

# **APPENDIX C**

## **FORMS FOR BIOLOGICAL MONITORING PACKETS**

---

The forms included in this appendix should be used when preparing a biological monitoring packet to be submitted to the TCEQ. Some of the forms will be used in every biological monitoring packet and some forms will be specific to a particular purpose such as an RWA.

# Elements of the Biological Data Summary Packet

This document provides guidance for **submitting** biological data that are collected for Routine ALM, ALU, UAA, and RWA. For guidance in the *collection* of the biological data consult the TCEQ *Surface Water Quality Monitoring Procedures Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data* (RG-416) in conjunction with the current approved version of the *Guidance for Assessing Texas Surface and Finished Drinking Water Quality Data*.

The minimum data which should be submitted to the TCEQ as part of any biological assessment must contain the data in items 1 through 4 below. These items should be compiled in a packet and submitted to the TCEQ. If submitting the data as part of a UAA, please also utilize the UAA Report Outline to ensure the summary of the collection efforts is complete. The TCEQ regional staff should submit the packets to the SWQM Team. CRP Planning Agencies and other cooperating entities should submit packets to the appropriate TCEQ CRP or appropriate Project Manager. Item 5 is optional.

1. Aquatic life monitoring and habitat assessment checklist.
2. Biological assessment
  - TCEQ nekton biological data reporting form or equivalent for seining efforts.
  - TCEQ nekton biological data reporting form or equivalent for electrofishing efforts.
  - TCEQ benthic macroinvertebrate biological data reporting form or equivalent.
3. Habitat assessment
  - TCEQ habitat reporting form or equivalent.
  - Part I: Stream physical characteristics worksheet.
  - Part II: Summary of physical characteristics of water body.
4. Field data reporting form or equivalent and stream flow (discharge) measurement form or equivalent.
5. Metric sets for biological and habitat assessments
  - Ecoregion scoring criteria for determining ALU–nekton
  - Scoring criteria for benthic macroinvertebrate rapid bioassessment (RBA)
    - Scoring criteria for benthic macroinvertebrate quantitative samples (Surber)
    - Part III: Habitat quality index

# Aquatic Life Monitoring and Habitat Assessment Checklist

## Background Information

Name of water body: \_\_\_\_\_

Segment number: \_\_\_\_\_ Station ID: \_\_\_\_\_

On segment: Yes No

Permit number, if applicable: \_\_\_\_\_ Circle monitoring objective: ALM ALU UAA RWA

Historic stream characterization:

Intermittent      Intermittent with perennial pools      Perennial      Unknown  
                                  sufficient to support significant aquatic  
                                  life use

Basis for historic stream characterization (describe):

Current aquatic life use designation (if classified segment or site specific standard determined):

Exceptional    High    Intermediate    Limited

Current assessment status on the (year) \_\_\_\_\_ Water Quality Inventory, 305(b) Report:

Supported    Partially Supported    Not Supported    Concern    Not Assessed

Field data entry (FDE) information:    Date entered into FDE: \_\_\_\_\_    RTAG #: \_\_\_\_\_  
 (TCEQ regional biologists only)

Field data (CRP partners only):      Tag #: \_\_\_\_\_

## Objective for Aquatic Life Use Assessment

Is this water body supporting its designated uses? Yes No    Reason: \_\_\_\_\_

Known or potential causes of aquatic life use concern or impairment: \_\_\_\_\_

Identify sources of pollution:

Point source:      Yes      No      Identify: \_\_\_\_\_

Nonpoint source:    Yes    No      Identify: \_\_\_\_\_

Ambient toxicity tests in water body? Yes No

Results:

	Sediment Chronic	Sediment Acute	Water Chronic	Water Acute
Significant effect				
No significant effect				

## Monitoring Information

Biological monitoring conducted during index period (03/15 to 06/30 and 10/01 to 10/15) and critical period (07/01-09/30).

**Stream characterization event 1, date:**

Dry	Pools covering _____% of the _____ meters assessed	Flowing at _____ cfs (measured)
-----	---	------------------------------------

**Note:** If sampling event for a RWA, characterize the receiving stream upstream of the existing discharge point or downstream of the proposed discharge point.

**Stream characterization event 2, date:**

Dry	Pools Covering _____% of the _____ meters assessed	Flowing at _____ cfs (measured)
-----	---	------------------------------------

Describe conditions which may have adversely affected stream during each sampling event (for example, recent rains, drought, construction):

**Nekton sampling event 1:**

Minimum 15-minute (900 seconds) electrofishing: Yes No  
 Minimum 6 seine hauls (or equivalent effort to sample 60 meters): Yes No  
 Fish sampling conducted in all available habitat types: Yes No  
**If no**, please describe why:

**Benthic macroinvertebrate sampling event 1:**

Indicate method(s) used:  
 Rapid bioassessment (5-minute kicknet or snags): \_\_\_\_\_  
 Quantitative (Surber, snags, or dredge): \_\_\_\_\_

**Habitat assessment event 1:**

TCEQ habitat protocols: Yes No

**Stream flow measurement event 1:**

Instantaneous measurement: Yes No  
 USGS gauge reading: Yes No

**Nekton sampling event 2:**

Minimum 15-minute (900 seconds) electrofishing: Yes No  
 Minimum 6 seine hauls (or equivalent effort to sample 60 meters): Yes No  
 Fish sampling conducted in all available habitat types: Yes No  
**If no**, please describe why:

**Benthic macroinvertebrate sampling event 2:**

Indicate method(s) Used:  
 Rapid bioassessment (5-minute kicknet or snags): \_\_\_\_\_  
 Quantitative (Surber, snags or dredge): \_\_\_\_\_

**Habitat assessment event 2:**

TCEQ habitat protocols: Yes No  
**If no**, flow, wetted channel width, photographs, description of bank conditions relative to first event, and description of canopy cover conditions relative to first event must be provided in this packet.

**Stream flow measurement event 2:**

Instantaneous measurement: Yes No  
 USGS gauge reading: Yes No

**Assessment Results (Optional)**

**Fish community index event 1:**

Exceptional High Intermediate Limited

**Fish community index event 2:**

Exceptional High Intermediate Limited

**Benthic macroinvertebrate community index event 1:**

Exceptional High Intermediate Limited

**Benthic macroinvertebrate community index event 2:**

Exceptional High Intermediate Limited

**Habitat index event 1:**

Exceptional High Intermediate Limited

**Habitat index event 2:**

Exceptional High Intermediate Limited

# **Outline for Use Attainability Analysis Report**

## ***Introduction***

- Problem statement
- Objectives

## ***Study Area***

- Description of water body and designated uses and criteria
- Environmental features and population characteristics
- Permitted discharges
- Nonpoint sources
- Summary of historical data

## ***Methodologies***

- Station descriptions
- Sampling methods
- Survey descriptions

## ***Results and Discussions***

- Physical evaluation
  - Hydrology
  - Habitat
- Physicochemical evaluation
- Biological evaluation
  - Fish
  - Benthic macroinvertebrates
  - Other

## ***Conclusions***

## ***References***

## ***Appendices***

# Biological Monitoring Data Reporting Packet

The following pages comprise the TCEQ's standard biological monitoring data reporting packet. These forms are available online at [www.tnrcc.state.tx.us/water/quality/data/wqm/swqm\\_resources.html#guidance](http://www.tnrcc.state.tx.us/water/quality/data/wqm/swqm_resources.html#guidance)



## Nekton Parameter Codes

NOTE: All measurements reported in metric units

Nekton Parameter Codes					
98005		Nekton, None Captured	98003		Total # Fish Species (Richness)
89944		Electrofishing Effort, Duration of Shocking (sec.)	98008		Total # of Sunfish Species (except bass)
89947		Seining Effort (# of Seine Hauls)	98010		Total # of Intolerant Fish Species
89948		Combined Length of Seine Hauls (meters)	98070		% of individuals as tolerant species (excluding western mosquitofish)
89949		Seining Effort, Duration (min.)	98017		Omnivore Individuals (% of community)
89930		Minimum Seine Mesh Size, net average bar (inches)	98021		Invertivore Individuals (% of community)
89931		Maximum Seine Mesh Size, net average bar (inches)	98022		Piscivore Individuals (% of community)
89941		Net Length (meters)	98039		Total # of Individuals, Seining
89943		Electrofishing Method (1= boat, 2=backpack, 3=tote barge)	98040		Total # of Individuals, Electrofishing
89976		Area Seined (m <sup>2</sup> )	98062		# of individuals per seine haul
89961		Ecoregion (Texas Ecoregion Code)	98069		# of individuals per minute electrofishing
98032		Total # of Native Cyprinid Species	98052		Total # of Benthic Invertivore Species
98033		Individuals as Non-native Species (% of community)	98053		Total # of Benthic Species (catfish, suckers, and darters)
98030		Individuals with Disease / Anomalies (% of community)			
Additional Parameters					
89942		Net or Hook & Line Effort, Duration in Water (hrs)	89951		Cooling Water Intake Screen (1=revolving, 2=static)
89945		Castnetting Effort (# of casts)	89940		Intake Screen Collection, Duration (min.)
89907		Trawl, Otter, Duration (min.)	89953		Trawl, Otter, Width (meters)



## Benthic Macroinvertebrate Parameter Codes

NOTE: All measurements reported in metric units

\* Indicates parameter measured at sample point (for example, riffle from which benthic sample is collected)

Quantitative Benthic Sample Descriptors					
89899		Biological Data Reporting Units (Values: 1= number of individuals from sub-sample; 2 = number of individuals/ft <sup>2</sup> ; 3 = number of individuals/m <sup>2</sup> ; 4 = total number in kicknet)	89946		Mesh size, any net or sieve (diagonal measurements) for benthic collection (cm)
89901		Surber Sampler Effort, area sampled (m <sup>2</sup> )	89961		Ecoregion (Texas Ecoregion Code)
89935		Ekman Sampler Effort, area sampled (m <sup>2</sup> )	84161		Stream Order
89934		Petersen Sampler Effort, area sampled (m <sup>2</sup> )	90005		Benthos Sampled–No Organisms Present
89933		Hester-Dendy Duration (days)	90055		Total Taxa (Taxa Richness), Benthos # Taxa
89950		Benthic Sampler (1=Surber, 2=Ekman, 3=kicknet, 4=Petersen, 5=Hester-Dendy)	90056		Total # of Diptera Taxa
89975		Area of snag surface sampled (m <sup>2</sup> )	90057		Total # of Ephemeroptera Taxa
**89921		Percent undercut bank at sample point (%)	90058		Total # of Intolerant Taxa
**89922		Percent overhanging brush at sample point (%)	90060		EPT Taxa (% of community)
**89923		Percent gravel substrate at sample point (%)	90062		Chironomidae (% of community)
**89924		Percent sand substrate at sample point (%)	90066		Tolerant Taxa (% of community), Benthos
**89925		Percent soft bottom at sample point (%)	90020		Benthic Grazers (% of community)
**89926		Percent macrophyte bed at sample point (%)	90025		Benthic Gatherers (% of community)
**89927		Percent snags and brush at sample point (%)	90030		Benthic Filterers (% of community)
**89928		Percent bedrock at sample point (%)	90067		Dominance (3 Taxa) (% of community)
RBAP Benthic Sample Descriptors					
89899		Biological Data Reporting Units (Values: 1= number of individuals from sub-sample; 2 = number of individuals/ft <sup>2</sup> ; 3 = number of individuals/m <sup>2</sup> ; 4 = total number in kicknet)	89946		Mesh size, sieve (diagonal measurements) (cm)
89950		Benthic Sampler (1=Surber, 2=Ekman, 3=kicknet, 4=Petersen, 5=Hester-Dendy)	89961		Ecoregion (Texas Ecoregion Code)
89902		Dip Net Effort, area swept (m <sup>2</sup> )	84161		Stream Order
89903		Kicknet Effort, area kicked (m <sup>2</sup> )	90005		Benthos Sampled–No Organisms Present
89904		Kicknet Effort, minutes kicked (min.)	90055		Total Taxa (Taxa Richness), Benthos, # Taxa
89905		Snags and Shoreline Sampling Effort, minutes picked	90008		EPT Taxa Abundance (# Taxa)
89906		Number of individuals in benthic RBA sub-sample (± 100)	90007		Biotic Index (HBI)
89950		Benthic Sampler (1=Surber, 2=Ekman, 3=kicknet, 4=Petersen, 5=Hester-Dendy)	90062		Chironomidae (% of community)
**89921		Percent undercut bank at sample point (%)	90042		Dominant Taxon, Benthos (% of community)
**89922		Percent overhanging brush at sample point (%)	90010		Dominant Functional Feeding Group (% of community)
**89923		Percent gravel substrate at sample point (%)	90036		Benthic Predators (% of community)
**89924		Percent sand substrate at sample point (%)	90050		Ratio of Intolerant: Tolerant Taxa
**89925		Percent soft bottom at sample point (%)	90069		% of Total Trichoptera as Hydropsychidae
**89926		Percent macrophyte bed at sample point (%)	90052		Total # Non-insect Taxa
**89927		Percent snags and brush at sample point (%)	90025		Benthic Collector-Gatherers (% of community)
**89928		Percent bedrock at sample point (%)	90054		% of Total # as Elmidae (% of community)



## HABITAT DESCRIPTORS

**NOTE: All measurements reported in metric units (except for flow)**

72051		Streambed slope over evaluated reach (from USGS map; elevation change in meters/reach length in kilometers)	89844		Dominant substrate type (1=clay, 2=silt, 3=sand, 4=gravel, 5=cobble, 6=boulder, 7=bedrock, 8=other)
89859		Approximate drainage area above the most downstream transect from USGS map (km <sup>2</sup> )	89845		Average percent of substrate gravel size (> 2mm) or larger (%)
89860		Length of stream evaluated (km)	84159		Average percent instream cover (%)
89832		Number of lateral transects that were made	89929		Number of stream cover types
89861		Average stream width (m)	89846		Average percent stream bank erosion (%)
89862		Average stream depth (m)	89847		Average stream bank angle (degrees)
00061		Instantaneous stream flow (ft <sup>3</sup> /sec)	89866		Average width of natural riparian vegetation (m)
89835		Flow measurement method 1=Flow Gage Station, 2= Electronic, 3=Mechanical, 4=Weir/Flume <b>Note:</b> Use either 74069 or 00061, not both	89849		Average percent trees as riparian vegetation (%)
			89850		Average percent shrubs as riparian vegetation (%)
89848		Channel Flow Status 1=no flow, 2=low, 3=moderate, 4=high	89851		Average percent grasses and forbs as riparian vegetation (%)
89864		Maximum pool width at time of study (m)	89852		Average percent cultivated fields as riparian vegetation (%)
89865		Maximum pool depth in study area (m)	89853		Average percent other as riparian vegetation (%)
89839		Total number of stream bends	89854		Average percent tree canopy coverage (%)
89840		Number of well defined stream bends	89867		Aesthetics (1=wilderness, 2=natural, 3=common, 4=offensive)
89841		Number of moderately defined stream bends	84161		Stream order
89842		Number of poorly defined stream bends	89961		Ecoregion (Texas Ecoregion Code)
89843		Total number of riffles	89962		Land development impact (1=unimpacted, 2=low, 3=moderate, 4=high)

<b>Specific to No Flow With Isolated Pools</b>			
Largest Pool (m)	89910		Max Depth
	89908		Max Width
	89909		Max Length
Smallest Pool (m)	89911		Max Depth
	89912		Max Width
	89913		Max Length
# perennial pools evaluated	89914		

TCEQ-20157 (Rev. 4-05-2005)

**Texas Commission on Environmental Quality  
Surface Water Quality Monitoring Program**

**Quantitative Biological Scoring for Evaluating  
Aquatic Life Use Subcategories  
Regional Criteria Worksheets for Fish**

C-13

<b>Ecoregion 24</b>					
<b>Stream Name:</b>		<b>Location:</b>		<b>Date:</b>	
<b>Collector:</b>		<b>County:</b>			
<b>No. seine hauls:</b>		<b>Electrofishing effort (min):</b>			
<b>Metric Category</b>	<b>Intermediate Totals for Metrics</b>		<b>Metric Name</b>	<b>Raw Value</b>	<b>IBI Score</b>
	Drainage basin size (km <sup>2</sup> )				
<b>Species richness and composition</b>	Number of fish species		Number of fish species		
	Number of native cyprinid species		Number of native cyprinid species		
	Number of benthic invertivore species		Number of benthic invertivore species		
	Number of sunfish species		Number of sunfish species		
	Number of intolerant species		Number of intolerant species		
	Number of individuals as tolerants <sup>a</sup>		% of individuals as tolerant species <sup>a</sup>		
<b>Trophic composition</b>	Number of individuals as omnivores		% of individuals as omnivores		
	Number of individuals as invertivores		% of individuals as invertivores		
<b>Fish abundance and condition</b>	Number of individuals (seine)		Number of individuals in sample		
	Number of individuals (electrofishing)		Number of individuals/seine haul		
	Number of individuals in sample		Number of individuals/min electrofishing		
	# of individuals as non-native species		% of individuals as non-native species		
	# of individuals with disease/anomaly		% of individuals with disease/anomaly		
			<b>Index of biotic integrity numeric score:</b>		

**Note:** This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

<sup>a</sup> Excluding western mosquitofish

**Aquatic life use:**

**Texas Commission on Environmental Quality  
Surface Water Quality Monitoring Program**

**Quantitative Biological Scoring for Evaluating  
Aquatic Life Use Subcategories  
Regional Criteria Worksheets for Fish**

C-14

Ecoregion 25 and 26					
Stream Name:		Location:		Date:	
Collector:		County:			
No. seine hauls:		Electrofishing effort (min):			
Metric Category	Intermediate Totals for Metrics		Metric Name	Raw Value	IBI Score
	Drainage basin size (km <sup>2</sup> )				
<b>Species richness and composition</b>	Number of fish species		Number of fish species		
	Number of native cyprinid species		Number of native cyprinid species		
	Number of sunfish species		Number of sunfish species		
<b>Trophic composition</b>	Number of individuals as omnivores		% of individuals as omnivores		
	Number of individuals as invertivores		% of individuals as invertivores		
<b>Fish abundance and condition</b>	Number of individuals (seine)		Number of individuals in sample		
	Number of individuals in sample		Number of individuals/seine haul		
	# of individuals as non-native species		% of individuals as non-native species		
	# of individuals with disease/anomaly		% of individuals with disease/anomaly		
			<b>Index of biotic integrity numeric score:</b>		

**Note:** This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

**Texas Commission on Environmental Quality  
Surface Water Quality Monitoring Program**

**Quantitative Biological Scoring for Evaluating  
Aquatic Life Use Subcategories  
Regional Criteria Worksheets for Fish**

C-15

Ecoregion 27, 29, and 32					
Stream Name:		Location:		Date:	
Collector:		County:			
No. seine hauls:		Electrofishing effort (min):			
Metric Category	Intermediate Totals for Metrics		Metric Name	Raw Value	IBI Score
	Drainage basin size (km <sup>2</sup> )				
<b>Species richness and composition</b>	Number of fish species		Number of fish species		
	Number of native cyprinid species		Number of native cyprinid species		
	Number of benthic invertivore species		Number of benthic invertivore species		
	Number of sunfish species		Number of sunfish species		
	Number of individuals as tolerants <sup>a</sup>		% of individuals as tolerant species <sub>a</sub>		
<b>Trophic composition</b>	Number of individuals as omnivores		% of individuals as omnivores		
	Number of individuals as invertivores		% of individuals as invertivores		
	Number of individuals as piscivores		% of individuals as piscivores		
<b>Fish abundance and condition</b>	Number of individuals (seine)		Number of individuals in sample		
	Number of individuals (electrofishing)		Number of individuals/seine haul		
	Number of individuals in sample		Number of individuals/min electrofishing		
	# of individuals as non-native species		% of individuals as non-native species		
	# of individuals with disease/anomaly		% of individuals with disease/anomaly		
			<b>Index of biotic integrity numeric score:</b>		
			<b>Aquatic life use:</b>		

**Note:** This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

<sup>a</sup> Excluding western mosquitofish

Texas Commission on Environmental Quality  
Surface Water Quality Monitoring Program

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

C-16

Ecoregion 30				
Stream Name:		Location:		Date:
Collector:		County:		
No. seine hauls:		Electrofishing effort (min):		
Metric Category	Intermediate Totals for Metrics	Metric Name	Raw Value	IBI Score
	Drainage basin size (km <sup>2</sup> )			
Species richness and composition	Number of fish species	Number of fish species		
	Number of native cyprinid species	Number of native cyprinid species		
	Number of benthic invertivore species	Number of benthic invertivore species		
	Number of sunfish species	Number of sunfish species		
	Number of intolerant species	Number of intolerant species		
	Number of individuals as tolerants <sup>a</sup>	% of individuals as tolerant species <sub>a</sub>		
Trophic composition	Number of individuals as omnivores	% of individuals as omnivores		
	Number of individuals as invertivores	% of individuals as invertivores		
	Number of individuals as piscivores	% of individuals as piscivores		
Fish abundance and condition	Number of individuals (seine)	Number of individuals in sample		
	Number of individuals (electrofishing)	Number of individuals/seine haul		
	Number of individuals in sample	Number of individuals/min electrofishing		
	# of individuals as non-native species	% of individuals as non-native species		
	# of individuals with disease/anomaly	% of individuals with disease/anomaly		
<b>Index of biotic integrity numeric score:</b>				

**Note:** This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

<sup>a</sup> Excluding western mosquitofish

**Texas Commission on Environmental Quality  
Surface Water Quality Monitoring Program**

**Quantitative Biological Scoring for Evaluating  
Aquatic Life Use Subcategories  
Regional Criteria Worksheets for Fish**

C-17

<b>Ecoregion 31</b>				
<b>Stream Name:</b>		<b>Location:</b>		<b>Date:</b>
<b>Collector:</b>		<b>County:</b>		
<b>No. seine hauls:</b>		<b>Electrofishing effort (min):</b>		
<b>Metric Category</b>	<b>Intermediate Totals for Metrics</b>	<b>Metric Name</b>	<b>Raw Value</b>	<b>IBI Score</b>
	Drainage basin size (km <sup>2</sup> )			
<b>Species richness and composition</b>	Number of fish species		Number of fish species	
	Number of native cyprinid species		Number of native cyprinid species	
	Number of benthic species		Number of benthic species	
	Number of sunfish species		Number of sunfish species	
	Number of individuals as tolerants <sup>a</sup>		% of individuals as tolerant species <sup>a</sup>	
<b>Trophic composition</b>	Number of individuals as omnivores		% of individuals as omnivores	
	Number of individuals as invertivores		% of individuals as invertivores	
	Number of individuals as piscivores		% of individuals as piscivores	
<b>Fish abundance and condition</b>	Number of individuals (seine)		Number of individuals in sample	
	Number of individuals (electrofishing)		Number of individuals/seine haul	
	Number of individuals in sample		Number of individuals/min electrofishing	
	# of individuals as non-native species		% of individuals as non-native species	
	# of individuals with disease/anomaly		% of individuals with disease/anomaly	
			<b>Index of biotic integrity numeric score:</b>	

**Note:** This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

<sup>a</sup> Excluding western mosquitofish

**Aquatic life use:**

**Texas Commission on Environmental Quality  
Surface Water Quality Monitoring Program**

**Quantitative Biological Scoring for Evaluating  
Aquatic Life Use Subcategories  
Regional Criteria Worksheets for Fish**

C-18

<b>Ecoregion 33 and 35</b>				
<b>Stream Name:</b>		<b>Location:</b>		<b>Date:</b>
<b>Collector:</b>		<b>County:</b>		
<b>No. seine hauls:</b>		<b>Electrofishing effort (min):</b>		
<b>Metric Category</b>	<b>Intermediate Totals for Metrics</b>	<b>Metric Name</b>	<b>Raw Value</b>	<b>IBI Score</b>
	Drainage basin size (km <sup>2</sup> )			
<b>Species richness and composition</b>	Number of fish species		Number of fish species	
	Number of native cyprinid species		Number of native cyprinid species	
	Number of benthic invertivore species		Number of benthic invertivore species	
	Number of sunfish species		Number of sunfish species	
	Number of intolerant species		Number of intolerant species	
	Number of individuals as tolerant <sup>a</sup>		% of individuals as tolerant species <sub>a</sub>	
<b>Trophic composition</b>	Number of individuals as omnivores		% of individuals as omnivores	
	Number of individuals as invertivores		% of individuals as invertivores	
	Number of individuals as piscivores		% of individuals as piscivores	
<b>Fish abundance and condition</b>	Number of individuals (seine)		Number of individuals in sample	
	Number of individuals (electrofishing)		Number of individuals/seine haul	
	Number of individuals in sample		Number of individuals/min electrofishing	
	# of individuals as non-native species		% of individuals as non-native species	
	# of individuals with disease/anomaly		% of individuals with disease/anomaly	
			<b>Index of biotic integrity numeric score:</b>	

**Note:** This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

<sup>a</sup> Excluding western mosquitofish

**Aquatic life use:**

**Texas Commission on Environmental Quality  
Surface Water Quality Monitoring Program**

**Quantitative Biological Scoring for Evaluating  
Aquatic Life Use Subcategories  
Regional Criteria Worksheets for Fish**

C-19

<b>Ecoregion 34</b>				
<b>Stream Name:</b>		<b>Location:</b>		<b>Date:</b>
<b>Collector:</b>		<b>County:</b>		
<b>No. seine hauls:</b>		<b>Electrofishing effort (min):</b>		
<b>Metric Category</b>	<b>Intermediate Totals for Metrics</b>	<b>Metric Name</b>	<b>Raw Value</b>	<b>IBI Score</b>
	Drainage basin size (km <sup>2</sup> )			
<b>Species richness and composition</b>	Number of fish species		Number of fish species	
	Number of native cyprinid species		Number of native cyprinid species	
	Number of benthic invertivore species		Number of benthic invertivore species	
	Number of sunfish species		Number of sunfish species	
	Number of intolerant species		Number of intolerant species	
	Number of individuals as tolerant <sup>a</sup>		% of individuals as tolerant species <sub>a</sub>	
<b>Trophic composition</b>	Number of individuals as omnivores		% of individuals as omnivores	
	Number of individuals as invertivores		% of individuals as invertivores	
<b>Fish abundance and condition</b>	Number of individuals (seine)		Number of individuals in sample	
	Number of individuals (electrofishing)		Number of individuals/seine haul	
	Number of individuals in sample		Number of individuals/min electrofishing	
	# of individuals as non-native species		% of individuals as non-native species	
	# of individuals with disease/anomaly		% of individuals with disease/anomaly	
			<b>Index of biotic integrity numeric score:</b>	

**Note:** This data should be incorporated with water quality, habitat, and other available biological data to assign an overall stream score.

<sup>a</sup> Excluding western mosquitofish

**Aquatic life use:**

**Texas Commission on Environmental Quality  
Surface Water Quality Monitoring Program**

**Metrics and Scoring for Kick Samples, Rapid  
Bioassessment Protocol - Benthic Macroinvertebrates**

<b>Stream Name:</b>					
<b>Date:</b>		<b>Collectors:</b>			
<b>Location:</b>					
<b>County:</b>		<b>Ecoregion #:</b>			
<b>Type of assessment:</b>		UAA	ALA	ALM	RWA
<b>Metric</b>	<b>Value</b>		<b>Score</b>		
1. Taxa richness					
2. EPT taxa abundance					
3. Biotic index (HBI)					
4. % Chironomidae					
5. % Dominant taxon					
6. % Dominant FFG					
7. % Predators					
8. Ratio of intolerant:tolerant taxa					
9. % of total trichoptera as Hydropsychidae					
10. # of non-insect taxa					
11. % Collector-gatherers					
12. % of total number as Elmidae					
Aquatic life use point score ranges:	Exceptional: High: Intermediate: Limited:		> 36 29-36 22-28 < 22		
<b>Total score:</b>					
<b>Aquatic life use:</b>					

**Texas Commission on Environmental Quality  
Surface Water Quality Monitoring Program**

**Metrics and Scoring for Surber  
Samples for Benthic Macroinvertebrates by Bioregion:  
Central, East, or North**

<b>Stream Name:</b>					
<b>Date:</b>		<b>Collectors:</b>			
<b>Location:</b>					
<b>County:</b>		<b>Ecoregion #:</b>			
<b>Type of assessment:</b>		UAA	ALA	ALM	RWA
<b>Metric</b>		<b>Value</b>		<b>Score</b>	
1. Total taxa					
2. Diptera taxa					
3. Ephemeroptera taxa					
4. Intolerant taxa					
5. % EPT taxa					
6. % Chironomidae					
7. % Tolerant taxa					
8. % Grazers					
9. % Gatherers					
10. % Filterers					
11. % Dominance (3 taxa)					
Aquatic life use point score ranges:		Exceptional: High: Intermediate: Limited:		> 40 31-40 21-30 < 21	
<b>Total Score:</b>					
<b>Aquatic Life Use:</b>					



Page 1 of ____		<b>Part I - Stream Physical Characteristics Worksheet</b>			
Observers:		Date:		Time:	
Weather conditions:					
Stream:			Stream segment no.		
Location of site:				Length of reach:	
Observed stream uses:					
Stream type (circle one): <b>perennial</b> or <b>intermittent w/ perennial pools</b>					
<b>Stream bends:</b>		No. well defined	No. moderately defined		No. poorly defined
Aesthetics (circle one): <b>(1) wilderness</b> <b>(2) natural</b> <b>(3) common</b> <b>(4) offensive</b>					
Channel obstructions or modifications:				No. of riffles	
Channel flow status (circle one): <b>high</b> <b>moderate</b> <b>low</b> <b>no flow</b>					
Riparian vegetation (%):		<b>Left Bank</b>	<b>Right Bank</b>	Maximum Pool Depth:	
Trees				Maximum Pool Width:	
Shrubs				<b>Notes</b>	
Grasses or forbs					
Cultivated fields					
Other					
<b>Site map:</b>					

TCEQ 20156-A (Rev. 4-15-2004)

**Part I - Stream Physical Characteristics Worksheet (continued)**

Date: \_\_\_\_\_ Stream Name: \_\_\_\_\_

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 (%)			
																		Total	
	Habitat type (circle one) <b>Riffle</b> <b>Run</b> <b>Glide</b> <b>Pool</b>		Dominant substrate type			Dominant types riparian vegetation: Left bank:  Right bank:										% Gravel or larger	CL		
Macrophytes (circle one) <b>Abundant</b> <b>Common</b> <b>Rare</b> <b>Absent</b>	Algae (circle one) <b>Abundant</b> <b>Common</b> <b>Rare</b> <b>Absent</b>		Width of natural buffer		Instream cover types:										% Instream cover	LB			
			LB:	RB:														RB	
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 (%)			
																	Total		
	Habitat type (Circle One) <b>Riffle</b> <b>Run</b> <b>Glide</b> <b>Pool</b>		Dominant substrate type			Dominant types riparian vegetation: Left bank:  Right bank:										% Gravel or larger	CL		
Macrophytes (circle one) <b>Abundant</b> <b>Common</b> <b>Rare</b> <b>Absent</b>	Algae (circle one) <b>Abundant</b> <b>Common</b> <b>Rare</b> <b>Absent</b>		Width of natural buffer		Instream cover types:										% Instream cover	LB			
			LB:	RB:														RB	
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 (%)			
																Total			
	Habitat type (circle one) <b>Riffle</b> <b>Run</b> <b>Glide</b> <b>Pool</b>		Dominant substrate type			Dominant types riparian vegetation: Left bank:  Right bank:										% Gravel or larger	CL		
Macrophytes (circle one) <b>Abundant</b> <b>Common</b> <b>Rare</b> <b>Absent</b>	Algae (circle one) <b>Abundant</b> <b>Common</b> <b>Rare</b> <b>Absent</b>		Width of natural buffer		Instream cover types:										% Instream cover	LB			
			LB:	RB:														RB	

C-24

**Part I - Stream Physical Characteristics Worksheet (continued)**

Date: \_\_\_\_\_ Stream Name: \_\_\_\_\_

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:																Total	
	Habitat type (circle one) Riffle Run Glide Pool	Dominant substrate type			Dominant types riparian vegetation: Left bank: Right bank:										% Gravel or larger	CL		
Macrophytes (circle one) Abundant Common Rare Absent	Algae (circle one) Abundant Common Rare Absent		Width of natural buffer		Instream cover types:										% Instream cover	LB		
			LB:	RB:												RB		
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:																Total	
	Habitat type (circle one) Riffle Run Glide Pool	Dominant substrate type			Dominant Types Riparian Vegetation: Left Bank: Right Bank:										% Gravel or Larger	CL		
Macrophytes (circle one) Abundant Common Rare Absent	Algae (circle one) Abundant Common Rare Absent		Width of natural buffer		Instream cover types:										% Instream cover	LB		
			LB:	RB:												RB		
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:																Total	
	Habitat type (circle one) Riffle Run Glide Pool	Dominant substrate type			Dominant types riparian vegetation: Left bank: Right bank:										% Gravel or larger	CL		
Macrophytes (circle one) Abundant Common Rare Absent	Algae (circle one) Abundant Common Rare Absent		Width of natural buffer		Instream cover types:										% Instream cover	LB		
			LB:	RB:												RB		

C-25

## Part II - Summary of Physical Characteristics of Water Body

Using information from all of the transects and measurements in Part I and other sources, report the following general characteristics or averages for the entire reach:

<b>Stream Name:</b>	<b>Date:</b>
<b>Physical Characteristics</b>	<b>Value</b>
Stream bed slope over evaluated reach (from USGS map; elevation change in meters/reach length in kilometers)	
Approximate drainage area above the transect furthest downstream (from USGS or county highway map in km <sup>2</sup> )	
Stream order	
Length of stream evaluated (meters or kilometers)	
Number of lateral transects made	
Average stream width (meters)	
Average stream depth (meters)	
Stream discharge (ft <sup>3</sup> /sec)	
Flow measurement method	
Channel flow status (high, moderate, low, or no flow)	
Maximum pool width (meters)	
Maximum pool depth (meters)	
Total number of stream bends	
Number of well defined bends	
Number of moderately defined bends	
Number of poorly defined bends	
Total number of riffles	
Dominant substrate type	
Average percent of substrate gravel sized or larger	
Average percent instream cover	
Number of stream cover types	
Average percent stream bank erosion potential	
Average stream bank slope (degrees)	
Average width of natural buffer vegetation (meters)	
Average riparian vegetation percent composition by: (total to equal 100%)	
Trees	
Shrubs	
Grasses and Forbs	
Cultivated fields	
Other	
Average percent tree canopy coverage	
Overall aesthetic appraisal of the stream	

TCEQ 20156-B (Rev. 4-15-2004)

### Part III - Habitat Quality Index

Habitat Parameter	Scoring Category			
<b>Available Instream Cover</b>  Score_____	<b>Abundant</b> >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	<b>Common</b> 30-50% of substrate supports stable habitat; adequate habitat for maintenance of populations; may be limited in the number of different habitat types	<b>Rare</b> 10-29.9% of substrate supports stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed	<b>Absent</b> <10% of substrate supports stable habitat; lack of habitat is obvious; substrate unstable or lacking
	4	3	2	1
<b>Bottom Substrate Stability</b>  Score_____	<b>Stable</b> >50% gravel or larger substrate; gravel, cobble, boulders; dominant substrate type is gravel or larger	<b>Moderately Stable</b> 30-50% gravel or larger substrate; dominant substrate type is mix of gravel with some finer sediments	<b>Moderately Unstable</b> 10-29.9% gravel or larger substrate; dominant substrate type is finer than gravel, but may still be a mix of sizes	<b>Unstable</b> <10% gravel or larger substrate; substrate is uniform sand, silt, clay, or bedrock
	4	3	2	1
<b>Number of Riffles</b>  To be counted, riffles must extend >50% the width of the channel and be at least as long as the channel width  Score_____	<b>Abundant</b> ≥ 5 riffles	<b>Common</b> 2-4 riffles	<b>Rare</b> 1 riffle	<b>Absent</b> No riffles
	4	3	2	1
<b>Dimensions of Largest Pool</b>  Score_____	<b>Large</b> Pool covers more than 50% of the channel width; maximum depth is >1 meter	<b>Moderate</b> Pool covers approximately 50% or slightly less of the channel width; maximum depth is 0.5-1 meter	<b>Small</b> Pool covers approximately 25% of the channel width; maximum depth is <0.5 meter	<b>Absent</b> No existing pools; only shallow auxiliary pockets
	4	3	2	1
<b>Channel Flow Status</b>  Score_____	<b>High</b> Water reaches the base of both lower banks; < 5% of channel substrate is exposed	<b>Moderate</b> Water fills >75% of the channel; or <25% of channel substrate is exposed	<b>Low</b> Water fills 25-75% of the available channel and/or riffle substrates are mostly exposed	<b>No Flow</b> Very little water in the channel and mostly present in standing pools; or stream is dry
	3	2	1	0

**Part III - Habitat Quality Index (continued)**

Habitat Parameter	Scoring Category			
<b>Bank Stability</b>  Score _____	<b>Stable</b> Little evidence (<10%) of erosion or bank failure; bank angles average <30°	<b>Moderately Stable</b> Some evidence (10-29.9%) of erosion or bank failure; small areas of erosion mostly healed over; bank angles average 30-39.9°	<b>Moderately Unstable</b> Evidence of erosion or bank failure is common (30-50%); high potential of erosion during flooding; bank angles average 40-60°	<b>Unstable</b> Large and frequent evidence (>50%) of erosion or bank failure; raw areas frequent along steep banks; bank angles average >60°
	3	2	1	0
<b>Channel Sinuosity</b>  Score _____	<b>High</b> ≥ 2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) present	<b>Moderate</b> 1 well-defined bend  or ≥ 3 moderately-defined bends present	<b>Low</b> <3 moderately-defined bends  or only poorly-defined bends present	<b>None</b> Straight channel; may be channelized
	3	2	1	0
<b>Riparian Buffer Vegetation</b>  Score _____	<b>Extensive</b> Width of natural buffer is >20 meters	<b>Wide</b> Width of natural buffer is 10.1-20 meters	<b>Moderate</b> Width of natural buffer is 5-10 meters	<b>Narrow</b> Width of natural buffer is <5 meters
	3	2	1	0
<b>Aesthetics of Reach</b>  Score _____	<b>Wilderness</b> Outstanding natural beauty; usually wooded or unpastured area; water clarity is usually exceptional	<b>Natural Area</b> Trees and/or native vegetation are common; some development evident (from fields, pastures, dwellings); water clarity may be slightly turbid	<b>Common Setting</b> Not offensive; area is developed, but uncluttered such as in an urban park; water clarity may be turbid or discolored	<b>Offensive</b> Stream does not enhance the aesthetics of the area; cluttered; highly developed; may be a dumping area; water clarity is usually turbid or discolored
	3	2	1	0
<b>Total Score</b> _____				

**HABITAT QUALITY INDEX**

26 - 31    **Exceptional**  
 20 - 25    **High**  
 14 - 19    **Intermediate**  
 ≤ 13        **Limited**