1		S	T	O
			Gambusia affinis	14		S	T	IF
			Gizzard Shad	1		E	T	O
			Green Sunfish	5	SF	E	T	P
			Longear Sunfish	4	SF	S	-	IF
			Longear Sunfish	28	SF	E	-	IF
			Mexican Tetra	1		E	-	IF
			Mimic Shiner	11		S	I	IF
			Redbreast Sunfish	10	SF	E	-	IF
			Redbreast Sunfish	1	SF	S	-	IF
			Red Shiner	115		S	T	IF
			Red Shiner	3		E	T	IF
			Rio Grande Cichlid	3		E	-	IF
			Sailfin Molly	1		S	T	O
			Spotted Bass	4		S	-	P
			Spotted/Guadalupe hybrid	2		E	-	P
			Spotted Sunfish	22	SF	E	-	IF
			Warmouth	1	SF	E	T	P
			Yellow Bullhead	2		E	-	O
Total				271				

BIOTIC ASSESSMENT – FISH

Indices of Biotic Integrity – Statewide Criteria



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

Stream: M. Cibolo		Date: 8/26/02	Location: 12927	County: Bexar
Category	Metric	Value	Score	
Species Richness and Composition	1. Total number of fish species	13	5	
	2. Number of darter species	0	1	
	3. Number of sunfish species (exc. bass)	4	5	
	4. Number of sucker speices	0	1	
	5. Number of intolerant species	1	3	
	6. Percentage of individuals as tolerants	68	1	
Trophic Composition	7. Percentage of individuals as omnivores	5	5	
	8. Percentage of individuals as insectivores	80	3	
	9. Percentage of individuals as piscivores	15	5	
Fish Abundance and Condition	10. Number of individuals in sample	81	3	
	11. Percentage of individuals as hybrids	1	3	
	12. Percentage of individuals with disease/anomalies	0	5	
Aquatic Life Use: INTERMEDIATE		Total Points:	40	

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

Stream: M. Cibolo		Date: 8/27/02	Location: 12924	County: Bexar
Category	Metric	Value	Score	
Species Richness and Composition	1. Total number of fish species	12	5	
	2. Number of darter species	0	1	
	3. Number of sunfish species (exc. bass)	4	5	
	4. Number of sucker speices	0	1	
	5. Number of intolerant species	0	1	
	6. Percentage of individuals as tolerants	19	3	
Trophic Composition	7. Percentage of individuals as omnivores	4	5	
	8. Percentage of individuals as insectivores	91	5	
	9. Percentage of individuals as piscivores	5	3	
Fish Abundance and Condition	10. Number of individuals in sample	139	3	
	11. Percentage of individuals as hybrids	0	5	
	12. Percentage of individuals with disease/anomalies	0	5	
Aquatic Life Use: INTERMEDIATE		Total Points:	42	

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

Stream: M. Cibolo		Date: 8/28/02	Location: 12921	County: Bexar
Category	Metric	Value	Score	
Species Richness and Composition	1. Total number of fish species	18	5	
	2. Number of darter species	0	1	
	3. Number of sunfish species (exc. bass)	6	5	
	4. Number of sucker speices	0	1	
	5. Number of intolerant species	1	3	
	6. Percentage of individuals as tolerants	65	1	
Trophic Composition	7. Percentage of individuals as omnivores	3	5	
	8. Percentage of individuals as insectivores	92	5	
	9. Percentage of individuals as piscivores	4	3	
Fish Abundance and Condition	10. Number of individuals in sample	271	5	
	11. Percentage of individuals as hybrids	1	3	
	12. Percentage of individuals with disease/anomalies	0	5	
Aquatic Life Use: INTERMEDIATE		Total Points:	42	

BIOTIC ASSESSMENT – FISH

Indices of Biotic Integrity – Regional Criteria



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

Stream: M.Cibolo		Date: 08/26/02	Location: 12927	County: Bexar
Metric	Value	Score		
1. Total number of fish species	13	3		
2. Number of native cyprinid species	3	3		
3. Number of benthic invertivore species	0	1		
4. Number of sunfish species	4	5		
5. Percentage of individuals as tolerants (exc. G. affinis)	51	1		
6. Percentage of individuals as omnivores	5	5		
7. Percentage of individuals as insectivores	80	5		
8. Percentage of individuals as piscivores	15	5		
9. Number of individuals in sample	81	-		
a. number of ind/seine haul	5.5	1		
b. number of ind/min electrofishing	3.2	1		
10. Percentage of ind. as non-native species	4.9	1		
11. Percentage of individuals with disease/anomalies	0	5		
Aquatic Life Use: INTERMEDIATE	Total Points:		35	

1*

*Average of 9a and 9b

Drainage area upstream of 12927 ~ 740 sq. km.

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

Stream: M.Cibolo		Date: 08/27/02	Location: 12924	County: Bexar
Metric	Value	Score		
1. Total number of fish species	12	3		
2. Number of native cyprinid species	2	3		
3. Number of benthic invertivore species	0	1		
4. Number of sunfish species	4	5		
5. Percentage of individuals as tolerants (exc. G. affinis)	12	5		
6. Percentage of individuals as omnivores	4	5		
7. Percentage of individuals as insectivores	91	5		
8. Percentage of individuals as piscivores	5	3		
9. Number of individuals in sample	139	-		
a. number of ind/seine haul	20.2	1		
b. number of ind/min electrofishing	1.2	1		
10. Percentage of ind. as non-native species	0.7	5		
11. Percentage of individuals with disease/anomalies	0	5		
Aquatic Life Use: HIGH	Total Points:		41	

1*

*Average of 9a and 9b

Drainage area upstream of 12924 ~ 772 sq. km.

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

Stream: M.Cibolo		Date: 08/28/02	Location: 12921	County: Bexar
Metric	Value	Score		
1. Total number of fish species	18	5		
2. Number of native cyprinid species	3	3		
3. Number of benthic invertivore species	0	1		
4. Number of sunfish species	6	5		
5. Percentage of individuals as tolerants (exc. G. affinis)	59	1		
6. Percentage of individuals as omnivores	3	5		
7. Percentage of individuals as insectivores	92	5		
8. Percentage of individuals as piscivores	4	1		
9. Number of individuals in sample	271	-		
a. number of ind/seine haul	27	1		
b. number of ind/min electrofishing	7.1	3		
10. Percentage of ind. as non-native species	4.1	1		
11. Percentage of individuals with disease/anomalies	0	5		
Aquatic Life Use: LIMITED	Total Points:		34	

2*

*Average of 9a and 9b

Drainage upstream of 12921 ~ 784 sq. km.

BIOTIC ASSESSMENT – BENTHIC MACROINVERTEBRATES

Species Lists and Preliminary Data Manipulation



Benthic Macroinvertebrates - Kick Sample (Qualitative)

Stream	Date	ID	Taxa	N=	Func.Gp.	Tolerance	HBI
M.Cibolo	8/26/02	12927	Odonata-Coenagrionidae- <i>Argia</i>	4	P	6	0.2307692
			Odonata-Libellulidae- <i>Brechmorhoga</i>	3	P	6	0.1730769
			Ephemeroptera-Tricorythidae- <i>Tricorythodes</i>	3	CG	5	0.1442308
Func.Gp	%		Ephemeroptera-Leptophlebiidae- <i>Thraulodes</i>	2	CG/SCR	2	0.0384615
P	9.52381		Ephemeroptera-Baetidae- <i>Baetis</i>	7	SCR/CG	4	0.2692308
SCR	10.79365		Trichoptera-Hydropsychidae- <i>Cheumatopsyche</i>	41	FC	6	2.3653846
CG	15.55556		Trichoptera-Hydropsychidae- <i>Smicridea</i>	11	FC	4	0.4230769
FC	63.80952		Trichoptera-Philopotamidae- <i>Chimarra</i>	4	FC	3	0.1153846
SHR	0.31746		Coleoptera-Hydrophilidae- <i>Berosus</i>	1	P	9	0.0865385
	100		Coleoptera-Elmidae- <i>Hexacylloepus</i> (A)	1	CG/SCR	2	0.0192308
			Coleoptera-Elmidae- <i>Stenelmis</i> (L)	1	CG/SCR	7	0.0673077
			Coleoptera-Elmidae (Scirtidae)- <i>Cyphon</i> (L)	1	CR/CG/SH	-	-
			Diptera-Chironomidae	11	SCR/CG	4	0.4230769
			Diptera-Simuliidae- <i>Simulium</i>	11	FC	4	0.4230769
			Hirudinea	2	P	8	0.1538462
			Oligochaeta	2	CG	8	0.1538462
Total				105	104		5.0865385
Intolerant/Tolerant							0.93

Stream	Date	ID	Taxa	N=	Func.Gp.	Tolerance	HBI
M.Cibolo	8/27/02	12924	Odonata-Coenagrionidae- <i>Argia</i>	14	P	6	0.7706422
			Ephemeroptera-Tricorythidae- <i>Tricorythodes</i>	1	CG	5	0.0458716
			Ephemeroptera-Leptophlebiidae- <i>Thraulodes</i>	1	CG/SCR	2	0.0183486
Func.Gp	%		Ephemeroptera-Baetidae- <i>Baetis</i>	12	SCR/CG	4	0.440367
P	13.76147		Ephemeroptera-Baetidae- <i>Camelobaetidius</i> (<i>Dactylobaetis</i>)	1	SCR/CG	4	0.0366972
SCR	16.97248		Trichoptera-Hydropsychidae- <i>Cheumatopsyche</i>	55	FC	6	3.0275229
CG	13.30275		Coleoptera-Elmidae- <i>Stenelmis</i> (A)	4	CG/SCR	7	0.2568807
FC	55.9633		Coleoptera-Elmidae- <i>Stenelmis</i> (L)	1	CG/SCR	7	0.0642202
SHR	0		Diptera-Chironomidae	8	SCR/CG	4	0.293578
	100		Diptera-Simuliidae- <i>Simulium</i>	6	FC	4	0.2201835
			Hirudinea	1	P	8	0.0733945
			Gastropoda (Limnophila)-Physidae- <i>Physella</i>	5	SCR	9	0.412844
Total				109	109		5.6605505
Intolerant/Tolerant							0.36

P-Predator
 SCR-Scraper
 CG-Collector/Gatherer
 FC-Filtering Collector
 SHR-Shredder

HBI-Hilsenhoff Biotic Index:
 =sum(nt/N) where n=number
 of ind. of a particular taxa,
 t=tolerance value of that
 taxon, N=number organisms
 in sample.

Benthic Macroinvertebrates - Kick Sample (Qualitative)

Stream	Date	ID	Taxa	N=	Func.Gp.	Tolerance	HBI
M.Cibolo	8/28/02	12921	Odonata-Coenagrionidae- <i>Argia</i>	7	P	6	0.4038462
			Odonata-Libellulidae- <i>Brechmorhoga</i>	1	P	6	0.0576923
			Ephemeroptera-Tricorythidae- <i>Tricorythodes</i>	6	CG	5	0.2884615
Func.Gp	%		Ephemeroptera-Leptophlebiidae- <i>Thraulodes</i>	2	CG/SCR	2	0.0384615
P	8.653846		Ephemeroptera-Leptophlebiidae- <i>Travarella</i>	2	FC	2	0.0384615
SCR	10.57692		Ephemeroptera-Baetidae- <i>Baetis</i>	4	SCR/CG	4	0.1538462
CG	16.34615		Trichoptera-Hydropsychidae- <i>Cheumatopsyche</i>	39	FC	6	2.25
FC	64.42308		Trichoptera-Hydropsychidae- <i>Smicridea</i>	7	FC	4	0.2692308
SHR	0		Trichoptera-Hydropsychidae- <i>Hydropsyche</i>	13	FC	5	0.625
	100		Trichoptera-Philopotamidae- <i>Chimarra</i>	2	FC	3	0.0576923
			Coleoptera-Elmidae- <i>Hexacylloepus</i> (A)	5	CG/SCR	2	0.0961538
			Coleoptera-Elmidae- <i>Microcyllloepus</i> (A)	4	CG/SCR	2	0.0769231
			Coleoptera-Elmidae- <i>Stenelmis</i> (A)	6	CG/SCR	7	0.4038462
			Diptera-Chironomidae	1	SCR/CG	4	0.0384615
			Diptera-Simuliidae- <i>Simulium</i>	3	FC	4	0.1153846
			Tricladida (Dugesia)	1	P	7.5	0.0721154
			Bivalvia (Heterodonta) Corbiculidae- <i>Corbicula</i>	1	FC	6	0.0576923
Total				104	104		5.0432692
Intolerant/Tolerant							0.89

BIOTIC ASSESSMENT – BENTHIC MACROINVERTEBRATES

Rapid Bioassessment Protocol



Stream: M.Cibolo Date: 8/26/02 Location: 12927 County: Bexar		
Metric	Value	Score
1. Taxa Richness	16	3
2. EPT Taxa Abundance	6	2
3. Biotic Index (HBI)	5.09	2
4. % Chironomidae	10.47619048	2
5. % Dominant Taxon	39.04761905	2
6. % Dominant FFG	63.80952381	1
7. % Predators	9.523809524	4
8. Ratio of Intolerant:Tolerant Taxa	0.93	1
9. % of Total Trichoptera as Hydropsychidae	92.85714286	1
10. # of Non-insect Taxa	2	2
11. % Collector-Gatherers	15.55552381	4
12. % of Total Number as Elmidae	2.857142857	4
Aqautic Life Use: INTERMEDIATE	Total Score:	28

Stream: M.Cibolo Date: 8/27/02 Location: 12924 County: Bexar		
Metric	Value	Score
1. Taxa Richness	11	2
2. EPT Taxa Abundance	5	2
3. Biotic Index (HBI)	5.66	1
4. % Chironomidae	7.339449541	3
5. % Dominant Taxon	50.4587156	1
6. % Dominant FFG	55.96330275	1
7. % Predators	13.76146789	4
8. Ratio of Intolerant:Tolerant Taxa	0.36	1
9. % of Total Trichoptera as Hydropsychidae	100	1
10. # of Non-insect Taxa	2	2
11. % Collector-Gatherers	13.30275229	4
12. % of Total Number as Elmidae	4.587155963	4
Aqautic Life Use: INTERMEDIATE	Total Score:	26

Stream: M.Cibolo Date: 8/28/02 Location: 12921 County: Bexar		
Metric	Value	Score
1. Taxa Richness	17	3
2. EPT Taxa Abundance	8	3
3. Biotic Index (HBI)	5.04	2
4. % Chironomidae	0.961538462	4
5. % Dominant Taxon	37.5	2
6. % Dominant FFG	64.42307692	1
7. % Predators	8.653846154	4
8. Ratio of Intolerant:Tolerant Taxa	0.89	1
9. % of Total Trichoptera as Hydropsychidae	96.72131148	1
10. # of Non-insect Taxa	2	2
11. % Collector-Gatherers	16.34615385	4
12. % of Total Number as Elmidae	14.42307692	3
Aqautic Life Use: HIGH	Total Score:	30

HABITAT ASSESSMENT

Part I – Stream Physical Characteristics Worksheet



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

Part I - Stream Physical Characteristics Worksheet

Observers: _____ Date: ___ Time: ___ Weather conditions: _____

Stream: _____ Location of site: _____ Length of stream reach: _____

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

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_

Location of Transect	Stream Width (m)	Left Bank Slope (°)	Left Bank Erosion Potential (%)	Stream Depths (m) at Points Across Transect										Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%)
				Thalweg Depth:												
	Habitat Type (Circle One) Riffle Run Glide Pool		Dominant Substrate Type			Dominant Types Riparian Vegetation: Left Bank: Right Bank:						% Gravel or Larger				
	Algae or Macrophytes (Circle One) Abundant Common Rare Absent		Width of Natural Buffer Vegetation (m) LB: RB:			Instream Cover Types:						% Instream Cover				

Location of Transect	Stream Width (m)	Left Bank Slope (°)	Left Bank Erosion Potential (%)	Stream Depths (m) at Points Across Transect										Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%)
				Thalweg Depth:												
	Habitat Type (Circle One) Riffle Run Glide Pool		Dominant Substrate Type			Dominant Types Riparian Vegetation: Left Bank: Right Bank:						% Gravel or Larger				
	Algae or Macrophytes (Circle One) Abundant Common Rare Absent		Width of Natural Buffer Vegetation (m) LB: RB:			Instream Cover Types:						% Instream Cover				

Location of Transect	Stream Width (m)	Left Bank Slope (°)	Left Bank Erosion Potential (%)	Stream Depths (m) at Points Across Transect										Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%)		
				Thalweg Depth:														
	Habitat Type (Circle One) Riffle Run Glide Pool		Dominant Substrate Type				Dominant Types Riparian Vegetation: Left Bank:				Right Bank:				% Gravel or Larger			
	Algae or Macrophytes (Circle One) Abundant Common Rare Absent		Width of Natural Buffer Vegetation (m) LB: RB:				Instream Cover Types:				% Instream Cover							

Location of Transect	Stream Width (m)	Left Bank Slope (°)	Left Bank Erosion Potential (%)	Stream Depths (m) at Points Across Transect										Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%)		
				Thalweg Depth:														
	Habitat Type (Circle One) Riffle Run Glide Pool		Dominant Substrate Type				Dominant Types Riparian Vegetation: Left Bank:				Right Bank:				% Gravel or Larger			
	Algae or Macrophytes (Circle One) Abundant Common Rare Absent		Width of Natural Buffer Vegetation (m) LB: RB:				Instream Cover Types:				% Instream Cover							

Location of Transect	Stream Width (m)	Left Bank Slope (°)	Left Bank Erosion Potential (%)	Stream Depths (m) at Points Across Transect										Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%)		
				Thalweg Depth:														
	Habitat Type (Circle One) Riffle Run Glide Pool		Dominant Substrate Type				Dominant Types Riparian Vegetation: Left Bank:				Right Bank:				% Gravel or Larger			
	Algae or Macrophytes (Circle One) Abundant Common Rare Absent		Width of Natural Buffer Vegetation (m) LB: RB:				Instream Cover Types:				% Instream Cover							

Location of Transect	Stream Width (m)	Left Bank Slope (°)	Left Bank Erosion Potential (%)	Stream Depths (m) at Points Across Transect										Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%)		
				Thalweg Depth:														
	Habitat Type (Circle One) Riffle Run Glide Pool		Dominant Substrate Type				Dominant Types Riparian Vegetation: Left Bank:				Right Bank:				% Gravel or Larger			
	Algae or Macrophytes (Circle One) Abundant Common Rare Absent		Width of Natural Buffer Vegetation (m) LB: RB:				Instream Cover Types:				% Instream Cover							

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

Part I - Stream Physical Characteristics Worksheet

Observers: _____ Date: ___ Time: ___ Weather conditions: _____

Stream: _____ Location of site: _____ Length of stream reach: _____

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

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_

Location of Transect	Stream Width (m)	Left Bank Slope (°)	Left Bank Erosion Potential (%)	Stream Depths (m) at Points Across Transect										Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%)
				Thalweg Depth:												
	Habitat Type (Circle One) Riffle Run Glide Pool		Dominant Substrate Type				Dominant Types Riparian Vegetation: Left Bank:				% Gravel or Larger					
	Algae or Macrophytes (Circle One) Abundant Common Rare Absent		Width of Natural Buffer Vegetation (m) LB: RB:				Instream Cover Types:				% Instream Cover					
	Right Bank: Right Bank Erosion Potential (%)		Right Bank: Right Bank Erosion Potential (%)				Right Bank: Right Bank Erosion Potential (%)				Right Bank: Right Bank Erosion Potential (%)					

Location of Transect	Stream Width (m)	Left Bank Slope (°)	Left Bank Erosion Potential (%)	Stream Depths (m) at Points Across Transect										Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%)
				Thalweg Depth:												
	Habitat Type (Circle One) Riffle Run Glide Pool		Dominant Substrate Type				Dominant Types Riparian Vegetation: Left Bank:				% Gravel or Larger					
	Algae or Macrophytes (Circle One) Abundant Common Rare Absent		Width of Natural Buffer Vegetation (m) LB: RB:				Instream Cover Types:				% Instream Cover					
	Right Bank: Right Bank Erosion Potential (%)		Right Bank: Right Bank Erosion Potential (%)				Right Bank: Right Bank Erosion Potential (%)				Right Bank: Right Bank Erosion Potential (%)					

Location of Transect	Stream Width (m)	Left Bank Slope (°)	Left Bank Erosion Potential (%)	Stream Depths (m) at Points Across Transect										Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%)		
				Thalweg Depth:														
	Habitat Type (Circle One) Riffle Run Glide Pool		Dominant Substrate Type					Dominant Types Riparian Vegetation: Left Bank: Right Bank:					% Gravel or Larger					
	Algae or Macrophytes (Circle One) Abundant Common Rare Absent		Width of Natural Buffer Vegetation (m) LB: RB:					Instream Cover Types:					% Instream Cover					

Location of Transect	Stream Width (m)	Left Bank Slope (°)	Left Bank Erosion Potential (%)	Stream Depths (m) at Points Across Transect										Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%)		
				Thalweg Depth:														
	Habitat Type (Circle One) Riffle Run Glide Pool		Dominant Substrate Type					Dominant Types Riparian Vegetation: Left Bank: Right Bank:					% Gravel or Larger					
	Algae or Macrophytes (Circle One) Abundant Common Rare Absent		Width of Natural Buffer Vegetation (m) LB: RB:					Instream Cover Types:					% Instream Cover					

Location of Transect	Stream Width (m)	Left Bank Slope (°)	Left Bank Erosion Potential (%)	Stream Depths (m) at Points Across Transect										Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%)		
				Thalweg Depth:														
	Habitat Type (Circle One) Riffle Run Glide Pool		Dominant Substrate Type					Dominant Types Riparian Vegetation: Left Bank: Right Bank:					% Gravel or Larger					
	Algae or Macrophytes (Circle One) Abundant Common Rare Absent		Width of Natural Buffer Vegetation (m) LB: RB:					Instream Cover Types:					% Instream Cover					

Location of Transect	Stream Width (m)	Left Bank Slope (°)	Left Bank Erosion Potential (%)	Stream Depths (m) at Points Across Transect										Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%)		
				Thalweg Depth:														
	Habitat Type (Circle One) Riffle Run Glide Pool		Dominant Substrate Type					Dominant Types Riparian Vegetation: Left Bank: Right Bank:					% Gravel or Larger					
	Algae or Macrophytes (Circle One) Abundant Common Rare Absent		Width of Natural Buffer Vegetation (m) LB: RB:					Instream Cover Types:					% Instream Cover					

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

Part I - Stream Physical Characteristics Worksheet

Observers: _____ Date: ___ Time: ___ Weather conditions: _____

Stream: _____ Location of site: _____ Length of stream reach: _____

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

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_

Location of Transect	Stream Width (m)	Left Bank Slope (°)	Left Bank Erosion Potential (%)	Stream Depths (m) at Points Across Transect										Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%)
				Thalweg Depth:												
	Habitat Type (Circle One) Riffle Run Glide Pool		Dominant Substrate Type			Dominant Types Riparian Vegetation: Left Bank: Right Bank:						% Gravel or Larger				
	Algae or Macrophytes (Circle One) Abundant Common Rare Absent		Width of Natural Buffer Vegetation (m) LB: RB:			Instream Cover Types:						% Instream Cover				

Location of Transect	Stream Width (m)	Left Bank Slope (°)	Left Bank Erosion Potential (%)	Stream Depths (m) at Points Across Transect										Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%)
				Thalweg Depth:												
	Habitat Type (Circle One) Riffle Run Glide Pool		Dominant Substrate Type			Dominant Types Riparian Vegetation: Left Bank: Right Bank:						% Gravel or Larger				
	Algae or Macrophytes (Circle One) Abundant Common Rare Absent		Width of Natural Buffer Vegetation (m) LB: RB:			Instream Cover Types:						% Instream Cover				

Location of Transect	Stream Width (m)	Left Bank Slope (°)	Left Bank Erosion Potential (%)	Stream Depths (m) at Points Across Transect										Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%)
				Thalweg Depth:												
	Habitat Type (Circle One) Riffle Run Glide Pool		Dominant Substrate Type				Dominant Types Riparian Vegetation: Left Bank:						Right Bank:		% Gravel or Larger	
	Algae or Macrophytes (Circle One) Abundant Common Rare Absent		Width of Natural Buffer Vegetation (m) LB: RB:				Instream Cover Types:						% Instream Cover			

Location of Transect	Stream Width (m)	Left Bank Slope (°)	Left Bank Erosion Potential (%)	Stream Depths (m) at Points Across Transect										Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%)
				Thalweg Depth:												
	Habitat Type (Circle One) Riffle Run Glide Pool		Dominant Substrate Type				Dominant Types Riparian Vegetation: Left Bank:						Right Bank:		% Gravel or Larger	
	Algae or Macrophytes (Circle One) Abundant Common Rare Absent		Width of Natural Buffer Vegetation (m) LB: RB:				Instream Cover Types:						% Instream Cover			

Location of Transect	Stream Width (m)	Left Bank Slope (°)	Left Bank Erosion Potential (%)	Stream Depths (m) at Points Across Transect										Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%)
				Thalweg Depth:												
	Habitat Type (Circle One) Riffle Run Glide Pool		Dominant Substrate Type				Dominant Types Riparian Vegetation: Left Bank:						Right Bank:		% Gravel or Larger	
	Algae or Macrophytes (Circle One) Abundant Common Rare Absent		Width of Natural Buffer Vegetation (m) LB: RB:				Instream Cover Types:						% Instream Cover			

Location of Transect	Stream Width (m)	Left Bank Slope (°)	Left Bank Erosion Potential (%)	Stream Depths (m) at Points Across Transect										Right Bank Slope (°)	Right Bank Erosion Potential (%)	Tree Canopy (%)
				Thalweg Depth:												
	Habitat Type (Circle One) Riffle Run Glide Pool		Dominant Substrate Type				Dominant Types Riparian Vegetation: Left Bank:						Right Bank:		% Gravel or Larger	
	Algae or Macrophytes (Circle One) Abundant Common Rare Absent		Width of Natural Buffer Vegetation (m) LB: RB:				Instream Cover Types:						% Instream Cover			

HABITAT ASSESSMENT

Part II – Summary of Physical Characteristics of Water Body



Part II - Summary of Physical Characteristics of Water Body

Stream name	M. Cibolo 12927
Date of assessment	8/26/2002
Stream bed slope over evaluated reach	0.0061
Approximate drainage area above transect furthest downstream	740km ²
Stream order	4
Length of stream evaluated	250m
Number of lateral transects made	5
Average stream width	9.22m
Average stream depth	0.33m
Instantaneous flow	4.85 ft ³ /sec
Indicate flow measurement method	Current Meter
Channel flow status	Moderate
Maximum pool width	5m
Maximum pool depth	0.5 - 1m
Total number of stream bends	4
Number of well defined bends	0
Number of moderately defined bends	1
Number of poorly defined bends	3
Total number of riffles	3
Dominant substrate type	Bedrock
Average percent of substrate gravel sized or larger	43%
Average percent instream cover	46%
Number of stream cover types	9
Average percent stream bank erosion potential	58%
Average stream bank slope	68°
Average width of vegetative buffer	>20m
Average riparian vegetation percent composition by:	
Trees	19%
Shrubs	15%
Grasses/Forbes	15.50%
Cultivated Fields	
Other	50.50%
Average percent tree canopy coverage	66%
Overall aesthetic appraisal of stream	Common

Part II - Summary of Physical Characteristics of Water Body

Stream name	M.Cibolo 12924
Date of assessment	8/27/2002
Stream bed slope over evaluated reach	0.0013
Approximate drainage area above transect furthest downstream	772km ²
Stream order	4
Length of stream evaluated	455m
Number of lateral transects made	6
Average stream width	26.43m
Average stream depth	0.45m
Instantaneous flow	8.66 ft ³ /sec
Indicate flow measurement method	Current Meter
Channel flow status	Moderate
Maximum pool width	20m
Maximum pool depth	>1m
Total number of stream bends	1
Number of well defined bends	0
Number of moderately defined bends	0
Number of poorly defined bends	1
Total number of riffles	2
Dominant substrate type	Cobble
Average percent of substrate gravel sized or larger	70%
Average percent instream cover	32.50%
Number of stream cover types	7
Average percent stream bank erosion potential	79%
Average stream bank slope	35°
Average width of vegetative buffer	>20m
Average riparian vegetation percent composition by:	
Trees	27.00%
Shrubs	22.00%
Grasses/Forbes	24.00%
Cultivated Fields	
Other	27.00%
Average percent tree canopy coverage	0%
Overall aesthetic appraisal of stream	Common

Part II - Summary of Physical Characteristics of Water Body

Stream name	M.Cibolo 12921
Date of assessment	8/28/2002
Stream bed slope over evaluated reach	0.0012
Approximate drainage area above transect furthest downstream	784km ²
Stream order	4
Length of stream evaluated	250m
Number of lateral transects made	5
Average stream width	8.35m
Average stream depth	0.51m
Instantaneous flow	14.63 ft ³ /sec
Indicate flow measurement method	Current Meter
Channel flow status	Moderate
Maximum pool width	10m
Maximum pool depth	>1m
Total number of stream bends	3
Number of well defined bends	1
Number of moderately defined bends	0
Number of poorly defined bends	2
Total number of riffles	1
Dominant substrate type	Cobble
Average percent of substrate gravel sized or larger	81%
Average percent instream cover	47%
Number of stream cover types	5
Average percent stream bank erosion potential	65%
Average stream bank slope	60°
Average width of vegetative buffer	>20m
Average riparian vegetation percent composition by:	
Trees	8%
Shrubs	28%
Grasses/Forbes	23%
Cultivated Fields	
Other	41%
Average percent tree canopy coverage	39%
Overall aesthetic appraisal of stream	Common

HABITAT ASSESSMENT

Part III – Habitat Quality Indices



Part III - Habitat Quality Index

Habitat Parameter	Scoring Category		Location: 12927	Date: 8/26/02
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: 3	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: 3	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 auxiliary 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: 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: 1	3	2	1	0
Total Score: 18	INTERMEDIATE			

Part III - Habitat Quality Index

Habitat Parameter	Scoring Category		Location: 12924	Date: 8/27/02
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: 3	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: 3	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 auxiliary 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: 1	3	2	1	0
Total Score: 20	HIGH			

Part III - Habitat Quality Index

Habitat Parameter	Scoring Category		Location: 12921	Date: 8/28/02
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: 3	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: 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: 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: 1	3	2	1	0
Total Score: 20	HIGH			