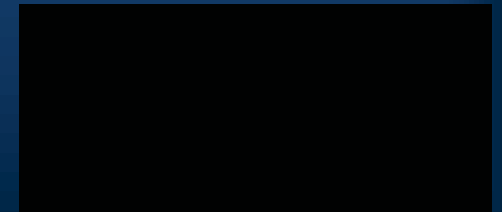


An Overview of the Habitat Assessment  
and Biological Sampling for the Licking  
River Watershed Watch  
February, 21, 2009



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# Stream Assessment



Biology



Chemistry



Habitat



# Bioassessments

1) Fish


2) Macroinvertebrates

3) Other aquatic life





# Habitat Assessment Metrics

1. Epifaunal Substrate / Available Cover
  2. Embeddedness
  3. Velocity-Depth Combinations
  4. Sediment Deposition
  5. Channel Flow Status
  6. Channel Alteration
  7. Frequency of Riffles
  8. Bank Stability
  9. Bank Vegetative Protection
  10. Riparian Vegetative Zone Width
- 

# 1. Epifaunal Substrate/Available Cover



## 9. Bank Vegetative Protection



# Site Characterization Forms

Provides  
Location Information  
and  
Site Descriptions

<b>RIPARIAN ZONE/ INSTREAMI USE %</b>  _____  _____  _____	<b>Predominant Surrounding Land Use</b> <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential	<b>Local Water Turbidity</b> <input type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy  <b>Estimated Stream Width</b> _____ m  <b>Estimated Stream Depth</b> <input type="checkbox"/> Little _____ m <input type="checkbox"/> Shallow _____ m <input type="checkbox"/> Prof _____ m  <b>Velocity</b> _____ m/sec  <b>Estimated Reach Length</b> _____ m  <input type="checkbox"/> Channelized <input type="checkbox"/> Yes <input type="checkbox"/> No  <input type="checkbox"/> Dam Present <input type="checkbox"/> Yes <input type="checkbox"/> No
<b>RIPARIAN VEGETATION (13 meter buffer)</b>  _____  _____	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous  Dominant species present: _____	
<b>AQUATIC VEGETATION</b>  _____  _____	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Banks' emergent <input type="checkbox"/> Annual submerged <input type="checkbox"/> Banks' floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae  Dominant species present: _____  Portion of the reach with vegetative cover: _____%	
<b>SEDIMENT/ SUBSTRATE</b>  _____  _____	<b>Odors</b> <input type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____  <b>Oil</b> <input type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse	<b>Degraded</b> <input type="checkbox"/> Sludge <input type="checkbox"/> Silt/clay <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Metal shavings <input type="checkbox"/> Litter  <b>Leading stones which are not deeply embedded, are the understones black in color?</b> <input type="checkbox"/> Yes <input type="checkbox"/> No
<b>WATER QUALITY</b>  _____  _____	<b>Temperature</b> _____ °C  <b>Specific Conductance</b> _____  <b>Dissolved Oxygen</b> _____  <b>pH</b> _____  <b>Turbidity</b> _____  <b>WQ Instrument Used</b> _____	<b>Water Odors</b> <input type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fusty <input type="checkbox"/> Other _____  <b>Water Surface Oil</b> <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Glob <input type="checkbox"/> Flecks <input type="checkbox"/> None <input type="checkbox"/> Other _____  <b>Turbidity (if not measured)</b> <input type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Watercolor <input type="checkbox"/> Other _____

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (Does not necessarily add up to 100%)			
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area	
Bedrock			Detritus	sticks, wood, coarse plant material (CPOM)		
Boulder	> 256 mm (10")			Muck/Mud	black, very fine organic (FPOM)	
Cobble	87-256 mm (3.5"-10")		Silt			
Gravel	7-64 mm (0.1"-2.5")				Mud	gray, shell fragments
Sand	0.062mm (gritty)					
Silt	0.0075-0.062 mm					
Clay	< 0.0075 mm (slit)					

# Habitat Assessment Forms

Provides  
Descriptions  
and  
Scoring Criteria  
for each Metric

## HABITAT ASSESSMENT FIELD DATA SHEET HIGH GRADIENT STREAMS (FRONT)

STREAM NAME _____		LOCATION _____	
STATION # _____ RIVERMILE _____		STREAM CLASS _____	
LAT _____ LONG _____		RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS _____			
FORM COMPLETED BY _____		DATE _____ AM PM	REASON FOR SURVEY _____

Habitat Parameter	Category			
	Optimal	Suboptimal	Marginal	Poor
<b>1. Epifaunal Substrate/ Available Cover</b>	Greater than 50% of substrate favorable for epifaunal colonization and fish cover, mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat, well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>2. Riffle Quality</b>	Well-developed riffle and run; riffle is as wide as stream and length extends two times the width of stream; abundance of cobble. (Boulders prevalent in headwater streams).	Riffle is as wide as stream but length is less than two times width; abundance of cobble, boulders and gravel common.	Run area may be lacking; riffle not as wide as stream and its length is less than 2 times the stream width; gravel or bedrock prevalent; some cobble present.	Riffles or runs virtually nonexistent; bedrock prevalent; cobble lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>3. Embeddedness</b>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>4. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 5% <20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

# Scores

## Qualitative Terms

## Quantitative Values

### HABITAT ASSESSMENT FIELD DATA SHEET HIGH GRADIENT STREAMS (FRONT)

STREAM NAME _____		LOCATION _____	
STATION # _____ RIVERMILE _____		STREAM CLASS _____	
LAT _____ LONG _____		RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS _____			
FORM COMPLETED BY _____		DATE _____ AM _____ PM _____	REASON FOR SURVEY _____

Habitat Parameter	Category																				
	Optimal					Suboptimal					Marginal					Poor					
<b>1. Epifaunal Substrate/ Available Cover</b>	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).					30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).					10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.					Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.					
<b>SCORE</b>	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>2. Riffle Quality</b>	Well developed riffle and run; riffle is as wide as stream and length extends two times the width of stream; abundance of cobble. (Boulders prevalent in headwater streams).					Riffle is as wide as stream but length is less than two times width; abundance of cobble; boulders and gravel common.					Run area may be lacking; riffle not as wide as stream and its length is less than 2 times the stream width; gravel or bedrock prevalent; some cobble present.					Beds of run virtually nonexistent; bedrock prevalent; cobble lacking.					
<b>SCORE</b>	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>3. Embeddedness</b>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment.					Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.					Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.					Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.					
<b>SCORE</b>	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>4. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.					
<b>SCORE</b>	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
<b>5. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 5% < 20% for low-gradient streams) of the bottom affected by sediment deposition.					Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.					Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.					Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.					
<b>SCORE</b>	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

# '08 Habitat Results

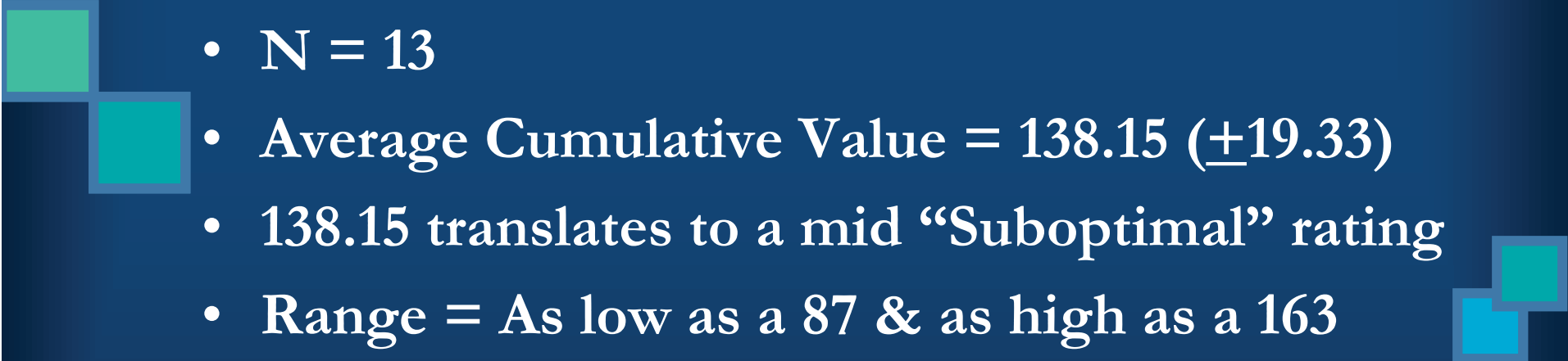
Sampling Site	Sampler	Score
1. Licking River (L436)	A. Haight	163
2. Stoner Creek (L43)	D. Carpenter	157
3. Triplett Creek (L519)	S. Topping	154
4. Slate Creek (L76)	B. Barnette	153
5. Slate Creek (L113)	B. Barnette	147
6. Banklick Creek (L470)	J. Lantz	141
7. Christy Creek (L502)	T. Collins	139
8. Houston Creek (L42)	D. Carpenter	137

# '08 Habitat Results

Sampling Site	Sampler	Score
9. Hinkston Creek (L79)	G. Wigglesworth	133
10. Licking River (L404)	A. Haight	132
11. Dry Creek (L503)	T. Collins	127
12. Mook Rd. (L520)	Y. Meichtry	126
13. Licking River (L405)	A. Haight	87
14. Licking River (L61)	P. Kutscher	N/A
15. Licking River (L127)	P. Kutscher	N/A
16. Licking River (L128)	P. Kutscher	N/A



## 2008 Habitat Scores

- N = 13
  - Average Cumulative Value = 138.15 ( $\pm 19.33$ )
  - 138.15 translates to a mid “Suboptimal” rating
  - Range = As low as a 87 & as high as a 163
  - The scores rate from “Marginal” to “Optimal.”
- 

## '08 versus '98-'99

Index	'08	'98-'99
No. of Samples	13	33
Average (Std. Dev.)	138.15 ( $\pm 19.33$ )	124.36 ( $\pm 26.05$ )
Rating	Mid Suboptimal	Mid-low Suboptimal
Range	87-163	52-167

# Bioassessment

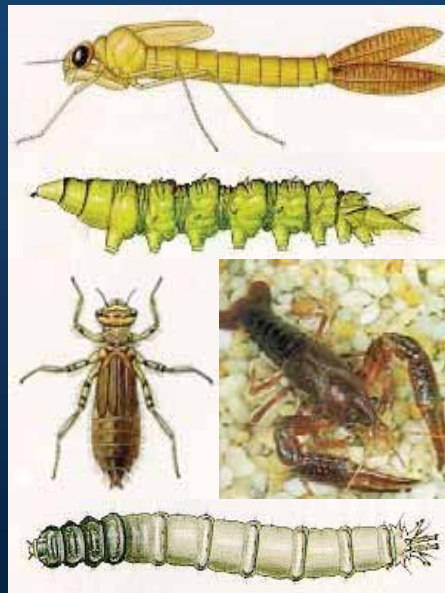


# Benthic macroinvertebrates

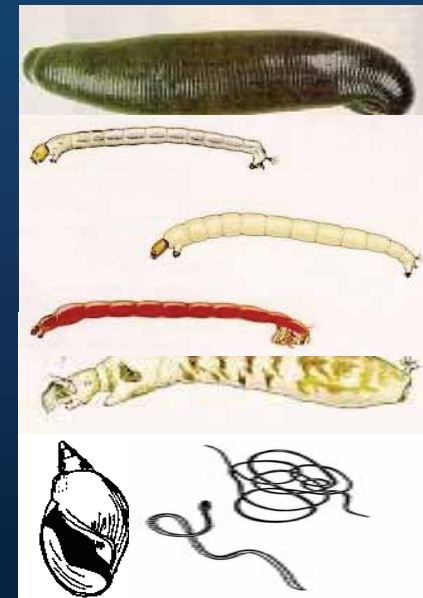
- Relatively sedentary and easy to collect
- Chronic Monitors of the stream
- Long-term record of environmental changes
- Vary in sensitivity to habitat alteration and pollution



**Good**

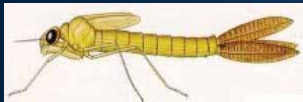
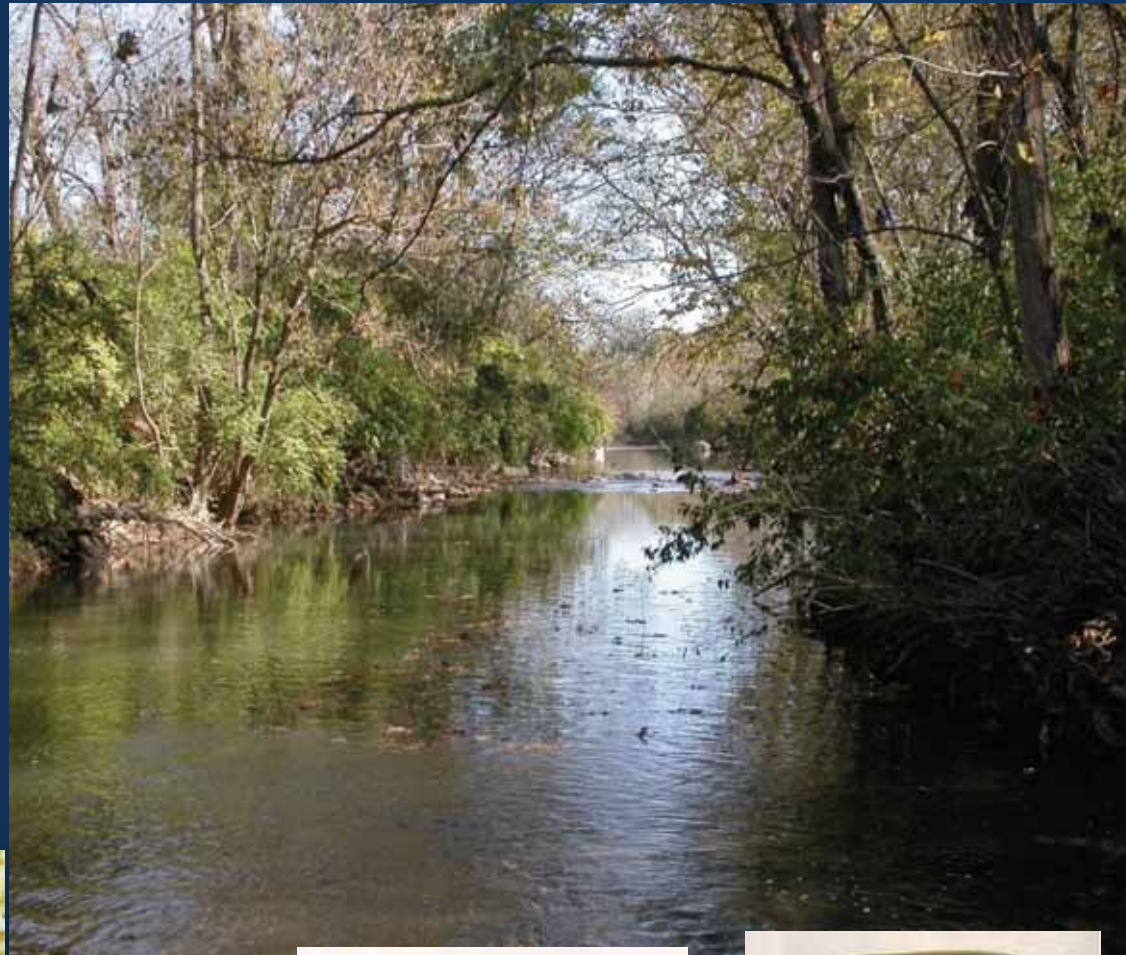


**Mid Range**



**Poor**

A diverse community represents a range of tolerances.



**A less diverse community is dominated by tolerant species**



# Sampling Protocol



# Aquatic Macroinvertebrates

A



B



C



D



E



F





A



Caddisfly larva

B



Crane fly larva

C



Water Penny

D



Mayfly larva

E



Sowbug (isopod)

F



damselfly larvae

# Biological Sampling Form

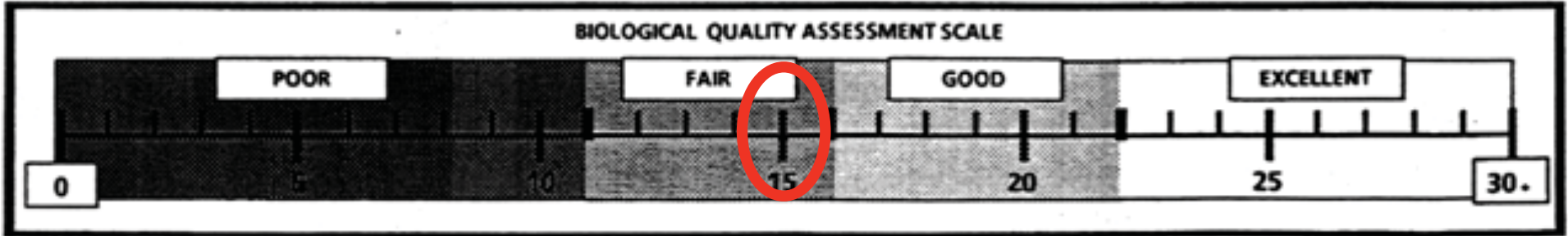
Provides  
Descriptions  
and  
Scoring Criteria  
for each Taxa

KENTUCKY WATER WATCH BIOLOGICAL MONITORING ASSESSMENT REPORT					
RIVER BASIN		DATE	TIME		
STREAM NAME		SUPERVISING SAMPLER			
SAMPLING SITE		ORGANIZATION			
FLOW RATE 1. _____ Pondered 2. _____ Low 3. _____ Normal 4. _____ Bank Full 5. _____ In Flood		MAILING ADDRESS			
AREA SAMPLED IN SQUARE FEET	NUMBER OF PARTICIPANTS	TELEPHONE #			
GENERAL DESCRIPTION OF WATER CONDITIONS					
MACROINVERTEBRATE TALLY					
GROUP 1 TAXA	CODE	GROUP 2 TAXA	CODE	GROUP 3 TAXA	CODE
WATER PENNY LARVAE		DAMSELFLY NYMPHS		BLACKFLY LARVAE	
MAYFLY NYMPHS		DRAGONFLY NYMPHS		AQUATIC WORMS	
STONEFLY NYMPHS		CRANE FLY LARVAE		MIDGE LARVAE	
DOBSONFLY LARVAE		BETLE LARVAE		POUCH SNAILS	
CADDISFLY LARVAE		CRAYFISH		LEECHES	
RIFFLE BEETLE ADULTS		SCUDS			
OTHER SNAILS		CLAMS			
		SOW BUGS / ISOPODS			
Number of taxa present		Number of taxa present		Number of taxa present	
Times index value of (3) =		Times index value of (2) =		Times index value of (1) =	
		Cumulative Index Value			
BIOLOGICAL QUALITY ASSESSMENT SCALE					

# MACROINVERTEBRATE TALLY

GROUP 1 TAXA	CODE	GROUP 2 TAXA	CODE	GROUP 3 TAXA	CODE
WATER PENNY LARVAE	X	DAMSELFY NYMPHS		BLACKFLY LARVAE	
MAYFLY NYMPHS		DRAGONFLY NYMPHS	X	AQUATIC WORMS	X
STONEFLY NYMPHS		CRANE FLY LARVAE		MIDGE LARVAE	
DOBSONFLY LARVE	X	BETLE LARVAE		POUCH SNAILS	X
CADDISFLY LARVAE		CRAYFISH		LEECHES	
RIFFLE BEETLE ADULTS		SCUDS			
OTHER SNAILS	X	CLAMS	X		
		SOW BUGS / ISOPODS			
Number of taxa present	3	Number of taxa present	2	Number of taxa present	2
Times index value of (3) =	9	Times index value of (2) =	4	Times index value of (1) =	2

Cumulative Index Value
15



# '08 Bio & Habitat Results


Sampling Site	Sampler	H	Bio
1. Licking River (L436)	A. Haight	163	19 (Good)
2. Stoner Creek (L43)	D. Carpenter	157	21 (Good)
3. Triplett Creek (L519)	S. Topping	154	14 (Fair)
4. Slate Creek (L76)	B. Barnette	153	19 (Good)
5. Slate Creek (L113)	B. Barnette	147	15 (Fair)
6. Banklick Creek (L470)	J. Lantz	141	23 (Exc)*
7. Christy Creek (L502)	T. Collins	139	12 (Fair)
8. Houston Creek (L42)	D. Carpenter	137	11 (Fair)

# '08 Bio & Habitat Results

Sampling Site	Sampler	H	Bio
9. Hinkston Creek (L79)	G.	133	10 (Poor)
10. Licking River (L404)	Wigglesworth A. Haight	132	15 (Fair)
11. Dry Creek (L503)	T. Collins	127	19 (Good)
12. Mook Rd. (L520)	Y. Meichtry	126	6 (Poor)
13. Licking River (L405)	A. Haight	87	14 (Fair)
14. Licking River (L61)	P. Kutscher	N/A	N/A
15. Licking River (L127)	P. Kutscher	N/A	N/A
16. Licking River (L128)	P. Kutscher	N/A	N/A



## 2008 Bio Scores

- N = 13
  - Average Cumulative Value = 15.23 ( $\pm 4.83$ )
  - 15.23 translates to a “Fair” to “Good” Rating
  - Range = As low as a 6 & as high as a 23
  - The scores rate from “Poor” to “Excellent”
- 

## '08 versus '98-'99 (Bio Scores)

Index	'08	'98-'99
No. of Samples	13	32
Average (Std. Dev.)	15.23 ( $\pm 4.83$ )	14.56 ( $\pm 7.15$ )
Rating	Fair to Good	Fair to Good
Range	6-23	3-31

# Habitat vs. Bio Scores

Bio Scores

