APPENDIX C

FORMS FOR BIOLOGICAL-MONITORING PACKETS

Use the forms in this appendix when preparing a biological-monitoring packet to be submitted to the TCEQ. Some of the forms are to be used in every biological-monitoring packet and some 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 ALMs, ALUs, UAAs, and RWAs. For guidance in the **collection** of the biological data, consult the text of this manual in conjunction with the current approved version of the *2012 Guidance for Assessing and Reporting Surface Water Quality in Texas*, available online at <www.tceq.texas.gov/assets/public/waterquality/swqm/assess/12twqi/2012_guidance.pdf>.

Items 1 to 4 below are the minimum data which that should be submitted to the TCEQ, in a packet, as part of any biological assessment. If submitting the data as part of a UAA, please also use 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 authorities should submit packets to the appropriate TCEQ CRP or appropriate project manager. Item 5 is optional.

1. Checklist for aquatic-life monitoring and habitat assessment.
2. Biological assessment
   - TCEQ Nekton Biological-Data Reporting Form or equivalent for seining.
   - TCEQ Nekton Biological-Data Reporting Form or equivalent for electrofishing.
   - 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
   - Scoring criteria for benthic macroinvertebrate quantitative samples (Surber)
   - Part III—Habitat-Quality Index

Checklist: Aquatic-Life Monitoring and Habitat Assessment

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 sufficient to support significant aquatic life use	Perennial	Unknown

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 no.: _____
(TCEQ regional biologists only)

Field data (CRP partners only): Tag no.:

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 (March 15–June 30 and Oct. 1–Oct. 15) and critical period (July 1–Sept. 30).

Stream characterization event 1, date:

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

Note: If the sampling event is for an 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 that may have adversely affected the stream during each sampling event (for example, recent rains, drought, and 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

Method(s) used:

Rapid bioassessment (5-minute kicknet or snags):

Quantitative (Surber, snags, or dredge):

Habitat-assessment event 1

TCEQ habitat protocols? Yes No

Streamflow-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 not, please describe why:

Benthic-macroinvertebrate sampling event 2

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, you must provide flow, wetted-channel width, photographs, description of bank conditions relative to first event, and description of canopy-cover conditions relative to the first event in this packet.

Streamflow-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

Appendixes

Packet for Reporting Biological-Monitoring Data

These forms are available online at <www.tceq.texas.gov/goto/biopacket>.

Nekton Data-Reporting Form

RTAG# | REGION | E-MAIL ID OF COLLECTOR

STATION ID | SEGMENT | SEQUENCE | DATA SOURCE

Station Description_____

Composite—coded as Space, Time, or Both

COMPOSITE SAMPLE

COMPOSITE CATEGORY: T = Time S = Space B = Both

M M D D Y Y Y Y — START DATE

H H M M — START TIME

START DEPTH (SHALLOWEST) . — M = meters F = feet

M M D D Y Y Y Y — END DATE

H H M M — END TIME

END DEPTH (DEEPEST) . — M = meters F = feet

PARAMETRIC DATA

Enter the codes and values appropriate for this sample. Enter "<" or ">" if necessary; otherwise, leave this column blank. Continue, if necessary, on additional worksheets. Codes to describe the habitat-sampling effort are on the back.

Code	< or >	Value	Description

Choose the most characteristic location and report data from this location as representative of the entire reach.

Nekton Parameter Codes

Note: Report all measurements in metric units.

Codes					
98005		Nekton, None Captured	98003		Total No. Fish Species (Richness)
89944		Electrofishing Effort, Duration of Shocking (sec.)	98008		Total No. of Sunfish Species (except bass)
89947		Seining Effort (No. of Seine Hauls)	98010		Total No. 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 No. of Individuals, Seining
89943		Electrofishing Method (1 = boat, 2 = backpack, 3 = tote barge)	98040		Total No. of Individuals, Electrofishing
89976		Area Seined (m^2)	98062		No. of individuals per seine haul
89961		Ecoregion (Texas Ecoregion Code)	98069		No. of individuals per minute electrofishing
98032		Total No. of Native Cyprinid Species	98052		Total No. of Benthic Invertivore Species
98033		Individuals as Nonnative Species (% of community)	98053		Total No. of Benthic Species (catfish, suckers, and darters)
98030		Individuals with Disease or Anomalies (% of community)			
Additional Parameters					
89942		Net or Hook-and-Line Effort, Duration in Water (hrs.)	89951		Cooling-Water Intake Screen (1 = revolving, 2 = static)
89945		Castnetting Effort (No. of casts)	89940		Intake-Screen Collection, Duration (min.)
89907		Trawl, Otter, Duration (min.)	89953		Trawl, Otter, Width (meters)

Benthic Macroinvertebrate Data-Reporting Form

RTAG# | REGION | E-MAIL ID OF COLLECTOR

STATION ID | SEGMENT | SEQUENCE | DATA SOURCE

Station Description_____

Composite—coded as Space, Time, or Both

COMPOSITE SAMPLE

COMPOSITE CATEGORY: T=Time S=Space B=Both

M M D D Y Y Y Y — START DATE

H H M M — START TIME

START DEPTH (SHALLOWEST) . — M = meters F = feet

M M D D Y Y Y Y — END DATE

H H M M — END TIME

END DEPTH (DEEPEST) . — M = meters

PARAMETRIC DATA

Enter the codes and values appropriate for this sample. Enter "<" or ">" if necessary; otherwise, leave this column blank. Continue, if necessary, on additional worksheets. Codes to describe the habitat-sampling effort are on the back.

Code	< or >	Value	Description

Choose the most characteristic location and report data from this location as representative of the entire reach.

Benthic-Macroinvertebrate Parameter Codes

Note: Report all measurements 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= no. of individuals from subsample; 2 = no. of individuals/ft^2; 3 = no. of individuals/m^2; 4 = total no. in kicknet)	89946		Mesh size, any net or sieve (diagonal measurements) for benthic collection (cm)
89901		Surber-sampler effort, area sampled (m^2)	89961		Ecoregion (Texas Ecoregion Code)
89935		Ekman-sampler effort, area sampled (m^2)	84161		Stream order
89934		Petersen-sampler effort, area sampled ($m^{2)}$	90005		Benthos sampled—no organisms present
89933		Hester-Dendy duration (days)	90055		Total taxa (taxa richness), benthos no. taxa
89950		Benthic sampler (1 = Surber, 2 = Ekman, 3 = kicknet, 4 = Petersen, 5 = Hester-Dendy)	90056		Total no. of Diptera taxa
89975		Area of snag surface sampled (m^2)	90057		Total no. of Ephemeroptera taxa
*89921		Undercut bank at sample point (%)	90058		Total no. of intolerant taxa
*89922		Overhanging brush at sample point (%)	90060		EPT taxa (% of community)
*89923		Gravel substrate at sample point (%)	90062		Chironomidae (% of community)
*89924		Sand substrate at sample point (%)	90066		Tolerant taxa (% of community), benthos
*89925		Soft bottom at sample point (%)	90020		Benthic grazers (% of community)
*89926		Macrophyte bed at sample point (%)	90025		Benthic gatherers (% of community)
*89927		Snags and brush at sample point (%)	90030		Benthic filterers (% of community)
*89928		Bedrock at sample point (%)	90067		Dominance (3 taxa) (% of community)
RBAP Benthic Sample Descriptors					
89899		Biological-data reporting units (Values: 1 = no. of individuals from subsample; 2 = no. of individuals/ft^2; 3 = no. of individuals/m^2; 4 = total no. in kicknet)	89946		Mesh size, sieve (diagonal measurements) (cm)
89950		Benthic Sampler (1 = Surber, 2 = Ekman, 3 = kicknet, 4 = Petersen, 5 = Hester-Dendy)	89961		Texas Ecoregion Code
89902		Dip-net effort, area swept (m^2)	84161		Stream order
89903		Kicknet effort, area kicked (m^2)	90005		Benthos el
89904		Kicknet effort, minutes kicked (min.)	90055		Total taxa (taxa Richness), Benthos, no. taxa
89905		Snags-and-shoreline sampling effort, minutes picked	90008		EPT taxa abundance (no. taxa)
89906		Number of individuals in benthic RBA subsample (± 100)	90007		Biotic index (HBI)
89950		Benthic sampler (1= Surber, 2 = Ekman, 3 = kicknet, 4 = Petersen, 5 = Hester-Dendy)	90062		Chironomidae (% of community)
*89921		Undercut bank at sample point (%)	90042		Dominant taxon, benthos (% of community)
*89922		Overhanging brush at sample point (%)	90010		Dominant functional feeding group (% of community)
*89923		Gravel substrate at sample point (%)	90036		Benthic predators (% of community)
*89924		Sand substrate at sample point (%)	90050		Ratio of intolerant : tolerant taxa
*89925		Soft bottom at sample point (%)	90069		Total Trichoptera as Hydropsychidae (%)
*89926		Macrophyte bed at sample point (%)	90052		Total no. non-insect taxa
*89927		Snags and brush at sample point (%)	90025		Benthic collector-gatherers (% of community)
*89928		Bedrock at sample point (%)	90054		Total no. as Elmidae (% of community)

Habitat Data-Reporting Form

RTAG# | REGION | E-MAIL ID OF COLLECTOR

STATION ID | SEGMENT | SEQUENCE | DATA SOURCE

Station Description_____

Composite—code as Space, Time, or Both.

COMPOSITE SAMPLE

COMPOSITE CATEGORY: T=Time S=Space B=Both

M M D D Y Y Y Y — START DATE

H H M M — START TIME

START DEPTH (SHALLOWEST) . — M = meters F = feet

M M D D Y Y Y Y — END DATE

H H M M — END TIME

END DEPTH (DEEPEST) . — M = meters F = feet

PARAMETRIC DATA

Enter the codes and values appropriate for this sample. Enter "<" or ">" if necessary; otherwise, leave this column blank. Continue, if necessary, on additional worksheets. Codes to describe the habitat-sampling effort are on the back.

Code	< or >	Value	Description

Choose the most characteristic location and report data from this location as representative of the entire reach.

Habitat Parameter Codes

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^2)	89845		Average substrate gravel > 2 mm or larger (%)
89860		Length of stream evaluated (km)	84159		Average instream cover (%)
89832		Number of lateral transects made	89929		Number of stream cover types
89861		Average stream width (m)	89846		Average stream-bank erosion (%)
89862		Average stream depth (m)	89847		Average stream-bank angle (degrees)
00061		Instantaneous stream flow (ft^3/sec)	89866		Average width of natural riparian vegetation (m)
89835		Flow measurement method (1=flow-gage station, 2= electronic, 3=mechanical, 4=weir or flume)	89849		Average trees as riparian vegetation (%)
			89850		Average shrubs as riparian vegetation (%)
89848		Channel flow (1 = none, 2 = low, 3 = moderate, 4 = high)	89851		Average grasses and forbs as riparian vegetation (%)
89864		Maximum pool width at time of study (m)	89852		Average cultivated fields as riparian vegetation (%)
89865		Maximum pool depth in study area (m)	89853		Average other as riparian vegetation (%)
89839		Total number of stream bends	89854		Average 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		Texas Ecoregion Code
89843		Total number of riffles	89962		Land-development impact (1 = none, 2 = low, 3 = moderate, 4 = high)

Specific to No Flow with Isolated Pools

Largest pool (m)	89910		Max. depth
	89908		Max. width
	89909		Max. length
Smallest pool (m)	89911		Max. depth
	89912		Max. width
	89913		Max. length
No. perennial pools evaluated	89914		

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

Ecoregion 24					
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^2)				
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 tolerant species[a]		% of individuals as tolerant species[a]		
Trophic composition	Number of individuals as omnivores		% of individuals as omnivores		
	Number of individuals as invertivores		% of individuals as invertivores		
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		
	Number of individuals as nonnative species		% of individuals as nonnative species		
	Number of individuals with disease or anomaly		% of individuals with disease or anomaly		
			Index of Biotic Integrity numeric score:		
			Aquatic-life use:		

TCEQ-20155-A (Rev. 3-05-2014)

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

[a] Excluding western mosquitofish.

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

Ecoregions 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^2)				
Species richness and composition	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		
Trophic composition	Number of individuals as omnivores		% of individuals as omnivores		
	Number of individuals as invertivores		% of individuals as invertivores		
Fish abundance and condition	Number of individuals (seine)		Number of individuals in sample		
	Number of individuals in sample		Number of individuals / seine haul		
	Number of individuals as nonnative species		% of individuals as nonnative species		
	Number of individuals with disease or anomaly		% of individuals with disease or anomaly		
			Index of Biotic Integrity numeric score:		
			Aquatic-life use:		

TCEQ-20155-B (Rev. 3-05-2014)

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

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

Ecoregions 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^2)				
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		
Trophic composition	Number of individuals as tolerant species[a]		% of individuals as tolerant species[a]		
	Number of individuals as omnivores		% of individuals as omnivores		
Fish abundance and condition	Number of individuals as invertivores		% of individuals as invertivores		
	Number of individuals as piscivores		% of individuals as piscivores		
	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		
	Number of individuals as nonnative species		% of individuals as nonnative species		
	Number of individuals with disease or anomaly		% of individuals with disease or anomaly		
			Index of Biotic Integrity numeric score:		
			Aquatic-life use:		

TCEQ-20155-C (Rev. 3-05-2014)

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

[a] Excluding western mosquitofish.

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

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^2)				
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		
Trophic composition	Number of individuals as tolerant species[a]		% of individuals as tolerant species[a]		
	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		
	Number of individuals as nonnative species		% of individuals as nonnative species		
	Number of individuals with disease or anomaly		% of individuals with disease or anomaly		
			Index of Biotic Integrity numeric score:		
			Aquatic-life use:		

TCEQ-20155-D (Rev. 3-05-2014)

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

[a] Excluding western mosquitofish.

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

Ecoregion 31					
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^2)				
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 species		Number of benthic species		
	Number of sunfish species		Number of sunfish species		
	Number of individuals as tolerant species[a]		% of individuals as tolerant species[a]		
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		
	Number of individuals as nonnative species		% of individuals as nonnative species		
	Number of individuals with disease or anomaly		% of individuals with disease or anomaly		
			Index of Biotic Integrity numeric score:		
			Aquatic-life use:		

TCEQ-20155-E (Rev. 3-05-2014)

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

[a] Excluding western mosquitofish.

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

Ecoregions 33 and 35					
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^2)				
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 tolerant species[a]		% of individuals as tolerant species[a]		
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		
	Number of individuals as nonnative species		% of individuals as nonnative species		
	Number of individuals with disease or anomaly		% of individuals with disease or anomaly		
			Index of Biotic Integrity numeric score:		
			Aquatic-life use:		

TCEQ-20155-F (Rev. 3-05-2014)

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

[a] Excluding western mosquitofish.

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

Ecoregion 34					
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^2)				
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[a]		% of individuals as tolerant species[a]		
Trophic composition	Number of individuals as omnivores		% of individuals as omnivores		
	Number of individuals as invertivores		% of individuals as invertivores		
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		
	Number of individuals as nonnative species		% of individuals as nonnative species		
	Number of individuals with disease or anomaly		% of individuals with disease or anomaly		
			Index of Biotic Integrity numeric score:		
			Aquatic-life use:		

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

[a] Excluding western mosquitofish.

BIBI Metrics and Scoring for Kick Samples, Rapid Bioassessment Protocol—Benthic Macroinvertebrates

Stream name:		
Date:	**Collectors:**	
Location:		
County:	**Ecoregion No.:**	
Type of assessment: UAA ALA ALM RWA		

Metric	**Value**	**Score**
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. % total Trichoptera as Hydropsychidae		
10. No. 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
Total score:		
Aquatic-life use:		

The scoring form for Surber samples—previously included in the Biological Monitoring Packet—entitled *Metrics and Scoring for Surber Samples for Benthic Macroinvertebrates by Bioregion: Central, East, or North*—now appears in Appendix F, "Surber-Sampler Protocols."

Streamflow (Discharge) Measurement Form

Streamflow (Discharge) Measurement Form

Stream:____Date:______________
Station ____
Description:____
Time Began:____________ Time Ended: ___________Meter Type:______________
Observers: ______________Total Stream Width: ________Section Width (W):________
Observations:____

Section Midpoint (ft)	Section Depth (ft) (D)	Sensor Depth (ft)	Velocity (V)		Flow (Q) (ft^3/s) Q = (W)(D)(V)
			At Point (ft/s)	Average (ft/s)	
$m^3/s \times 35.3 = ft^3/s$			**Total Flow (Discharge)**		

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Page 1 of ___	**Part I—Stream Physical-Characteristics Worksheet**	

Observers:	Date:	Time:
Weather conditions:		
Stream:	Stream segment no.	
Location of site:	Length of reach:	
Observed stream uses:		
Stream type (circle one): **perennial** or **intermittent with perennial pools**		

Stream bends:	No. well defined		No. moderately defined		No. poorly defined	

Aesthetics (circle one): **(1) wilderness (2) natural (3) common (4) offensive**

Channel obstructions or modifications:	No. of riffles	

Channel flow status (circle one): **high moderate low no flow**

Riparian vegetation (%):	**Left Bank**	**Right Bank**	Maximum pool depth:
Trees			Maximum pool width:
Shrubs			**Notes:**
Grasses or forbs			
Cultivated fields			
Other			

Site map:

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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 Thalweg Depth:	Right-bank slope (°)	Right-bank erosion potential (%)	Tree canopy (%)
							Total
	Habitat type (circle one) **Riffle** **Run** **Glide** **Pool**		Dominant substrate type	Dominant types riparian vegetation Left bank: Right bank:		% Gravel or larger	CL
							CR
Macrophytes (circle one) **Abundant** **Common** **Rare** **Absent**	Algae (circle one) **Abundant** **Common** **Rare** **Absent**		Width of natural buffer vegetation (m) LB:	RB:	Instream cover types	% Instream cover	LB
							RB

Location of Transect	Stream width (m)	Left-bank slope (°)	Left-bank erosion potential (%)	Stream depths (m) at points across transect Thalweg depth:	Right-bank slope (°)	Right-bank erosion potential (%)	Tree canopy (%)
							Total
	Habitat type (circle one) **Riffle** **Run** **Glide** **Pool**		Dominant substrate type	Dominant types riparian vegetation Left bank: Right bank:		% Gravel or larger	CL
							CR
Macrophytes (circle one) **Abundant** **Common** **Rare** **Absent**	Algae (circle one) **Abundant** **Common** **Rare** **Absent**		Width of natural buffer vegetation (m) LB:	RB:	Instream cover types	% Instream cover	LB
							RB

Location of transect	Stream width (m)	Left-bank slope (°)	Left-bank erosion potential (%)	Stream depths (m) at points across transect Thalweg depth:	Right-bank slope (°)	Right-bank erosion potential (%)	Tree canopy (%)
							Total
	Habitat type (circle one) **Riffle** **Run** **Glide** **Pool**		Dominant substrate type	Dominant types riparian vegetation Left bank: Right bank:		% Gravel or larger	CL
							CR
Macrophytes (circle one) **Abundant** **Common** **Rare** **Absent**	Algae (circle one) **Abundant** **Common** **Rare** **Absent**		Width of natural buffer vegetation (m) LB:	RB:	Instream cover types	% Instream cover	LB
							RB

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 Thalweg Depth:	Right-bank slope (°)	Right-bank erosion potential (%)	Tree canopy (%)
							Total
	Habitat type (circle one) **Riffle** **Run** **Glide** **Pool**		Dominant substrate type	Dominant types riparian vegetation Left bank: Right bank:		% Gravel or larger	CL
							CR
Macrophytes (circle one) **Abundant** **Common** **Rare** **Absent**	Algae (circle one) **Abundant** **Common** **Rare** **Absent**		Width of natural buffer vegetation (m) LB:	RB:	Instream cover types	% Instream cover	LB
							RB

Location of Transect	Stream width (m)	Left-bank slope (°)	Left-bank erosion potential (%)	Stream depths (m) at points across transect Thalweg depth:	Right-bank slope (°)	Right-bank erosion potential (%)	Tree canopy (%)
							Total
	Habitat type (circle one) **Riffle** **Run** **Glide** **Pool**		Dominant substrate type	Dominant types riparian vegetation Left bank: Right bank:		% Gravel or larger	CL
							CR
Macrophytes (circle one) **Abundant** **Common** **Rare** **Absent**	Algae (circle one) **Abundant** **Common** **Rare** **Absent**		Width of natural buffer vegetation (m) LB:	RB:	Instream cover types	% Instream cover	LB
							RB

Location of transect	Stream width (m)	Left-bank slope (°)	Left-bank erosion potential (%)	Stream depths (m) at points across transect Thalweg depth:	Right-bank slope (°)	Right-bank erosion potential (%)	Tree canopy (%)
							Total
	Habitat type (circle one) **Riffle** **Run** **Glide** **Pool**		Dominant substrate type	Dominant types riparian vegetation Left bank: Right bank:		% Gravel or larger	CL
							CR
Macrophytes (circle one) **Abundant** **Common** **Rare** **Absent**	Algae (circle one) **Abundant** **Common** **Rare** **Absent**		Width of natural buffer vegetation (m) LB:	RB:	Instream cover types	% Instream cover	LB
							RB

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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:

Stream Name:	**Date:**
Physical Characteristics	**Value**
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^2)	
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^3/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 percent composition of riparian vegetation by: (total to equal 100%)	
Trees	
Shrubs	
Grasses and forbs	
Cultivated fields	
Other	
Average percent of tree-canopy coverage	
Overall aesthetic appraisal of the stream	

Part III—Habitat-Quality Index

Habitat Parameter		Scoring Category		
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 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_____	4	3	2	1
Bottom Substrate Stability	**Stable** > 50% gravel or larger substrate; 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 a mix of sizes	**Unstable** < 10% gravel or larger substrate; substrate is uniform sand, silt, clay, or bedrock
Score_____	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_____	4	3	2	1
Dimensions of Largest Pool	**Large** Pool covers more than 50% of the channel width; maximum depth is > 1 meter	**Moderate** Pool covers approximately 50% or slightly less of 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_____	4	3	2	1
Water Level	**High** Water reaches the base of both 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 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_____	3	2	1	0

Part III—Habitat-Quality Index (continued)

Habitat Parameter	Scoring Category			
Bank Stability	**Stable** Little evidence (< 10%) of erosion or bank failure; bank angles average < 30º	**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 or 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_____	3	2	1	0
Channel Sinuosity	**High** ≥ 2 well-defined bends with deep outside areas (cut banks) and shallow inside areas (point bars) present	**Moderate** 1 well-defined bend **or** ≥ 3 moderately-defined bends present	**Low** < 3 moderately-defined bends **or** only poorly-defined bends present	**None** Straight channel; may be channelized
Score_____	3	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	2	1	0
Aesthetics of Reach	**Wilderness** Outstanding natural beauty; usually wooded or unpastured area; no obvious indications of human activity	**Natural Area** Trees or native vegetation is common; some development evident (from fields, pastures, rural dwellings) little evidence of human activity	**Common Setting** Not offensive; area is developed, but uncluttered such as in an urban park	**Offensive** Stream does not enhance the aesthetics of the area; cluttered; highly developed; may be a dumping area
Score_____	3	2	1	0
Total Score_____				

Habitat-Quality Index

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