

# AQUATIC HABITAT ASSESSMENT METHODS IN TEXAS

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# HABITAT ASSESSMENT IN TEXAS

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- ▶ A requirement of all bioassessment activities in Texas
- ▶ Follows the TCEQ's SWQM Procedures, Volume 2
- ▶ Provides quantifiable, reproducible data
- ▶ Involves moderate level of field effort
  - ▷ Approximately 3-4 hours for average site

# STREAM REACH LENGTH

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## Wadeable Streams

- ▶ Based on 40x average stream width
- ▶ Minimum of 150m
- ▶ Maximum of 500m
- ▶ Usually is 200-300m

## Non-wadeable Streams

- ▶ Based on one full meander of stream channel to include two examples of at least two types of geomorphic units
- ▶ Minimum of 500m
- ▶ Maximum of 1K

# TRANSECT PLACEMENT — WADEABLE STREAMS

For reach lengths 150-300m: 5 transects

▶ Maximum distance between transects: 75m

For reach lengths 301-500m: 6 transects

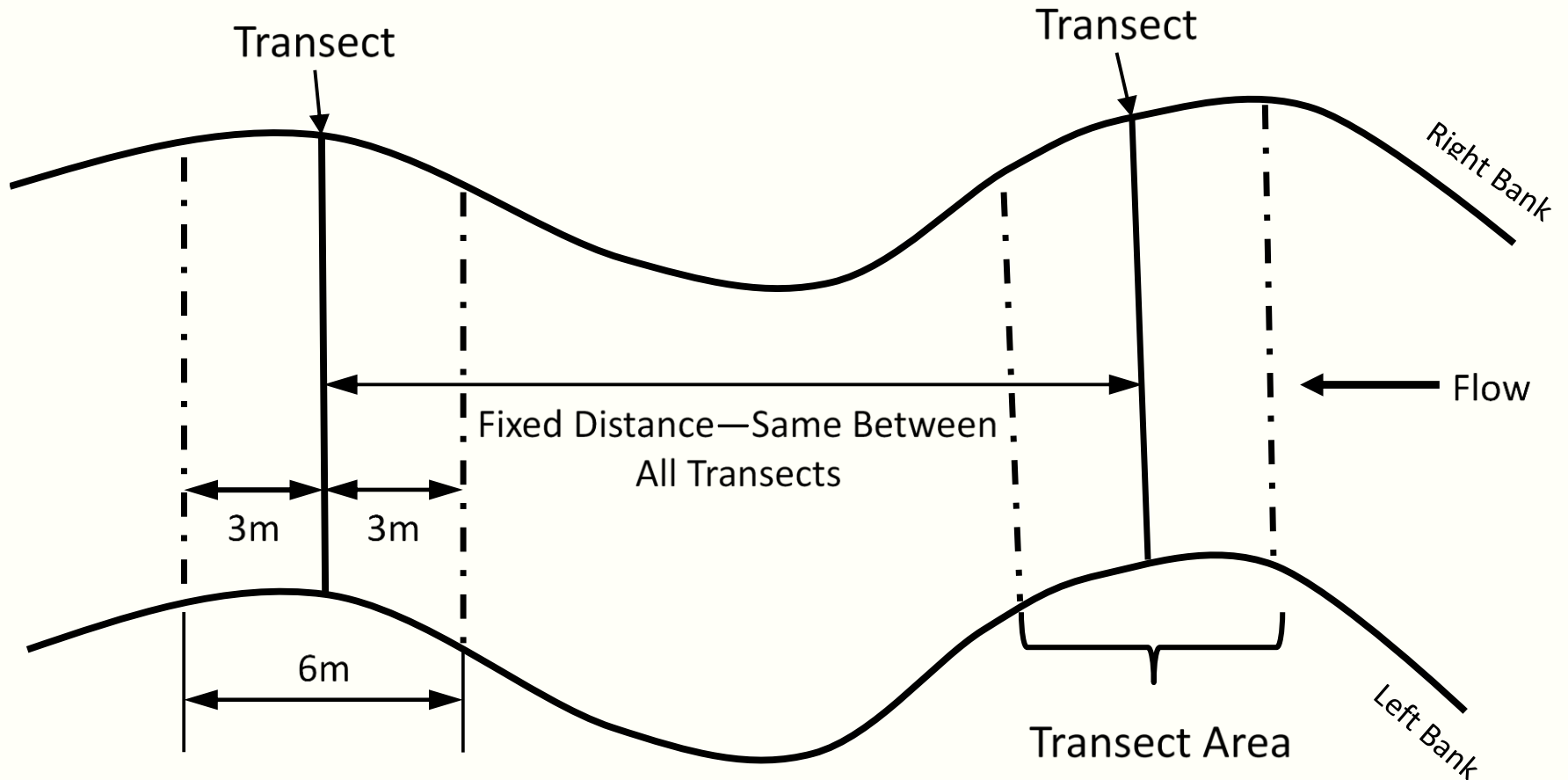
▶ Maximum distance between transects: 100m

Transect Area is defined as area 3m on each side of transect



# TRANSECT PLACEMENT

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# MEASURING TRANSECT DISTANCES

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**Range finder**



**Traditional measuring tape**



**Hip chain**

**Use metric units for all measuring equipment!**

# USE FIXED OBJECT TO MARK END OF REACH

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- ▶ If possible, take GPS coordinates of both ends of reach
- ▶ Shoot distance from downstream end of reach to a fixed landmark (the bridge) and record in notes

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): <b>perennial</b> or <b>intermittent with perennial pools</b>							
<b>Stream bends:</b>		No. well defined		No. moderately defined		No. poorly defined	
Aesthetics (circle one): <b>(1) wilderness (2) natural (3) common (4) offensive</b>							
Channel obstructions or modifications:				No. of riffles			
Channel flow status (circle one): <b>high moderate low 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>							

Page one captures:  
 Reach-based information  
 Notes  
 Sketch of reach



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 vegetation (m)		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
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			LB:      RB:													RB



# STREAM PHYSICAL CHARACTERISTICS

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## Primary Attributes (Substrate and Instream Cover)

- ▶ Dominant Substrate Type (transect)
- ▶ % Gravel or Larger (transect)
- ▶ Algae and Macrophyte Abundance (transect)
- ▶ Instream Cover Types (transect)
- ▶ % Instream Cover (transect)
- ▶ Dimensions of Largest Pool (reach)

# STREAM PHYSICAL CHARACTERISTICS

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## Secondary Attributes (Channel Morphology)

- ▶ Number of Riffles (reach)
- ▶ Habitat Type (transect)
- ▶ Number of Stream Bends (reach)
- ▶ Channel Obstructions and Modifications (reach)
- ▶ Channel Flow Status (reach)
- ▶ Wetted Width (transect)
- ▶ Stream Depths Across the Transect (transect)

# STREAM PHYSICAL CHARACTERISTICS

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## Tertiary Attributes (Riparian and Bank Structure)

- ▶ Bank Slope (transect)
- ▶ % Bank Erosion Potential (transect)
- ▶ % Tree Canopy (transect)
- ▶ Dominant Types of Riparian Vegetation (transect)
- ▶ Width of Natural Buffer Vegetation (transect)
- ▶ % Riparian Vegetation (reach)
- ▶ Aesthetics (reach)

# PRIMARY ATTRIBUTES

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The “House” level of aquatic habitat

# SUBSTRATE CLASSIFICATION SIZES

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<b><u>Size Class</u></b>	<b><u>Size Range (mm)</u></b>	<b><u>Description</u></b>
Bedrock	>4000	Rock bigger than a car
Boulders	>1000 to 4000	Basketball to Car size
Cobbles	>64 to 250	Tennis ball to basketball
Gravel (Coarse)	>16 to 64	Marble to tennis ball size
Gravel (Fine)	> 2 to 16	Ladybug to marble size
Sand	>0.06 to 2	Gritty – up to ladybug size,
Fines	<0.06	Silt, Clay, Muck (not gritty)
Hardpan	Firm	Consolidated fine substrate



# DOMINANT SUBSTRATE

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Gravel



Cobble



Mix of fines and gravel



Silt or clay

# OBSERVING SUBSTRATE WITH THE AQUASCOPE

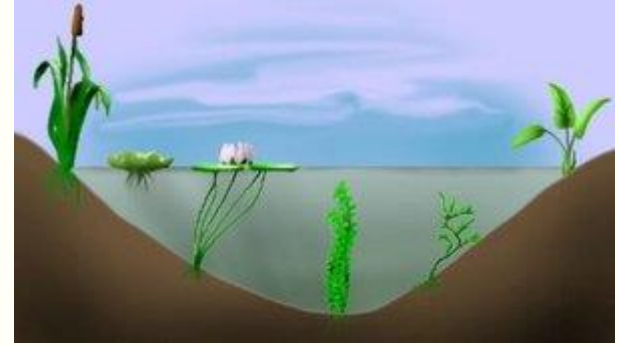
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# MACROPHYTE ABUNDANCE

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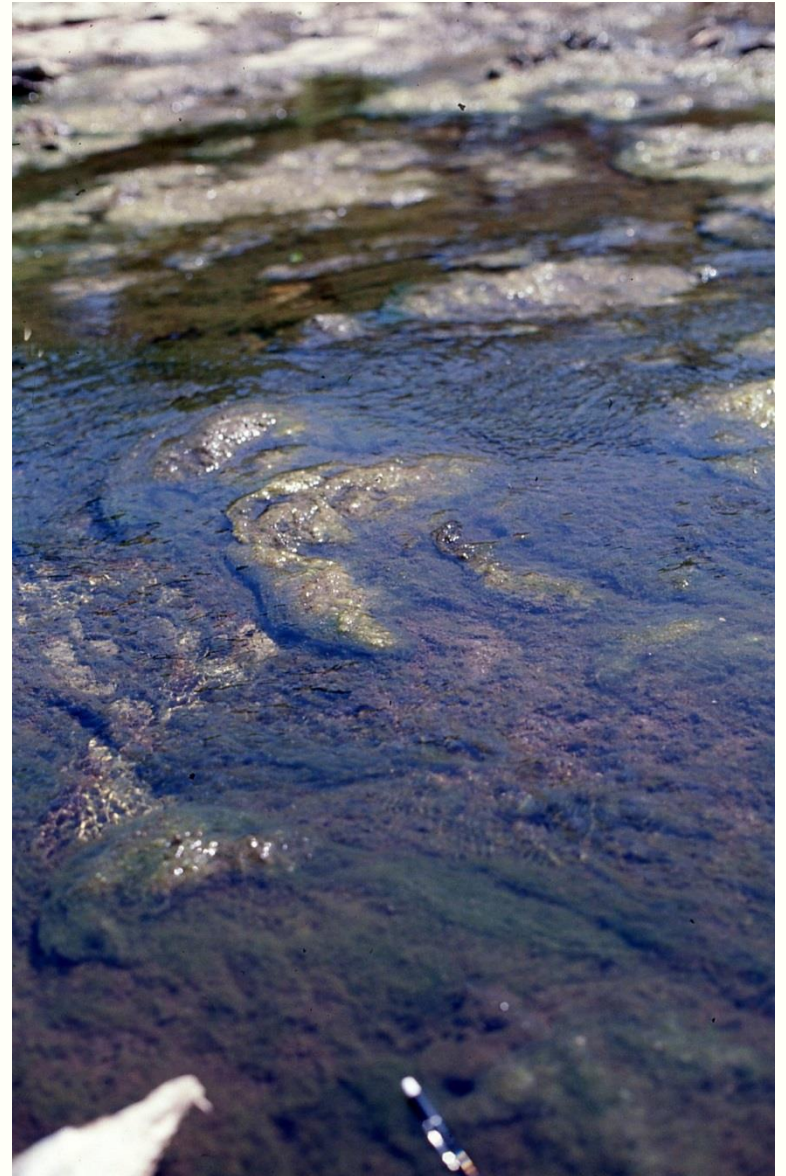
Absent, Rare, Common, Abundant





# ALGAE ABUNDANCE

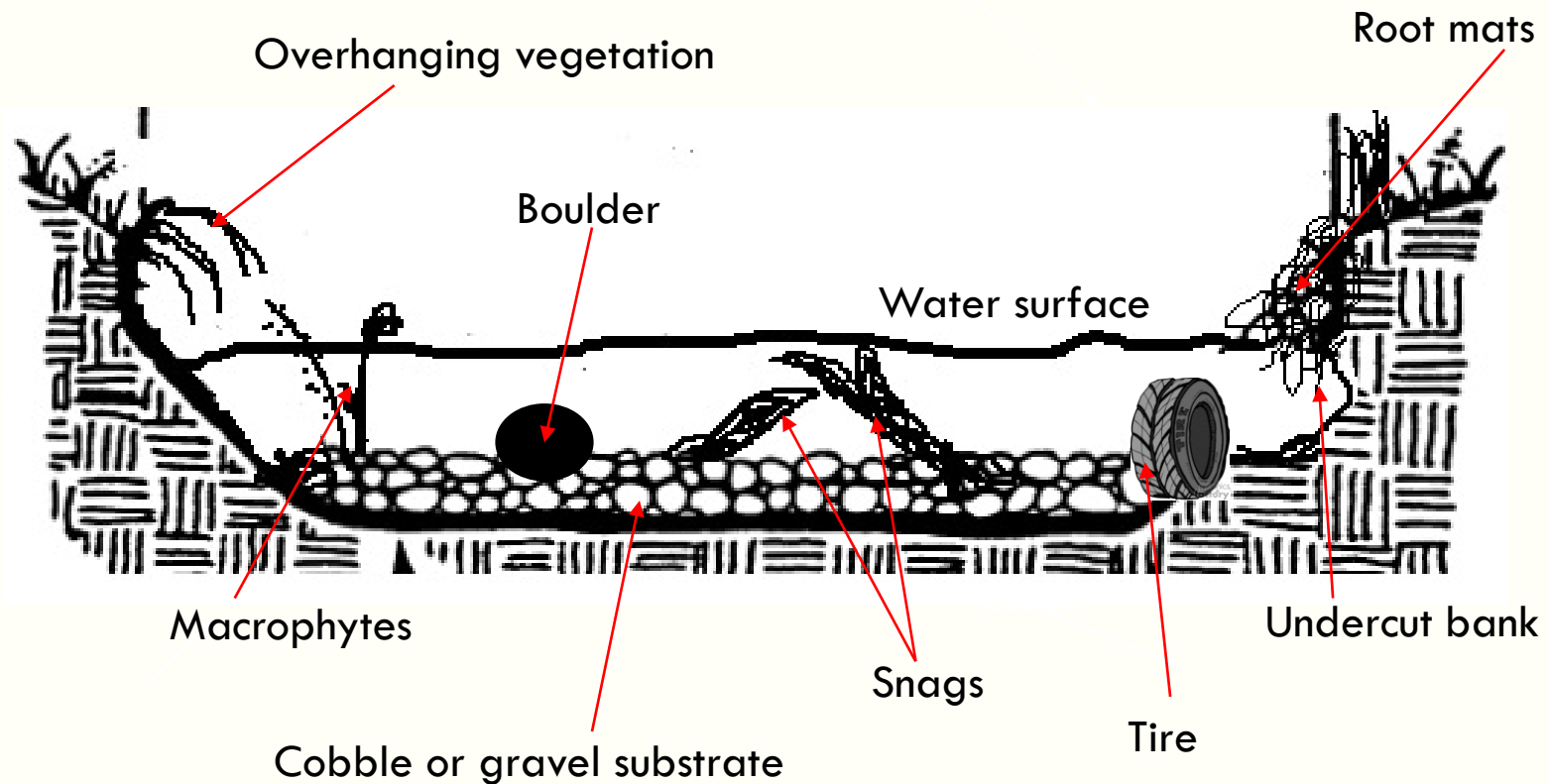
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Absent, Rare, Common, Abundant

# INSTREAM COVER

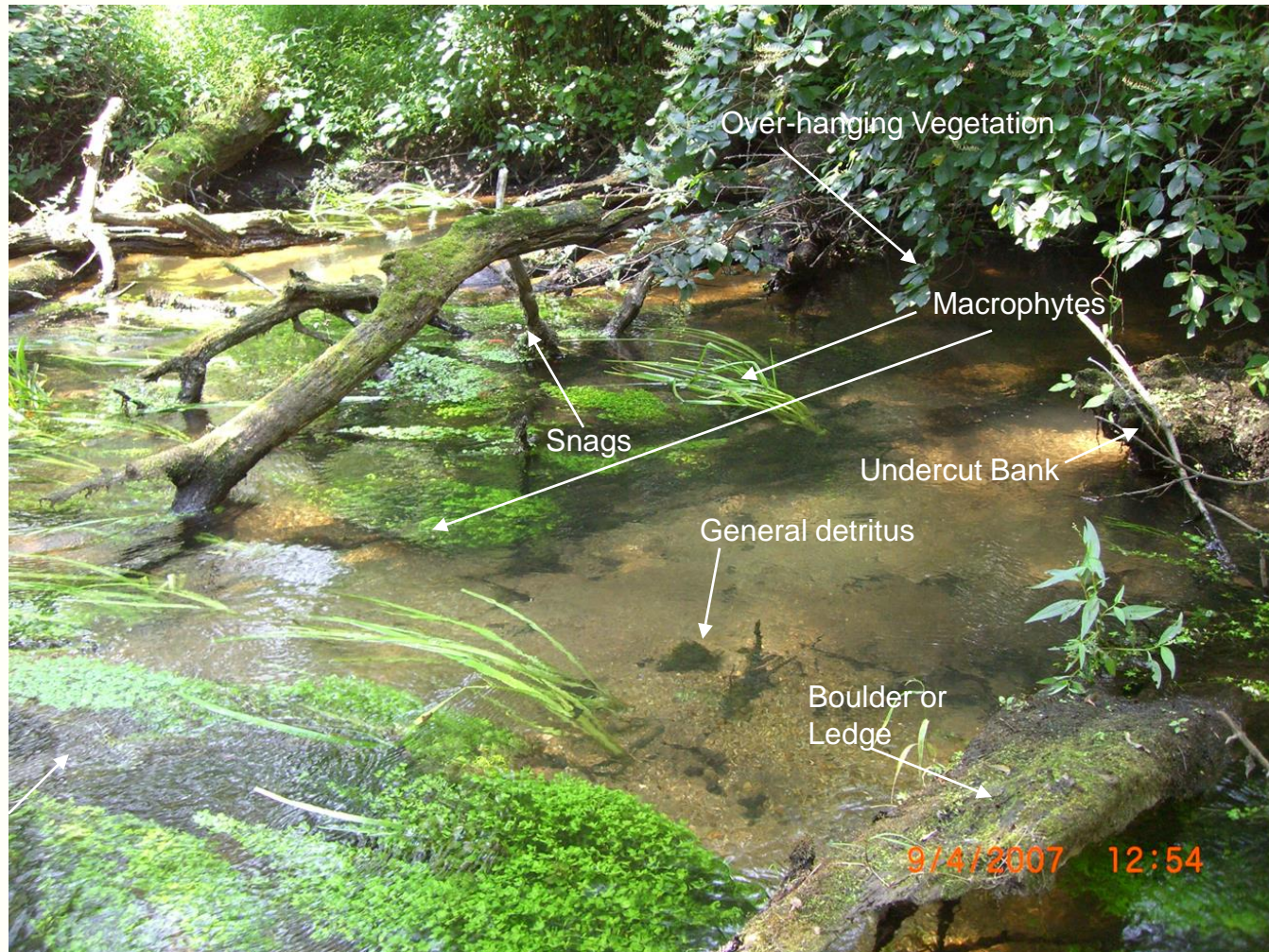
The percent instream cover increases as more types are present relative to depth or if any one type is in abundance





# INSTREAM COVER

## Natural Cover Types - High Percent



High-Gradient Stream

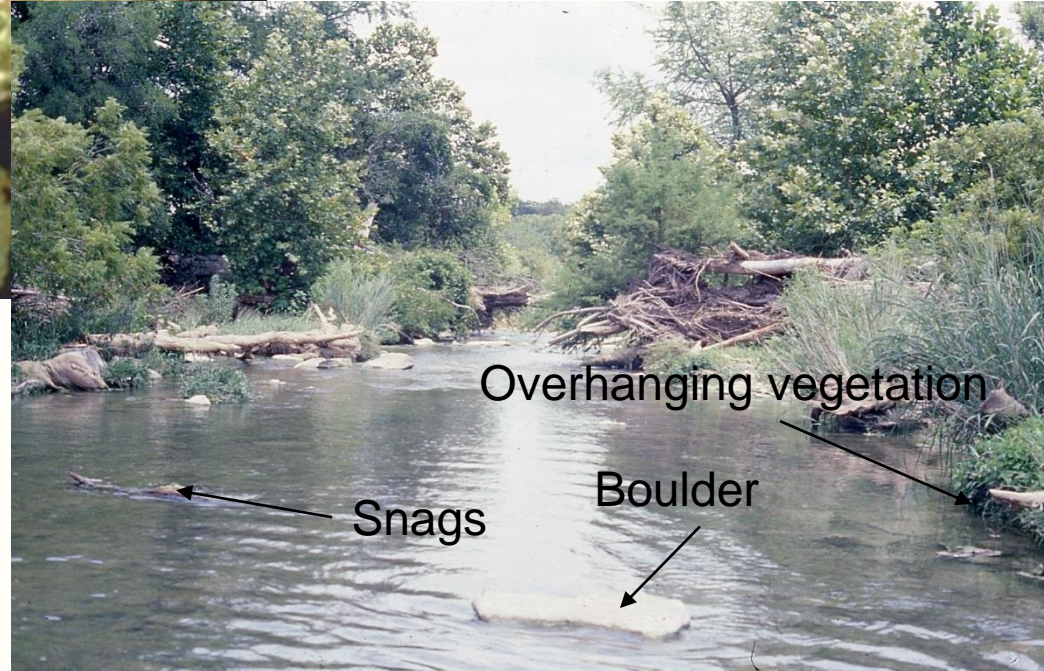


# INSTREAM COVER

## Natural Cover Types - High Percent



Low-Gradient Stream





# LOG JAMS MAKE EXCELLENT COVER

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# INSTREAM COVER

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Very Little Cover - Low Percent



High-Gradient Stream

Low-Gradient Stream





# RELATIVELY LOW INSTREAM COVER

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Photo Credit: Corey Dunn

Few cobbles and some algae is about it

Few snags is about it





# INSTREAM COVER

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Artificial Cover - Sometimes It's All You've Got!







Typical low gradient stream with rooted undercut banks as the primary habitat. The substrate is a combination of sand and mud with a high concentration of particulate organic matter and occasional snags.



Many Hill Country streams have widely scattered riffle areas separated by long expanses of bedrock. Habitat is naturally limited in these streams. Flow may vary greatly between seasons.





Typical high gradient riffle stream. Diverse habitat is provided by a good riffle-run-pool sequence combined with a mix of substrate size and excellent riparian vegetation.





In some agricultural areas, removal of riparian vegetation results in erosion and sedimentation making riffles less-useable to benthos. Loss of canopy and native vegetation reduces the diversity of niches available for colonization, removes food supplies for biota and promotes algal growth.

# DIMENSIONS OF LARGEST POOL

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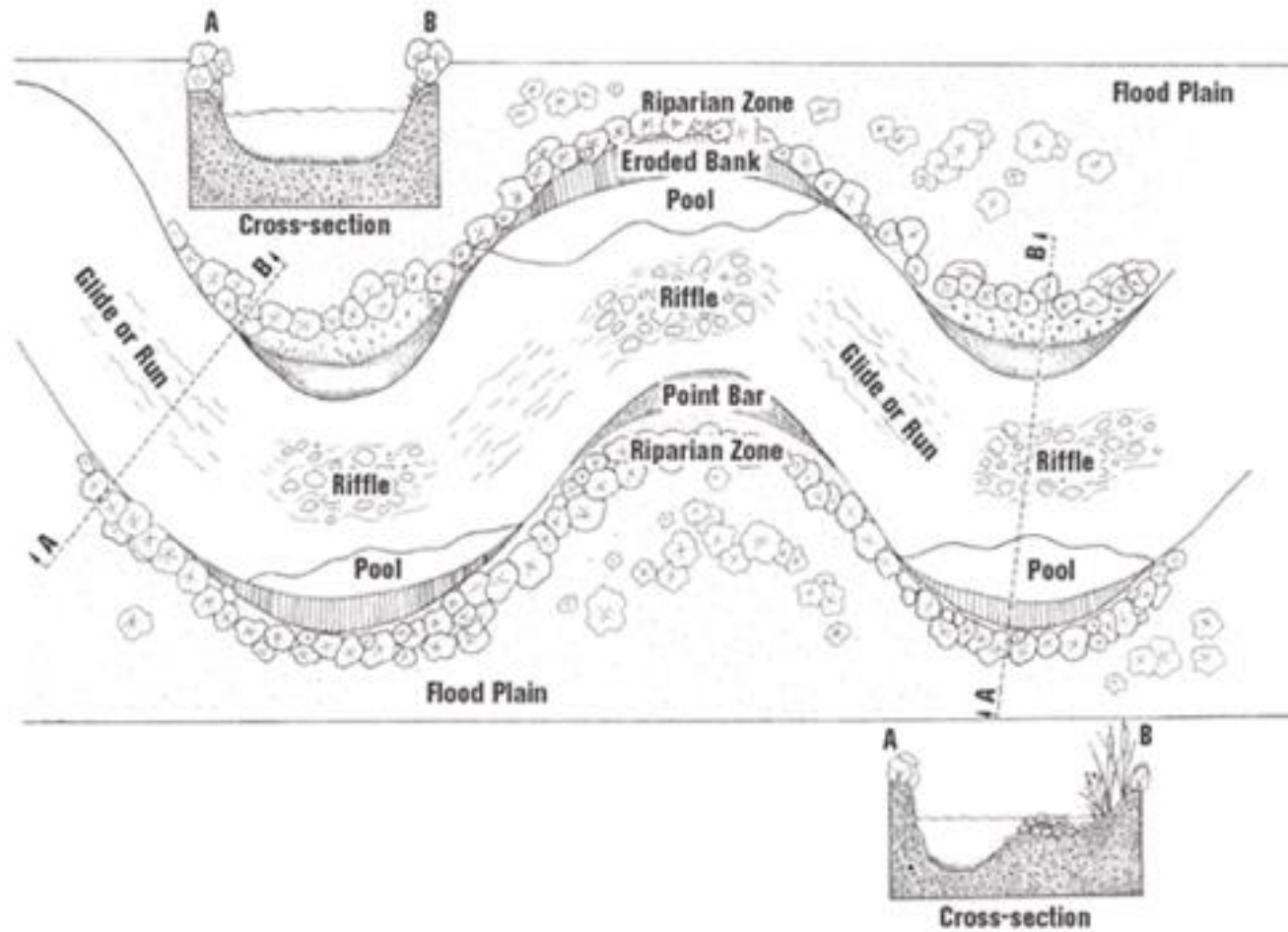


# SECONDARY ATTRIBUTES

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The “Neighborhood” level of aquatic habitat

# STREAM MORPHOLOGY



# HABITAT TYPES

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## Riffles



Riffles are generally the fast, shallow sections of a stream where the water flows over partially submerged rocks and gravel and the surface is broken into small standing waves.



# QUALIFYING NUMBER OF RIFFLES

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To be counted, a riffle must span at least 50% of the stream's width and be at least as long as the stream is wide.



# HABITAT TYPES

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## Runs and Glides



Run



Glide

- ▶ An area of stream characterized by moderate current, a continuous, usually smooth and unbroken surface, and depths greater than riffles
- ▶ Usually downstream of pools and riffles
- ▶ The smooth surface allows for greater light penetration than pools
- ▶ Glides tend to have slower flow velocities and fine-grained substrates - sand, silt, organic debris
- ▶ Runs have a variety of streambed substrates - sand and gravel



# HABITAT TYPES

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Croton Creek, Kent Co.

## Pools



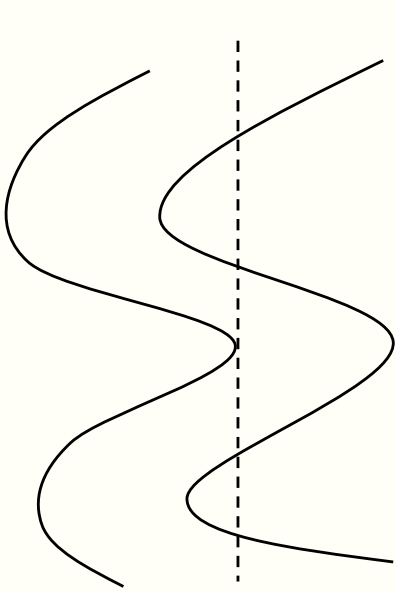
N. Prong Medina River, Bandera Co.

- ▶ An area of the stream characterized by deep depths and slow current
- ▶ Often found along a cut bank

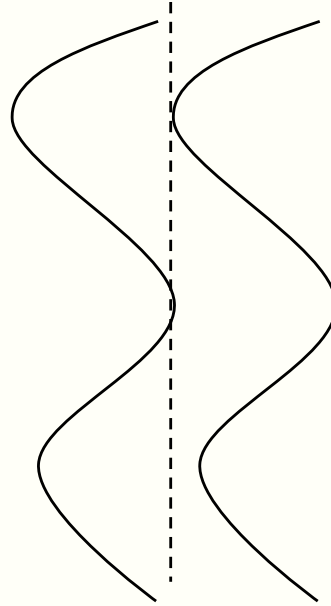


# QUALIFYING STREAM BENDS

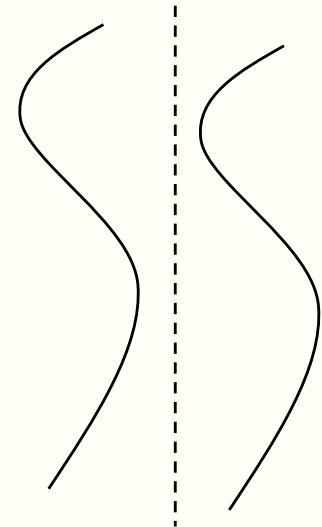
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Well-Defined



Moderately Defined



Poorly Defined

# QUALIFYING STREAM BENDS

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## Well-defined Bend





# QUALIFYING STREAM BENDS

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## Moderately-defined Bend





# QUALIFYING STREAM BENDS

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## Poorly-defined Bend





# CHANNEL OBSTRUCTIONS AND MODIFICATIONS

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Dams may look very natural





# CHANNEL OBSTRUCTIONS AND MODIFICATIONS

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# CHANNEL FLOW STATUS

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- ▶ Flow status will change with changing flow regimes resulting in varying amounts of viable substrate for aquatic organisms
- ▶ Should be reported as conditions are the day you sample
- ▶ Estimates the extent to which the channel is filled with water over the entire habitat reach

# CHANNEL FLOW STATUS

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# CHANNEL FLOW STATUS

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Low Range - Water Fills 25-75% Available Channel





# CHANNEL FLOW STATUS

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Moderate Range - Water Fills  $>75\%$  Available Channel

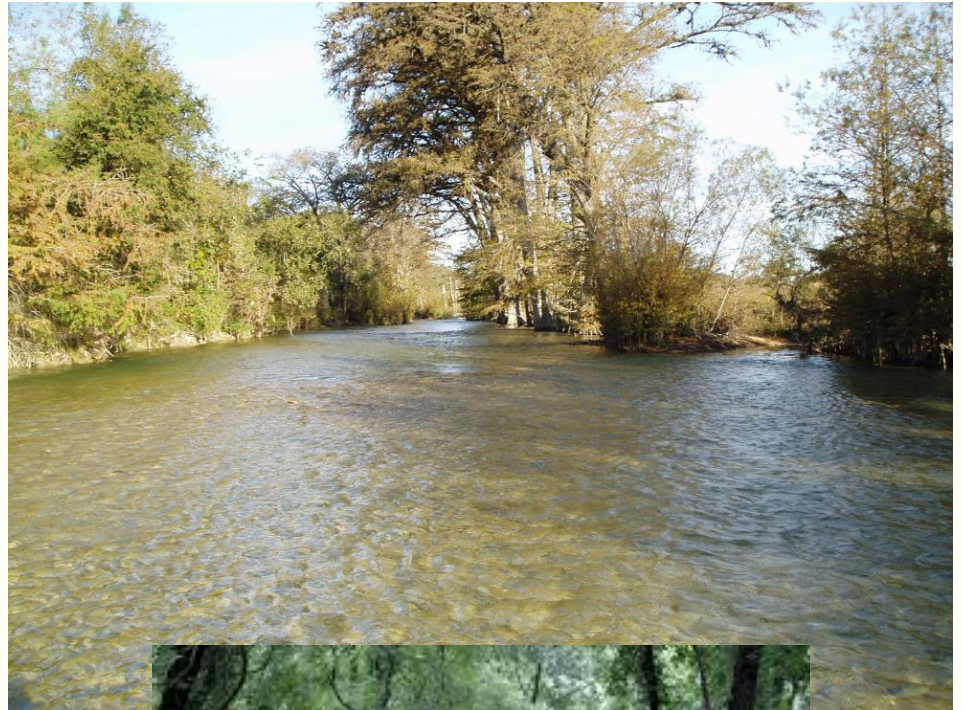




# CHANNEL FLOW STATUS

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Optimal Range - Water Reaches Base of Both Banks





# DEPTH MEASUREMENT

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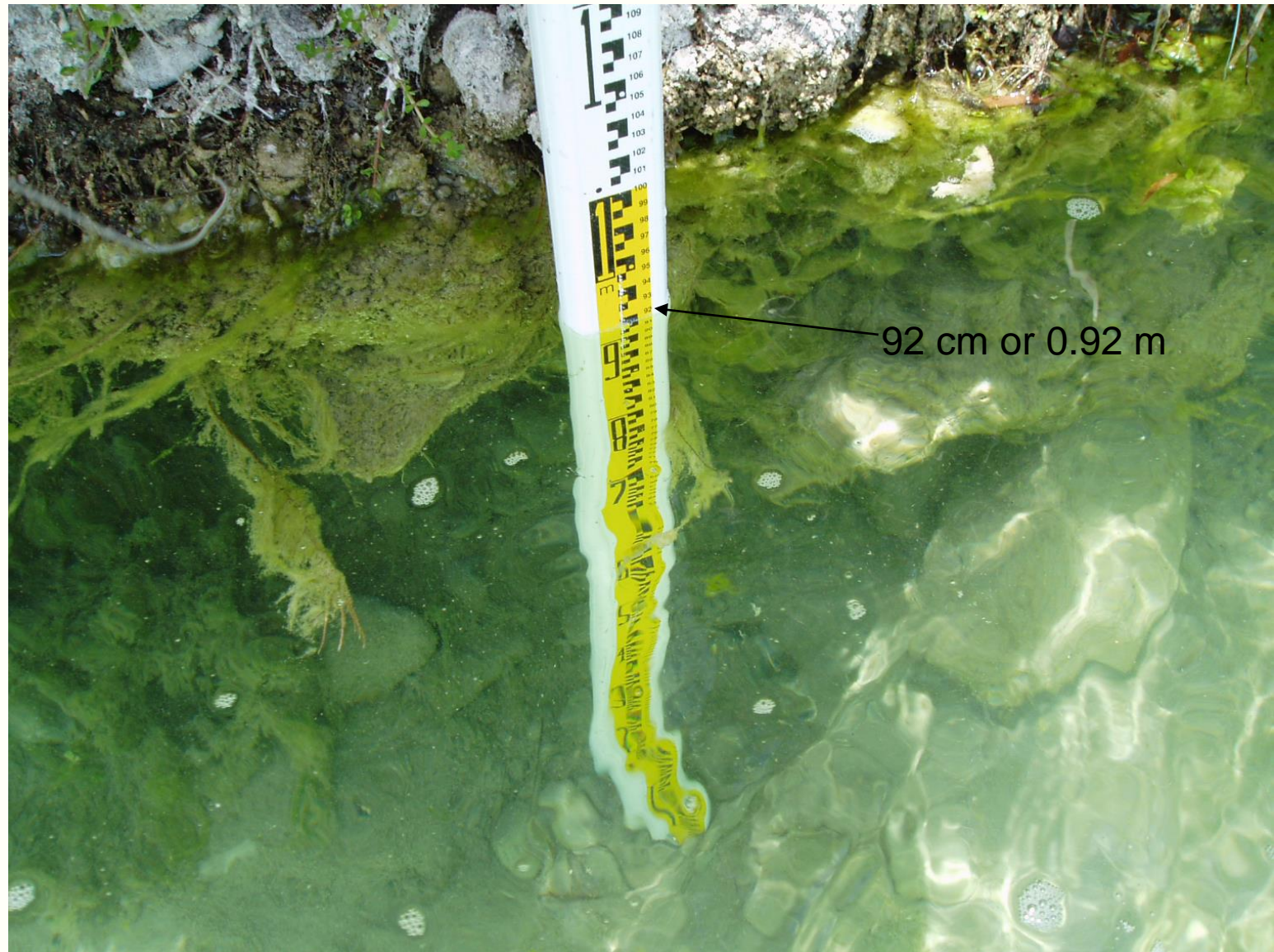
Measure depth in meters at eleven equidistant points along transect line (including banks)





# DEPTH MEASUREMENT

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# TERTIARY ATTRIBUTES

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The “Town” level of aquatic habitat



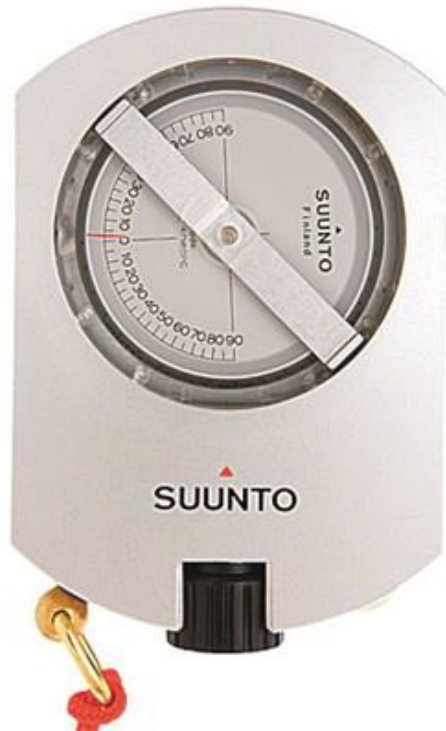
# MEASURING BANK SLOPE USING A CLINOMETER

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# TYPES OF CLINOMETERS

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Manual

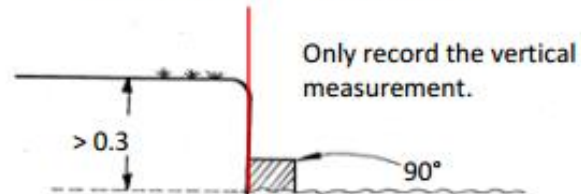


Electronic

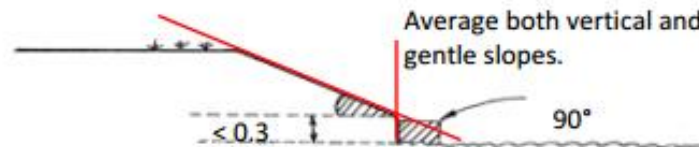


# BANK ANGLE

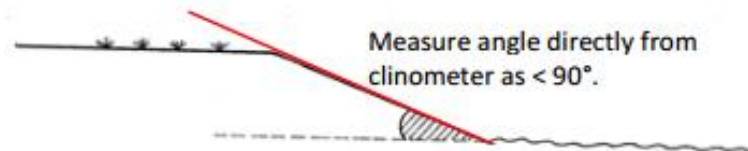
## VERTICAL BANKS $\geq 0.3$ METERS



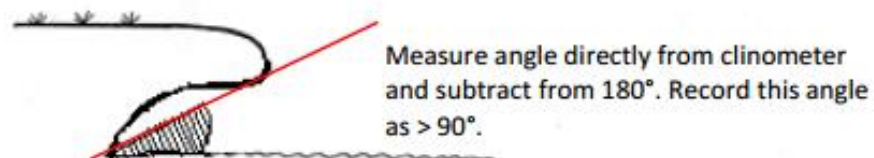
## VERTICAL BANKS $< 0.3$



## GENTLY SLOPING



## UNDERCUT



# EROSION POTENTIAL

Combination of Bank Angle, Cover Amount  
and Types of Cover



High-Gradient Stream



Low-Gradient Stream

Low Erosion Potential on Both of These



# EROSION POTENTIAL

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Combination of Bank Angle, Cover Amount  
and Types of Cover



High-Gradient Stream



Low-Gradient Stream

High Erosion Potential on Both of These

# HIGHEST EROSION POTENTIAL

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# LOWEST EROSION POTENTIAL





# MEASURING TREE CANOPY WITH A DENSIOMETER

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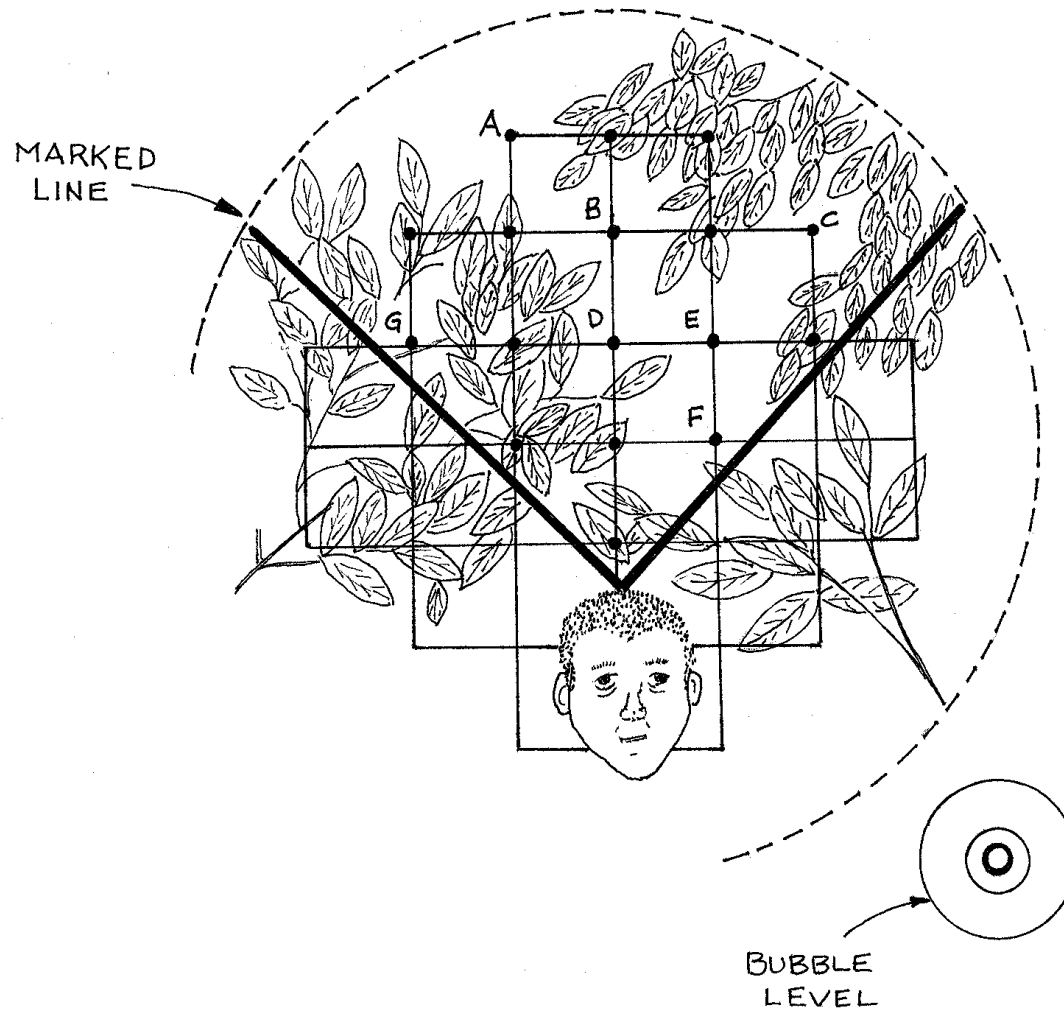


# THE CONVEX DENSIMETER

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# READING THE DENSIMETER





# DOMINANT TYPES OF RIPARIAN VEGETATION

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- ▶ Determine dominant vegetation classes for each bank at each transect
  - ▷ Trees
  - ▷ Shrubs
  - ▷ Grasses and forbs



Tree dominant



Shrub dominant



Grass dominant

# WIDTH OF NATURAL BUFFER VEGETATION

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- ▶ TCEQ methods distinguish between “riparian zone” and “natural vegetative buffer”
- ▶ Measure the width at each transect on each bank
- ▶ **Riparian Zone** - Exists whether man has encroached or not. What’s important is how the zone is functioning as a natural buffer for the stream.
- ▶ **Natural Vegetative Buffer** - Defines the area of natural vegetation which buffers the stream from the activities of man. It is the lateral extent of natural vegetation until human activity or encroachment is observed.



# BUFFER VEGETATION WIDTHS CAN VARY GREATLY BETWEEN BANKS

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# NATURAL VEGETATIVE BUFFER WIDTH

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Maximum Buffer Width  $>20$  m



High-Gradient Stream



Low-Gradient Stream



# NATURAL VEGETATIVE BUFFER WIDTH

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## Little to No Buffer Width





# NATURAL VEGETATIVE BUFFER WIDTH

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Vegetative buffer may be patchy





# NATURAL VEGETATIVE BUFFER WIDTH

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Vegetative buffer may be great except for one place





# RECORDING QUALITATIVE INFORMATION

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## Make note all stream uses





# PERCENT OF RIPARIAN VEGETATION CLASSES

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- ▶ Determine dominant vegetation classes along entire reach
  - ▷ Trees
  - ▷ Shrubs
  - ▷ Grasses and forbs
- ▶ Although transect information can be used, do not simply average all transect vegetation classes





# AESTHETICS OF THE STREAM

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## Wilderness

- ▶ Outstanding natural beauty
- ▶ No evidence of man's alterations to landscape
- ▶ Water clarity may be exceptional



Martin Canyon, Rio Grande

## Natural Area

- ▶ Native vegetation is common
- ▶ Alterations to landscape by man are minimal (power lines, occasional fence)



Neils Creek

# AESTHETICS OF THE STREAM

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## Common Setting

- ▶ Landscape is fairly altered by man, but is not offensive
- ▶ Could include an urban park setting



## Offensive

- ▶ Stream does not enhance the aesthetics of the landscape
- ▶ Littered with trash
- ▶ Highly developed





Questions?





# HABITAT QUALITY INDEX

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# SUMMARY OF PHYSICAL CHARACTERISTICS OF WATER BODY

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- ▶ Field data is summarized on Part II
- ▶ Additional calculations are made from topographic maps or GIS, Google Earth, etc.
- ▶ Summary sheet is then used to score the metrics of the HQI

**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 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	



# HABITAT QUALITY INDEX

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## Scoring and Evaluation Criteria

### Primary Attributes

- ▶ Bottom Substrate Stability (1-4 score)
- ▶ Dimensions of Largest Pool (1-4 score)
- ▶ Available Instream Cover (1-4 score)

### Secondary Attributes

- ▶ Number of Riffles (1-4 score)
- ▶ Channel Flow Status (0-3 score)
- ▶ Channel Sinuosity (0-3 score)

# HABITAT QUALITY INDEX

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## Scoring and Evaluation Criteria

### Tertiary Attributes

- ▶ Bank Stability (0-3 score)
- ▶ Riparian Buffer Vegetation (0-3 score)
- ▶ Aesthetics of Reach (0-3 score)



# TOTAL SCORE FOR AQUATIC LIFE SUBCATEGORIES

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26-31 Exceptional

20-25 High

14-19 Intermediate

8-13 Limited

$\leq 7$  Minimal