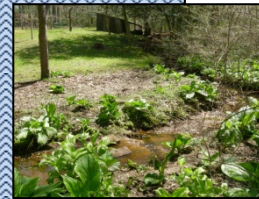


<u>Contact</u>	<u>Telephone</u>
Emergency/Police/Fire/Ambulance	911
Poison Control Center	(800) 222-1222
National Response Center	(800) 424-8802



# Field Data Collection Guide for Watershed Studies



**Anne Arundel County**  
**Department of Public Works**  
**Bureau of Engineering**  
**Watershed, Ecosystem, and**  
**Restoration Services Division**

2012





## Notes

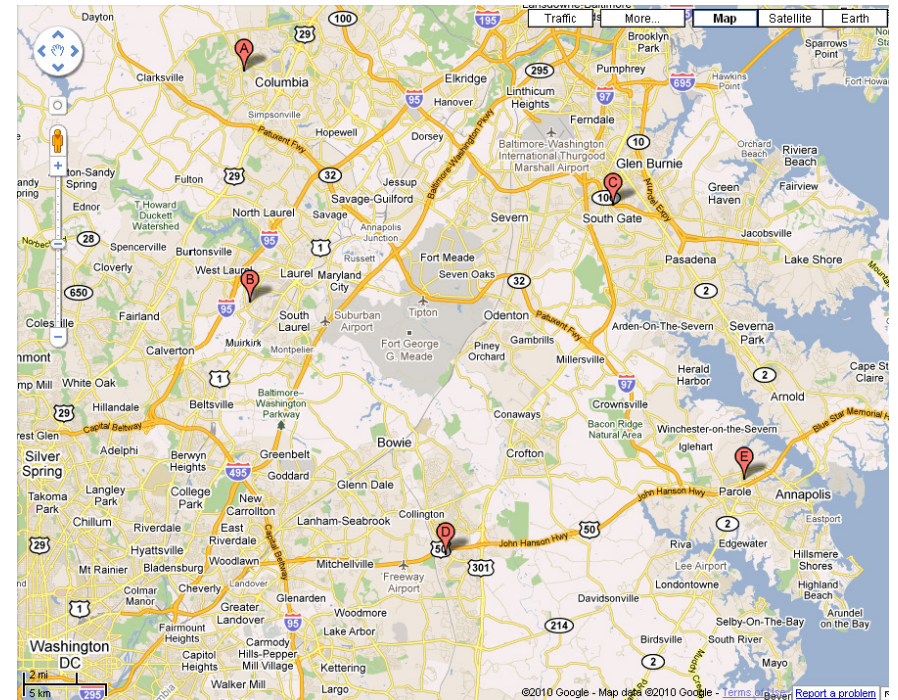
## Purpose

This *Field Data Collection Guide for Watershed Studies* documents data collection protocols, procedures, and assessment and scoring guidance for watershed studies conducted by Anne Arundel County's Watershed, Ecosystem, and Restoration Services Division. This guide is intended for use by future field assessment teams to help ensure consistent data collection throughout all of the County's watershed assessments.

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## Hospitals/Emergency Care Facilities



Location	Hospital	Address	Phone Number
A	Howard County General Hospital	5755 Cedar Lane, Columbia, MD 21044	(410) 740-7777
B	Doctor’s Community Hospital	8118 Good Luck Rd., Lanham, MD 20706	(301) 552-8665
C	Baltimore Washington Medical Center	301 Hospital Dr., Glen Burnie, MD 21061	(410) 787-4565
D	Bowie Emergency Center	15001 Health Center Dr, Bowie, MD 20716	(301) 262-5511
E	Anne Arundel Medical Center	2001 Medical Parkway, Annapolis, MD 21401	(443) 481-1000



## OTHER IMPACT

### Scoring Guide

- Note and photograph any other issues that should be brought to County’s attention (e.g., erosion and sediment control violations).

## FIELD TASK OVERVIEW

This is a summary of the primary tasks associated with the field data collection for the County’s watershed studies. Each task is discussed in more detail in the sections that follow.

### Stream Reaches

- Verify actual position and alignment of all channels represented on the County’s planimetric *Stream* GIS layer, other perennial streams encountered in the field, or other non-perennial channels connected to a storm drain outfall in the County’s GIS *Outfall* layer.
- Mark with a *Confluence* point and perform no further assessment on those intermittent/ephemeral channels that do not meet the criteria above.
- Break the stream layer into reaches based on flow type and other considerations.

### Physical Habitat Assessment

- Provide basic data and a photo for each stream reach regardless of flow type.
- Perform full physical habitat assessments on perennial reaches only.
- Perform rapid assessments on in-line wetlands

### Stream Geomorphology (Rosgen)

- Place *Rosgen* point and take photo for each stream reach regardless of flow type.
- Perform geomorphology/Rosgen assessments only on single-threaded reaches regardless of flow type.

### Infrastructure Inventory

- Perform inventory assessment and take photo for each infrastructure type encountered within each reach regardless of flow type.
- Place multiple points when an inventory point crosses a reach break.

## UTILITY

### Scoring Guide

- Impact Score
  - *Extreme (20)*: Line is leaking.
  - *Severe (10)*: Exposed line causing a significant erosion and/or obstruction **OR** potential to burst/leak appears high.
  - *Moderate (5)*: Half exposed line causing moderate erosion.
  - *Minor (2)*: Line is partially visible however mostly buried in stream bed, little if any erosion.

### Photo Tips

Include location of utility relative to stream and/or banks. Use additional photos as necessary to capture any erosion or other impacts.



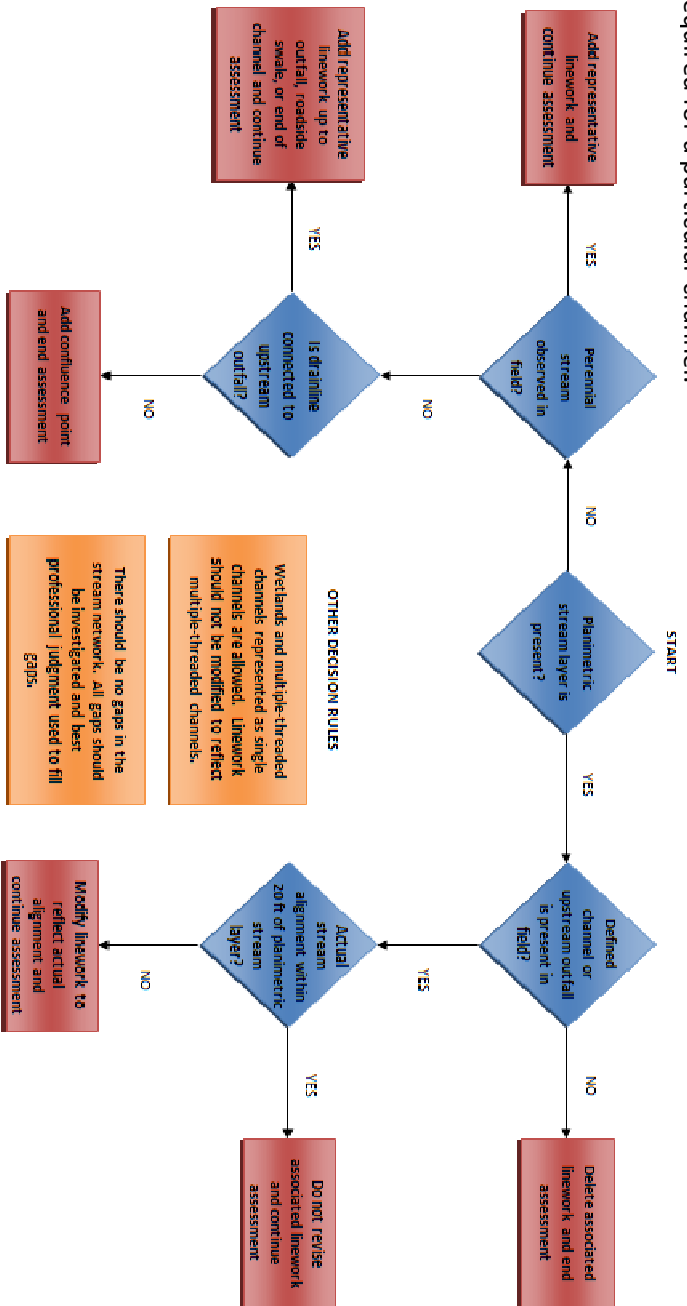
### Additional Information

- Bank side (right or left) is determined by looking upstream.

## STREAM REACHES

### Stream Layer Verification

The decision tree below should be used to guide whether or not stream verification and subsequent assessment are required for a particular channel.



## Additional Information

- Bank side (right or left) is determined by looking upstream.
- Record either pipe diameter (in inches) or ditch width (in feet) depending on whether the inventory point is a pipe or ditch.
- In general, record only pipe outfalls that are encountered within the 100 ft. stream buffer. Outfall drainage channels longer than 100 ft. will need to be treated as an assessment reach, for which the four primary tasks described in this guide on page 1 will need to be conducted.
- Standing water in a downstream channel should not be used as a surrogate for discharge quality parameters when no flow is present. Poor quality standing water should be noted however in the *Comments* field.

## Stream Character Types

Channels that require assessment according to the stream layer verification decision tree (previous page) should be assessed and assigned one of the following stream character types:

- Perennial - Continuous flow year round during years of normal rainfall
- Intermittent - Flow ceases for weeks or months each year
- Ephemeral - Flows for only hours or days following a rain event
- Underground
- Wetland/marsh
- Pond/lake
- Floodway
- Stormwater management (SWM)
- Pipe
- Ditch

## Stream Reach Breaks

Channels should be broken into reaches based on the following criteria:

- Changes in flow type
- Changes in physical habitat
- Major changes in riparian buffer
- Changes in stream geomorphology
- Major culverts or bridges



## PHYSICAL HABITAT ASSESSMENT

### Data Collection Procedures

- Provide basic data and at least one representative photo for each reach regardless of flow type. Basic data includes: date assessed, assessor, past weather, current weather, presence of flow, whether a physical habitat assessment and infrastructure assessment were performed, and if not, why not.
- Perform full physical habitat assessments only on perennial reaches that are greater than 75 meters.
- Select representative 75 meter reach to perform assessment.
- Collect MPHI scoring parameters.
- Collect additional information contained in the County SAT database (*Stream Characteristics* table).
- When a wetland is identified, see wetland rapid assessment field guide.

### Photo Tips

Take photo within channel facing upstream, if possible. Photo should capture channel cross section and floodplain (see below) and should be representative of entire reach.



## PIPE AND DITCH

### Scoring Guide

- Impact Score
  - *Severe (10)*: Pipe or ditch causing a significant erosion problem to stream bank or stream and/or discharge is coming from pipe that may not be stormwater.
  - *Moderate (5)*: Pipe or ditch is causing moderate erosion problem and should be fixed, it may worsen if left unattended.
  - *Minor (0)*: Pipe or ditch is not causing erosion problem and no discharge is occurring.

### Photo Tips

Context is important, do not zoom in on pipe opening, include flow path out of pipe and erosion, if present.



## OBSTRUCTION

### Scoring Guide

- Impact Score
  - *Severe (10)*: Blockage causing significant erosion problem and/or potential for flooding. Stream usually almost totally blocked (>75%).
  - *Moderate (5)*: Blockage is causing moderate erosion and could cause flooding. Stream partially blocked, but obstruction should probably be removed, because problem could worsen.
  - *Minor (2)*: Blockage is causing some erosion problems but does have potential to worsen and probably should be looked at or monitored.

### Photo Tips

Take photo that includes full extent of obstruction, if possible. Highlight erosion if present in additional photos.



## MPHI Parameter Scoring Guide

- In-stream Habitat
  - *Optimal (16-20)*: Greater than 50% of a variety of cobble, boulder, submerged logs, undercut banks, snags, root wads, aquatic plants or other stable habitat.
  - *Sub-Optimal (11-15)*: 30-50% stable habitat. Adequate.
  - *Marginal (6-10)*: 10-30% mix of stable habitat. Less than desirable.
  - *Poor (0-5)*: <10% stable habitat. Lack of habitat is obvious.
- Epifaunal Substrate
  - *Optimal (16-20)*: Preferred substrate abundant, stable, and at full colonization potential (riffles well developed and dominated by cobble; woody debris prevalent, not new, and not transient).
  - *Sub-Optimal (11-15)*: Abundance of cobble with gravel and/or boulders common; or woody debris, aquatic vegetation, undercut banks, or other productive surfaces common but not prevalent/suited for full colonization.
  - *Marginal (6-10)*: Large boulders and/or bedrock prevalent; cobble, woody debris, or other preferred surfaces uncommon.
  - *Poor (0-5)*: Stable substrate lacking; sedimentation or flocculent material covering >75% surface.



## MPHI Parameter Scoring Guide (continued)

- Woody Debris and Root Wads
  - Count woody debris >10 cm diameter, more than 1.5 m long
  - Count root wads on live trees with DBH of at least 15 cm
  - Only count those found in wetted (or likely to become wetted) portion of stream
- Bank Stability
  - Linear % erosion of both banks of the stream
  - Severity = None, Minimal, Moderate, or Severe
- Remoteness
  - Distance to nearest road (meters)
- Shading
  - Estimate of degree and duration of shading during summer
  - 0%: Fully exposed to sunlight all day in summer
  - 100%: Fully and densely shaded all day in summer

### Additional Physical Habitat Assessment Data

- Water clarity and odor
- Sediment odor
- Fish presence and size
- Aquatic plant presence, type, and location
- Algae (slime, floating, and filamentous) presence and color
- Bacteria presence and type
- Dominant land use
- Dominant riparian vegetation type and width
- Maximum depth

## HEAD CUT

### Scoring Guide

- Height of the head cut (in feet) is measured from channel bottom to channel bottom.

### Photo Tips

Take photo facing upstream from bank or instream. Include background height reference, if possible.



### Additional Information

- Consecutive head cuts that are within 5 to 10 feet of each other may be aggregated into a single point.

## Additional Information

- Bank side (right or left) is determined by looking upstream.
- Linear footage of erosion should be reported as the longitudinal distance along the stream. Erosion reported on both sides of the stream should be measured as the average distance on both sides of the stream (*e.g.*, the erosion should *not* be doubled if it appears on both sides of the stream; if there is 20 ft of erosion on the right bank and 40 ft of erosion on the left bank, it should be recorded as 30 ft on both banks).
- Discrete areas of erosion along a reach may be aggregated into a single point as long as the characteristics and impacts are identical.
- Bank height and bankfull height should be measured to channel bottom not water surface.
- Place multiple points when erosion crosses a reach break (*e.g.*, erosion that spans two or more reaches).

## STREAM GEOMORPHOLOGY (ROSGEN)

### Data Collection Procedures

- Place *Rosgen* point and take at least one representative photo for each reach regardless of flow type.
- Collect data for Manning's roughness calculation, Rosgen classification, and other geomorphic assessments for all perennial, intermittent, and ephemeral reaches.
- Place point at representative location in channel (preferably riffle).

### Photo Tips

Take photo from top of stream banks, if possible. Photo should capture channel cross section at a riffle as well as connection with floodplain.





## Manning's Roughness Parameter Scoring Guide

- Dominant and Subdominant Bed Material
  - *Clay/Silt (<0.08mm)*
  - *Fine Sand (0.08-1mm)*
  - *Coarse Sand (1-2mm)*
  - *Gravel (2-64mm)*
  - *Cobble (64-256mm)*
  - *Boulder (>256mm)*
- Surface Irregularities
  - *Smooth:* Compares to the smoothest channel attainable given a bed material.
  - *Minor:* Compares to a carefully degraded channel in good condition but having slightly eroded or scoured side slopes.
  - *Moderate:* Compares to dredged channels having moderate to considerable bed roughness and moderately sloughed or eroded side slopes.
  - *Severe:* Badly sloughed or scalloped banks or natural streams; badly eroded or sloughed sides of canals or drainage channels; unshaped jagged, and irregular surfaces of channel.
- Channel Shape and Size Variation
  - *Gradual:* Size and shape of channel cross sections change gradually.
  - *Alternating Occasionally:* Large and small cross sections alternate occasionally or the shifts in main flow occasionally shift from one side to another because of the changes in cross sectional shape.
  - *Alternating Frequently:* Large and small cross sections alternate frequently or the main flow frequently shifts from side to side because of the changes in cross sectional shape.

## Photo Tips

Take photos that capture bank(s) with erosion in context of the stream. Also include area upstream or downstream of immediate erosion, if possible.



## EROSION

### Scoring Guide

- Impact Score
  - *Extreme (10)*: Impending threat to structures or infrastructure.
  - *Severe (7)*: Large area of erosion that is damaging property and causing obvious instream degradation. Eroding bank is generally 5 ft. or greater in height.
  - *Moderate (5)*: Moderate area of erosion that may be damaging property and causing some instream degradation. Eroding bank is generally 2-3 ft. or greater in height.
  - *Minor (is not recorded, scored or photographed)*: Minor area of erosion, low threat to property, and no noticeable instream degradation.
- Restoration Potential
  - *High*: Potential project is of good size, would not involve easements in residential yards, involves minimal number of property owners, appears to have good access, and would provide good benefit to stream.
  - *Moderate*: Potential project is of good or fair size, involves just a few property owners, may include but is not confined to small residential yards, appears to have good access, and would benefit stream.
  - *Low*: Potential project is small OR is confined to small residential yards, appears to have access issues OR is not critical for character of stream.

## Manning's Roughness Parameter Scoring Guide (continued)

- Obstructions
  - *Negligible*: A few scattered obstructions, which include debris deposits, stumps, exposed roots, logs, piers, or isolated boulders, that occupy less than 5 percent of the cross-sectional area.
  - *Minor*: Obstructions occupy 5 percent to 15 percent of the cross-sectional area, and the spacing between obstructions is such that the sphere of influence around one obstruction does not extend to the sphere of influence around another obstruction. Smaller adjustments are used for curved, smooth-surfaced objects than are used for sharp-edged angular objects.
  - *Appreciable*: Obstructions occupy from 15 percent to 50 percent of the cross-sectional area, or the space between obstructions is small enough to cause the effects of several obstructions to be additive, thereby blocking an equivalent part of a cross section.
  - *Severe*: Obstructions occupy more than 50 percent of the cross-sectional area, or the space between obstructions is small enough to cause turbulence across most of the cross section.
- Meander
  - *Minor*: Ratio of the channel length to valley length is 1.0 to 1.2.
  - *Appreciable*: Ratio of the channel length to valley length is 1.2 to 1.5.
  - *Severe*: Ratio of the channel length to valley length is greater than 1.5.

## Manning’s Roughness Parameter Scoring Guide (continued)

- Vegetation
  - *Small*: Dense growths of flexible turf grass, such as Bermuda, or weeds growing where the average depth of flow is at least two times the height of the vegetation; supple tree seedlings such as willow, cottonwood, arrowhead, or salt cedar growing where the average depth of flow is at least three times the height of the vegetation.
  - *Medium*: Turf grass growing where the average depth of flow is from one to two times the height of the vegetation; moderately dense stemmy grass, weeds, or tree seedlings growing where the average depth of flow is from two to three times the height of the vegetation; brushy, moderately dense vegetation, similar to 1-to-2-year-old willow trees in the dormant season, growing along the banks, and no significant vegetation is evident along the channel bottoms where the hydraulic radius exceeds 2 ft.
  - *Large*: Turf grass growing where the average depth of flow is about equal to the height of the vegetation; 8-to-10-years-old willow or cottonwood trees intergrown with some weeds and brush (none of the vegetation in foliage) where the hydraulic radius exceeds 2 ft.; bushy willows about 1 year old intergrown with some weeds along side slopes (all vegetation in full foliage), and no significant vegetation exists along channel bottoms where the hydraulic radius is greater than 2 ft.
  - *Very Large*: Turf grass growing where the average depth of flow is less than half the height of the vegetation; bushy willow trees about 1 year old intergrown with weeds along side slopes (all vegetation in full foliage), or dense cattails growing along channel bottom; trees intergrow with weeds and brush (all vegetation in full foliage).

## Additional Information

- When estimating the volume of material at the dumpsite, this value must be a compacted volume. Estimates of volume should ignore void space and account only for the volume of physical materials that compromise the objects.
- Bank side (right or left) is determined by looking upstream.
- In general, record only dumpsites encountered within the 100 ft. stream buffer.
- In the cleanup comments, consider the ease of access, the weight or bulk of the items, and any potential hazards to cleanup crews.



## DUMPSITE

### Scoring Guide

- Impact Score
  - *Severe (10):* Active and/or threatening. Material may be considered toxic or threatening to environment (concrete, petroleum, empty 55 gallon drums) or site is large (>2,500 sq. ft.).
  - *Moderate (5):* Dumpsite (<2,500 sq. ft.) containing non-toxic material, does not appear to be used often, however clean-up would definitely be a benefit.
  - *Minor (1):* Dumpsite appears small (<100 sq. ft.) and material stable (will not likely be transported downstream by high water). Not high priority.

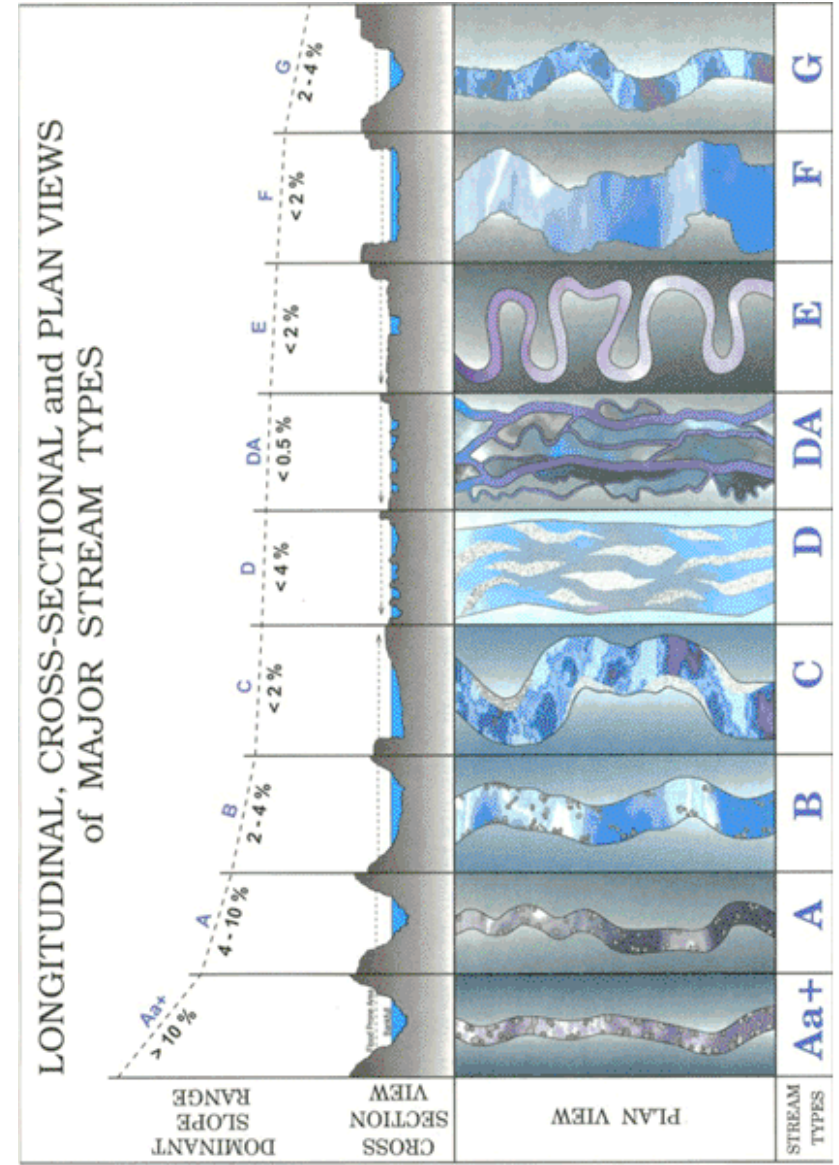
### Photo Tips

Take photo that captures context of dumpsite relative to the stream, if possible. Take additional photos that capture the largest impact items.



## Rosgen Classification

Perform quick estimate of Rosgen Level I classification using the following chart.



## Additional Geomorphic Assessment Data

- Overall Channel Condition  
[Poor conditions (1) to Good conditions (10)]
  - 1: Channel is actively down cutting or widening; >50% of the reach altered and/or unstable.
  - 2, 3, or 4: Altered channel; <50% of the reach altered (riprap, channelization, etc) and/or unstable.
  - 5, 6, 7, 8, or 9: Channel largely stable. Evidence or past channel alteration, but with significant recovery of channel and banks.
  - 10: Natural channel. No evidence of significant lateral or bed adjustment.
- Channel Incision  
[Poor conditions (1) to Good conditions (10)]
  - 1: Channel significantly incised.
  - 2 or 3: Majority of channel moderately and/or significantly incised.
  - 4, 5, or 6: Portions of channel moderately incised.
  - 7, 8, or 9: Channel largely connected with floodplain, except locally where past channel alteration has occurred.
  - 10: Channel connected to floodplain.

## Photo Tips

Take photos at both the upstream and downstream ends of the crossing. If possible, take photos from within stream channel. Photo should provide appropriate context and include the crossing structure as well as the stream bed and banks. Include all barrels in single photo, if possible. Highlight erosion or sediment or debris deposition, if present, in additional photos, if needed.



## Additional Information

- Foot bridges and bridges that span a stream without culverts should be assigned a barrel quantity of zero (0).
- Crossing diameter is in feet.
- In the event multiple barrels are present, the reported diameter should be the average of all barrels or crossing structures.
- Bed erosion height is measured from the structure invert to the bottom of the eroded stream bed.



## CROSSING

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### Scoring Guide

- Impact Score
  - *Extreme (10)*: Condition of debris, sediment or erosion poses immediate threat to structural stability of road or other structure. Major repair will be needed if problem is not addressed.
  - *Severe (7)*: Condition probably poses threat to road or other structure. Problem should be addressed to avoid bigger problem in future.
  - *Moderate (5)*: Condition does not appear to pose threat to road or other structure, but should be addressed to enhance stream integrity and future stability of structure.
  - *Minor (2)*: Condition is noticeable but may not warrant repair.

## INFRASTRUCTURE INVENTORY

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### General Data Collection Procedures

- Collect characteristics and impact data for the following features encountered in each reach regardless of perennality:
  - Deficient Buffers
  - Crossings
  - Dumpsites
  - Erosion
  - Head Cuts
  - Obstructions
  - Pipes and Ditches
  - Utilities
  - Other Impacts
- Record each observed instance encountered in the field with the following exceptions:
  - Discrete areas of erosion along a reach may be aggregated into a single point as long as the characteristics and impacts are identical.
  - Consecutive head cuts that are within 5 to 10 feet of each other may be aggregated into a single point.
- Place point at center of each feature.
- Take at least one representative photo.
- Place multiple points when an inventory feature crosses a reach break (*e.g.*, deficient buffer or erosion that spans two or more reaches).

## DEFICIENT BUFFER

### Scoring Guide

- Impact Score
  - *Extreme (10)*: Impervious/commercial area in close proximity to stream, banks may be modified or engineered. Stream character such as (bank/bed stability, sediment deposition, and/or shading) is obviously degraded by adjacent use.
  - *Severe (7)*: Some impervious and/or just turf up to the bank, very little vegetation aside from turf within 25 ft. zone, stream character probably degraded by adjacent uses.
  - *Moderate (5)*: Encroachment mostly from residential uses and yard; some vegetation within 25 ft. zone, but very little other than turf within remainder of 100 ft. zone; stream character may be changed slightly by adjacent use.
  - *Minor (is not recorded, scored or photographed)*: Vegetated buffer primarily intact within 100 ft. of stream.
- Restoration Potential
  - *High*: Potential project is of good size, would not involve easements in residential yards, involves minimal number of property owners, appears to have good access, and would provide good benefit to stream.
  - *Moderate*: Potential project is of good or fair size, involves just a few property owners, may include but is not confined to small residential yards, appears to have good access, and would benefit stream.
  - *Low*: Potential project is small **OR** is confined to small residential yards, appears to have access issues **OR** is not critical for character of stream.

### Photo Tips

Take photo that captures the buffer deficiency's proximity to the stream, if possible (*e.g.*, stream channel in the foreground). Also ensure that the buffer type is discernible.



### Additional Information

- Bank side (right or left) is determined by looking upstream.
- Record only buffer deficiencies within 100 ft. of stream channel.
- Linear footage of the buffer deficiency should be reported as the longitudinal distance along the stream. A deficiency reported on both sides of the stream should be measured as the average distance on both sides of the stream (*e.g.*, the deficiency should *not* be doubled if it appears on both sides of the stream; if there is 20 ft of deficiency on the right bank and 40 ft of buffer deficiency on the left bank, it should be recorded as 30 ft on both banks).