

Standard Operating Procedures For the Assessment of Habitat

Interim

**Colorado Department of Public Health and
Environment
Water Quality Control Division**

Physical Characterization and RBPs

Habitat Assessment and Physical Parameters

An evaluation of habitat quality is critical to any assessment of ecological integrity and should be performed at the time of biological sampling. In general, habitat and biological diversity in rivers are closely linked. Habitat incorporates all aspects of physical and chemical constituents along with the biotic interactions. For this SOP, the definition of habitat is narrowed to the quality of the instream and riparian habitat that influences the structure and function of the aquatic community in a stream.

Procedure for performing habitat assessment:

1. Select the reach to be assessed. The habitat assessment is performed on the same reach from which the biological sampling is conducted. Some parameters require an observation of a broader section of the catchment than just the sampling reach. The reach should measure 20 times the bankfull width.
2. Walk the entire sampling reach, taking note of the physical and habitat features that are included on the field data forms.
3. Complete the field data sheets, in a team of 2 or more, if possible, to come to a consensus on determination of quality.

PHYSICAL CHARACTERIZATION FIELD DATA SHEET

Stream Name:	Site Number:
Location Description:	
Site name from Master Site List:	
Date:	Elevation in ft.:
Latitude:	Longitude:
Satellites checked for GPS reading? (minimum of 3) <input type="checkbox"/> YES <input type="checkbox"/> NO NAD27	
Time Begin:	Time End:
Investigators:	
Form Completed By:	
Weather Conditions:	

Flow: _____cfs	Estimated Width: _____ft
Estimated Depth: _____ft	Estimated Velocity: _____ft/sec

Site Sketch

1.Field Chemistry	Ph_____ Sp Cond_____ DO_____	Temp_____ Alkalinity_____
2. Stream Characterization	Stream Type: <input type="checkbox"/> Cold Water <input type="checkbox"/> Warm Water <input type="checkbox"/> Transition	Stream Subsystem: <input type="checkbox"/> Perennial <input type="checkbox"/> Intermittent
3.Water Quality	Water Odors: <input type="checkbox"/> Sewage <input type="checkbox"/> None <input type="checkbox"/> Petroleum <input type="checkbox"/> Other <input type="checkbox"/> Chemical	Water Surface Oils: <input type="checkbox"/> Slick <input type="checkbox"/> Flecks <input type="checkbox"/> Sheen <input type="checkbox"/> None <input type="checkbox"/> Globs <input type="checkbox"/> Other
4.Turbidity Tube	Beginning Transect	Final Transect
	Random	Random
5.Watershed Features (Immediate watershed)	Dominant Surrounding Landuse: <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Agricultural <input type="checkbox"/> Industrial <input type="checkbox"/> Stream <input type="checkbox"/> Residential Management <input type="checkbox"/> Other <input type="checkbox"/> Recreational	Watershed NPS Pollution: <input type="checkbox"/> None <input type="checkbox"/> Some <input type="checkbox"/> Obvious Sources
	Note obvious features:	Watershed Erosion: <input type="checkbox"/> None <input type="checkbox"/> Heavy <input type="checkbox"/> Moderate
6.Instream Features	Canopy Cover: <input type="checkbox"/> Partially Open <input type="checkbox"/> Partially Shaded <input type="checkbox"/> Shaded	Proportion of Reach Represented by Stream Morphology Types: <input type="checkbox"/> Riffle_____ % <input type="checkbox"/> Pool_____ % <input type="checkbox"/> Run_____ %
	Bankfull width_____ Wetted width_____ Sampling Reach length_____ Estimated Stream Depth_____ High Water Mark_____	Channelized: <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Drop structures present Dam Present: <input type="checkbox"/> Yes <input type="checkbox"/> No
7.Dominant Vegetation (Flood Prone Area)	Overstory_____ Understory_____ Condition_____	
8.Aquatic Vegetation	Indicate Dominant Type: <input type="checkbox"/> Rooted Emergent <input type="checkbox"/> Free Floating <input type="checkbox"/> Rooted Submergent <input type="checkbox"/> Floating Algae <input type="checkbox"/> Rooted Floating <input type="checkbox"/> Attached Algae Portion of Reach with Aquatic Vegetation:_____ %	

How to fill out Physical Characterization Field Data Sheet:

1. Fill out first block of the physical characterization field data sheet: General Information

- Stream Name
- Site Number
- Location Description – brief explanation of how to get to the site and how selected the reach being sampled.
- Site name from Master Site List
- Date
- Elevation in ft
- Latitude/Longitude – GPS set to NAD27. See GPS SOP.
- Time begin/time end – Time arrived to the site and the time done sampling.
- Investigators – names of technicians and biologists working on the site.
- Form completed by – The form should be completed by one person only.
- Weather conditions – Brief description of the weather conditions at the site the day of sampling. Note any recent evidence of hard rain.

2. Flow

An estimate of flow will be conducted. If not using a flowmeter, use a buoyant object, such as an orange or film canister partially filled with water. Measure off a section of distance, for example 5 feet and record with a stopwatch how long it takes to travel the distance measured. This measurement is the surface velocity. Because the surface velocity is typically 70% faster than the actual stream velocity, multiply the surface velocity by 0.7.

Record the following measurements:

- A. Average stream width _____ft
- B. Average stream depth _____ft
- C. Distance float travel _____ft
- D. Time needed to travel _____sec

To calculate average velocity:

Step C answer (divided by) Step D answer (x) 0.7 = _____ft/sec surface velocity

To calculate the flow rate in cfs (cubic feet per second):

Step A answer (x) Step B answer (x) surface velocity = _____ cfs

3. Site sketch

Draw a sketch of the reach selected for sampling. Make sure to include transects, stream flow direction, and label left and right bank. Since all work is conducted working upstream, the left bank will be in the upstream direction.

Back Side of Physical Characterization Field Data sheet:

4. Field Chemistry

Using the quanta meter, record the basic field parameters:

- Ph
- Sp Cond
- DO
- Temp
- Alkalinity

5. Stream characterization

Communities inhabiting coldwater streams are markedly different from those in warmwater streams. Also, the perennial nature of stream is important. These parameters should be documented.

Mark the following for the stream reach sampled:

- Cold Water, or warm water stream, or transition stream
- Perennial, or intermittent. This is best completed before leaving for the field.

6. Water Quality

Water Odors: Note those odors described on the form or include any other odors not listed that are associated with the water in the sampling area.

Water Surface Oils: Note the term that best describes the relative amount of any oils present on the water surface.

7. Turbidity Tube

See the Turbidity Tube SOP for how to take a turbidity tube measurement. One will be taken at the beginning transect, one at the final transect, and two random measurements.

8. Watershed Features

Dominant Surrounding Landuse: Document the prevalent land-use type in the catchment of the station, i.e. the immediate watershed (noting any other land uses in the area which, although not predominant, may potentially affect water quality).

Watershed NPS Pollution: This item refers to problems and potential problems in the watershed. Nonpoint source pollution is defined as diffuse agricultural and urban runoff. Other compromising factors in a watershed that may affect water quality include feedlots, constructed wetlands, septic systems, dams and impoundments, mine seepage, etc...

Local Watershed Erosion: The existing or potential detachment of soil within the local watershed (the portion of the watershed or catchment that directly affects the stream reach or station under study) and its movement into the stream is noted. Erosion can be rated through visual observation of watershed and stream characteristics (note any turbidity observed during water quality assessment below).

9. Instream Features

Instream features are measured or evaluated in the area within the stream reach selected for sampling.

Canopy Cover: Note the general proportion of open to shaded area which best describes the best amount of cover at the sampling reach or station. A densiometer may be used in place of visual estimation. The categories are:

- Partially open: mostly open, few trees
- Partially shaded: intermittent shading
- Shaded: lots of cover

Proportion of Reach Represented by Stream Morphological Types: The proportion represented by riffles, runs, and pools should be noted to describe the morphological heterogeneity of the reach.

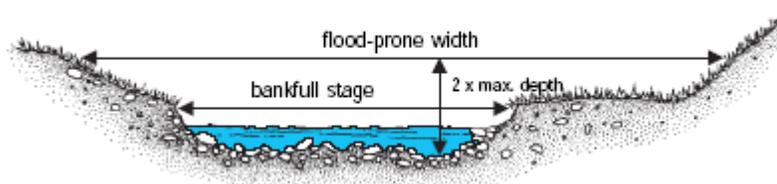
Channelized: Indicated whether or not the area around the sampling reach or station is channelized (e.g., straightening of stream, bridge abutments and road crossings, diversions, etc.).

Dam Present: Indicate the presence or absence of a dam upstream in the catchment or downstream of the sampling reach of station. If a dam is present, include specific information relating to alteration of flow.

Drop Structures Present: Indicate the presence or absence of drop structures.

Instream measures:

- Bankfull width
- Wetted width
- Sampling reach length
- Estimated stream depth
- High water mark



Bankfull width: By definition, Bankfull stage is the elevation of the floodplain adjacent to the active channel. If the stream is entrenched, bankfull stage is identified as a scour line, bench, or top of the point bar. If the stream is not entrenched, then bankfull is near or at the top of the bank.

Wetted width: The width of the water surface measured at right angles to the direction of flow and at a specific discharge. Widths of multiple channels are summed to represent total wetted width.

High water mark: Estimate the vertical distance from the bankfull margin of the stream bank to the peak overflow level, as indicated by debris hanging in riparian or floodplain vegetation, and deposition of silt or soil. In instances where bank overflow is rare, a high water mark may not be evident.

10. Dominant Vegetation: Overstory and Understory. Identify the types of vegetation that comprise the dominant vegetation of the Overstory and Understory. Identify the condition of the vegetation. These features are measured or evaluated in the area within the stream reach selected for sampling.

11. Aquatic Vegetation: The general type and relative dominance of aquatic plants are documented in this section. Only an estimation of the extent of aquatic vegetation is made. Besides being an ecological assemblage that responds to perturbation, aquatic vegetation provides refugia and food for aquatic fauna. These features are measured or evaluated in the area within the stream reach selected for sampling.

How to fill out Habitat Assessment/Modified RBP Field Data Sheet:

1. Cover suitable for mature fish species of concern: Determine the percent cover for the following listed parameters

- Undercut banks
- Deep pools (>1.5')
- Pocket pools (>1')
- Submerged logs
- Overhanging vegetation
- Other

Tally up the percentages of each type. Determine which category the sampling reach falls under and circle the score on the field data sheet. Write down the tallied percents onto the field sheet.

2. Flow: Determine occurrences of the following depth/velocity regimes present:

- Deep/slow
- Deep/fast
- Shallow/slow
- Shallow/fast

Determine the category the sampling reach falls under and circle the score on the field data sheet.

3. Channel Alteration: Is a measure of large-scale changes in the shape of the stream channel. Many streams in urban and agricultural areas have been straightened, deepened, or diverted into concrete channels, often for flood control or irrigation purposes. Scouring is often associated with channel alteration. Channel alteration is present when artificial embankments, riprap, and other forms of artificial bank stabilization or structures are present.

Determine the category the sampling reach falls under and circle the score on the field data sheet.

4. Percentage of pool and riffle-run habitat: Determine the percentage of the sampling reach that is comprised of pools and the percentage of riffle-runs.

Pool: still water, low velocity, smooth, glassy surface, usually deep compared to other parts of the channel.

Riffle: Water moving, with small ripples, waves and eddies, waves not breaking, surface tension not broken. The sound is a babbling or a gurgling.

Run: Water moving with an unbroken surface. Low turbulence.

Determine the category the sampling reach falls under and circle the score on the field data sheet.

5. Bank stability: Measures whether the stream banks are eroded (or have the potential for erosion). Steep banks are more likely to collapse and suffer from erosion than are gently sloping banks, and are therefore considered to be unstable. Signs of erosion include crumbling, unvegetated banks, exposed tree roots, and exposed soil. Evaluate each bank separately and determine the cumulative score for this parameter.

6. Disruptive riparian/streambank pressures: Measures the amount of vegetative protection afforded to the stream bank and the near-stream portion of the riparian zone. The root systems of plants growing on stream banks help hold soil in place, thereby reducing the amount of erosion that is likely to occur. This parameter supplies information on the ability of the bank to resist erosion as well as some additional information on the uptake of nutrients by the plants, the control of instream scouring, and stream shading.

Determine the category the sampling reach falls under and circle the score on the field data sheet.

Habitat Assessment Field Data Sheet

Modified RBP

Moderate to High Gradient, Riffle-Run Channels

<p>1. Cover suitable for mature fish species of concern.</p> <p>Stream distance surveyed:</p> <p>Species:</p>	<p>Greater than 50% over specified stream reach. Includes the following:</p> <ul style="list-style-type: none"> a. Undercut banks b. Deep pools- (>1.5 ft.) c. Pocket pools- (>1 ft. ie. behind boulders) d. Submerged logs e. Overhanging vegetation f. other <p>Score 4</p>	<p>30-50 % cover over specified stream reach. Includes the following:</p> <ul style="list-style-type: none"> a. Undercut banks b. Deep pools- (>1.5 ft.) c. Pocket pools- (>1 ft. ie. behind boulders) d. Submerged logs e. Overhanging vegetation f. Other <p>Score 3</p>	<p>10-30% cover over specified stream reach. Includes the following:</p> <ul style="list-style-type: none"> a. Undercut banks b. Deep pools- (>1.5 ft.) c. Pocket pools- (>1 ft. ie. behind boulders) d. Submerged logs e. Overhanging vegetation f. other <p>Score 2</p>	<p><10% suitable cover over specified stream reach. Includes the following:</p> <ul style="list-style-type: none"> a. Undercut banks b. Deep pools- (>1.5 ft.) c. Pocket pools- (>1 ft. ie. behind boulders) d. Submerged logs e. Overhanging vegetation f. other <p>Score 1</p>
<p>2. Flow</p> <ul style="list-style-type: none"> a. small streams, flow less than 5 cfs or b. larger streams, flow > 5 cfs 	<p>Cold >2 cfs Warm 4-5 cfs</p> <p>Sequences of all the following 4 depth/velocity regimes present:</p> <ul style="list-style-type: none"> a. deep/slow (D>1.5ft, V<1ft/sec) b. deep/fast (D>1.5ft, V>1ft/sec) c. shallow/slow (D<1.5ft, V<1ft/sec) d. shallow/fast (D<1.5ft, V>1ft/sec) <p>Score 4</p>	<p>Cold 1-2 cfs Warm 2-5 cfs</p> <p>Only 3 of 4 habitat categories present in expected sequence</p> <p>Score 3</p>	<p>Cold .5-1 cfs Warm 1-2 cfs</p> <p>Only 2 of 4 habitat categories present in expected sequence</p> <p>Score 2</p>	<p>Cold <0.5 cfs Warm <1 cfs</p> <p>Dominated by one depth/velocity category</p> <p>Score 1</p>

<p>3. Channel alteration from expected pattern. ie. Rosgen</p>	<p>No channelization apparent. Meander pattern as expected.</p> <p>Score 4</p>	<p>Some loss of meanders apparent. Some channelization present. Ridge abutments; evidence of past channelization.</p> <p>Score 3</p>	<p>Loss of meanders and blown-out areas common. Channelization may be extensive; embankments or shoring structures present on both banks.</p> <p>Score 2</p>	<p>Expected meanders generally absent. Channelization extensive. Over 80% of stream reach channelized and disrupted.</p> <p>Score 1</p>
<p>4. Percentage of pool and riffle - run habitat over a distance of approximately 15-20 stream widths</p> <p>Distance measured:_____</p>	<p>30-50% of the total stream reach composed of pools. Remainder riffle-run.</p> <p>Score 4</p>	<p>20-35% of the total stream reach composed of pools. Remainder riffle-run.</p> <p>Score 3</p>	<p>10-20% of the total stream reach composed of pools. Remainder riffle-run.</p> <p>Score 2</p>	<p>Less than 10% of the stream reach composed of pools. Remainder riffle-run.</p> <p>Score 1</p>
<p>5. Bank stability</p> <p>Estimate of raw slumping banks _____%</p> <p>Estimate of streambank covered by:</p> <p>a. shrubs b. grasses c. rock d. other</p>	<p>Stable. No evidence of erosion or bank failure.</p> <p>Score 4</p>	<p>Moderately stable. Infrequent, small areas of erosion mostly healed over. Slight potential during bankfull flows.</p> <p>Score 3</p>	<p>Moderately unstable. Moderate frequency and size of erosional areas. High erosion potential during bankfull flows.</p> <p>Score 2</p>	<p>Unstable. Many eroded areas. Raw areas frequent along straight sections and bends.</p> <p>Score 1</p>
<p>6. Disruptive riparian/streambank pressures.</p> <p>a. Grazing b. Logging c. Roads d. Other</p>	<p>Vegetative disruption minimal or not evident. Almost all potential plant biomass at present stage of development remains.</p> <p>Score 4</p>	<p>Disruption evident but not affecting community vigor. Vegetative use is moderate, and at least one-half of the potential plant biomass remains.</p> <p>Score 3</p>	<p>Disruption obvious; some patches of bare soil or closely cropped vegetation present. Less than half of the potential plant biomass remains.</p> <p>Score 2</p>	<p>Disruption of streambank vegetation is very high. Vegetation has been removed to 2 inches or less in average stubble height.</p> <p>Score 1</p>

