Appendix G

Specialized Site-Scale In-Stream Surveys

*****NOTE: These surveys are included for discussion purposes at this point.**

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Impacted Buffer Survey

Outfall Tracking ID (AutoNumber)

Impacted Buffer **IB**

Watershed | Date | Assessed By:

Survey Reach | Time | PhotoID: Camera # | PhotoID: Pic#s

SiteID: (condition-#)

IB-

Lat 0° 0' 0" Long 0° 0' 0" LMK

Lat 0° 0' 0" Long 0° 0' 0" LMK

GPS: (Unit ID)

Impacted Bank: ☐ LT ☐ RT ☐ Both

Reason Inadequate: ☐ Lack of vegetation ☐ Too narrow ☐ Widespread invasive plants ☐ Recently planted ☐ Other Description

Land Use: *(Facing downstream)*

	Private	Institutional	Golf Course	Park	Other Public	Other Public Desc
LT Bank	☐	☐	☐	☐	☐	
RT Bank	☐	☐	☐	☐	☐	

Dominant Land Cover:

	Paved	Bare Ground	Turf Lawn	Tall Grass	Shrub/Scrub	Trees	Other	Other Desc
LT Bank	☐	☐	☐	☐	☐	☐	☐	
RT Bank	☐	☐	☐	☐	☐	☐	☐	

Invasive Plants

Stream Shade Provided?

Wetlands Present ☐ Unkown ☐

Potential Restoration Candidate ☐ Active Reforestion ☐ Greenway Design ☐ Natural regeneration ☐ Invasives Removal

If No select ☐ ☐ Other Other Desc

Restorable Area

	LT	Bank RT
Length (ft):	0	0
Width (ft):	0	0

Reforestation Potential:

Impacted area on public land where the riparian area does not appear to be used for any specific purpose; plenty of area available for planting		Impacted area on either public or private land that is presently used for a specific purpose; available area for planting adequate		Impacted area on private land where road; building encroachment or other feature significantly limits available area for planting
5	4	3	2	1

Potential conflicts with reforestation ☐ Widespread Invasive Plants ☐ Potential Contamination ☐ Lack of Sun

☐ Poor/unsafe access to site ☐ Existing Impervious Cover ☐ Severe animal impacts (deer, beaver) ☐ Other Desc

Notes:

Riparian Buffer Survey:
Problem Site Documentation

Field Team:____

Section:_______________ Site Number:__________ Photos Taken: _____________________

Town:_____________________ County: ____________________ Date:____________________

GPS Reading(s):____

SITE DESCRIPTION:

- Approx. width of river (bank to bank): ________________
- Approx. length (along bank) of problem site: ___________
- Approx. width of riparian buffer (if any) separating site from river:_______________
- Bank Vegetation:

  ___none ___wild grasses ___lawn (grass) ___herbaceous ___shrubs ___trees
- Is river well shaded?____
- If bank is exposed, note soil type(s): ___sand/gravel ___silt/loam ___clay
- Type of land use potentially causing degradation:

  ___Natural ___Logging ___Dirt Road

  ___Crops (agriculture) ___Livestock (agriculture) ___Multiple use trail

  ___Domestic/lawn ___Tarred road

  ___Other: please describe____

SITE CHARACTERIZATION:

- Site best characterized as (e.g. summer camp, boat launch, dam, horse pasture, hay field, etc.)

  ____
- Check all that apply:

  ___Immediate shore cleared and not recovering
  ___Immediate shore cleared and recovering naturally
  ___Active silt deposition/sedimentation occurring
  ___No active siltation/sedimentation but potential present
  ___Livestock impacting bank
  ___Human activity impacting bank (includes lawn maintenance, recreation, etc.)
  ___Clear and present danger of increased loading (excessive nutrients, pollutants, etc.)
  ___Potential loading threat (excessive nutrients, pollutants, etc.)
  ___Physical disruption of river bed
  ___Others: please list
- Is there a dock at this site? __________

I would rank the degree of concern for this site as: ___high ___medium ___low

Use back of sheet for a sketch of the site, & for any additional comments, concerns, & suggestions.

INADEQUATE BUFFER IB

Map: _______________ **Team:** _______ **Site:** _________

Date: ____/____/____ **Photo:** _______ **Survey:** _______
MM DD YY

Buffer inadequate on: **L**eft **R**ight **B**oth (looking downstream)

Is stream unshaded? **L**eft **R**ight **B**oth (looking downstream) **N**either

Buffer width left: _______ ft. **Buffer width right:** _______ ft.

Length left: ____________ ft. **Length right:** ____________ ft.

Present land use left side: **Cr**op field, **Pa**sture, **La**wn, **Pav**ed, **Sh**rubs & Small Trees, **Fo**rest, **M**ultiflora **R**ose, **O**ther _____________________

Present land use right side: **Cr**op field, **Pa**sture, **La**wn, **Pav**ed, **Sh**rubs & Small Trees, **Fo**rest, **M**ultiflora **R**ose, **O**ther _____________________

Has a buffer recently been established: **Y**es **N**o

Are Livestock present: **Y**es **N**o **Type:** **C**attle, **H**orses, **P**igs, **O**ther: _____________________

Severity	Severe	**1**	**2**	**3**	**4**	**5**	Minor	Unknown (**–1**)
Correctability	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)
Access	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)
Wetland Potential	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)

(Good wetland potential = low slope, low bank height)

INADEQUATE BUFFER IB

Map: _______________ **Team:** _______ **Site:** _________

Date: ____/____/____ **Photo:** _______ **Survey:** _______
MM DD YY

Buffer inadequate on: **L**eft **R**ight **B**oth (looking downstream)

Is stream unshaded? **L**eft **R**ight **B**oth (looking downstream) **N**either

Buffer width left: _______ ft. **Buffer width right:** _______ ft.

Length left: ____________ ft. **Length right:** ____________ ft.

Present land use left side: **Cr**op field, **Pa**sture, **La**wn, **Pav**ed, **Sh**rubs & Small Trees, **Fo**rest, **M**ultiflora **R**ose, **O**ther _____________________

Present land use right side: **Cr**op field, **Pa**sture, **La**wn, **Pav**ed, **Sh**rubs & Small Trees, **Fo**rest, **M**ultiflora **R**ose, **O**ther _____________________

Has a buffer recently been established: **Y**es **N**o

Are Livestock present: **Y**es **N**o **Type:** **C**attle, **H**orses, **P**igs, **O**ther: _____________________

Severity	Severe	**1**	**2**	**3**	**4**	**5**	Minor	Unknown (**–1**)
Correctability	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)
Access	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)
Wetland Potential	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)

(Good wetland potential = low slope, low bank height)

Channel Modification Survey

Channel Modification Tracking ID: (AutoNumber) Channel Modification **CM**

Watershed: Date: Assessed By:

Survey Reach ID: Time: *am/pm* Photo ID:(Camera-Pic#) -#

Site ID: (Condition-#)
CM-

Start Lat: 0 ° 0 ' 0 " Long: 0 ° 0 ' 0 " LMK: GPS: (Unit ID)

End Lat: 0 ° 0 ' 0 " Long: 0 ° 0 ' 0 " LMK:

Type: ☐ Channelizatic ☐ Bank Armorir ☐ Concrete Chann ☐ Floodplain Encroachm ☐ Other OtherDescriptio

Material:
☐ Concrete ☐ Gabion
☐ Rip Rap ☐ Earthen
☐ Metal ☐ Other:

Does channel have perennial flow? ☐ Click if "Yes" if "No" leave blank.
Is there evidence of sediment depostion? ☐
Is vegetationgrowing in channel? ☐
Is channel connected to floodpl: ☐

Dimensions:
Height 0 ft
Bottom Width 0 ft
Top Width 0 ft
Length 0 ft

Base Flow Channel
Depth of flow 0 (in)
Defined Low Flow Channel ☐
% of Channel Bottom 0 %

Adjacent Stream Corridor
LT 0 (ft) RT 0 (ft)
Utilities Present? ☐
Fill in Flood Plain? ☐

Channelization Severity:	A long section of concrete stream (>500') channel where water is very shallow (<1" deep) with no natural sediments present in the channel.	A moderate length (>200') ,but the channel stabilized and to function as a natural stream channel. Vegetated bars may have formed in channel.	An earthen channel of less than 100 ft with good water depth, a natural sediment bottom, and size and shape similar to the unchannelized stream reaches above and below impacted area.
	5 4	3 2	1

Notes:

CHANNEL ALTERATION

CA

Map: _______________ **Team:** _______ **Site:** _________

Date: ____/____/____ **Photo:** _______ **Survey:** _______

MM DD YY

Type: **Co**ncrete, **Ga**bion, **R**ip-**r**ap, **E**arth **C**hannel, **O**ther: ________________

Bottom Width: _______________ in **Length:** _______________ ft.

Does channel have perennial flow? **Y**es **N**o

Is sediment deposition occurring in the channel? **Y**es **N**o

Is vegetation growing in the channel? **Y**es **N**o

Is it part of a road crossing? **No** **Ab**ove **Be**low **Bo**th

Channelized length above road crossing _______________ ft.

Channelized length below road crossing _______________ ft.

Severity	Severe	**1**	**2**	**3**	**4**	**5**	Minor	Unknown (**-1**)
Correctability	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**-1**)
Access	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**-1**)

CHANNEL ALTERATION

CA

Map: _______________ **Team:** _______ **Site:** _________

Date: ____/____/____ **Photo:** _______ **Survey:** _______

MM DD YY

Type: **Co**ncrete, **Ga**bion, **R**ip-**r**ap, **E**arth **C**hannel, **O**ther: ________________

Bottom Width: _______________ in **Length:** _______________ ft.

Does channel have perennial flow? **Y**es **N**o

Is sediment deposition occurring in the channel? **Y**es **N**o

Is vegetation growing in the channel? **Y**es **N**o

Is it part of a road crossing? **No** **Ab**ove **Be**low **Bo**th

Channelized length above road crossing _______________ ft.

Channelized length below road crossing _______________ ft.

Severity	Severe	**1**	**2**	**3**	**4**	**5**	Minor	Unknown (**-1**)
Correctability	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**-1**)
Access	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**-1**)

FISH BARRIER FB

Map: _______________ **Team:** _______ **Site:** _________

Date: ____/____/_____ **Photo:** _______ **Survey:** _______
MM DD YY

Fish Blockage: **To**tal, **Pa**rtial, **Te**mporary, **Un**known

Type of Barrier: **Da**m, **R**oad **C**rossing, **P**ipe **C**rossing, **N**atural **F**alls, **B**eaver **D**am, **Ch**annelized, Instream **Po**nd, **D**ebris **D**am, **Ot**her: __________________________

Blockage because: Too **hi**gh Too **sh**allow Too **fa**st

Water drop: __________________ inches (if too high)

Water depth: ___________________ inches (if too shallow)

Severity	Severe	**1**	**2**	**3**	**4**	**5**	Minor	Unknown (**–1**)
Correctability	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)
Access	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)

FISH BARRIER FB

Map: _______________ **Team:** _______ **Site:** _________

Date: ____/____/_____ **Photo:** _______ **Survey:** _______
MM DD YY

Fish Blockage: **To**tal, **Pa**rtial, **Te**mporary, **Un**known

Type of Barrier: **Da**m, **R**oad **C**rossing, **P**ipe **C**rossing, **N**atural **F**alls, **B**eaver **D**am, **Ch**annelized, Instream **Po**nd, **D**ebris **D**am, **Ot**her: __________________________

Blockage because: Too **hi**gh Too **sh**allow Too **fa**st

Water drop: __________________ inches (if too high)

Water depth: ___________________ inches (if too shallow)

Severity	Severe	**1**	**2**	**3**	**4**	**5**	Minor	Unknown (**–1**)
Correctability	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)
Access	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)

Field Data Form: Road-Stream Crossing Inventory

Coordinator	Crossing ID#

Date:________ **Stream/River:** ________________ **Road:**__________________________ **Town:** ________________

Location:__________________________________**GPS Coordinates (lat/long):**______________________________

Observer:______________________ **Phone #:** _____________ **Email address:**___________________________

Photo IDs: ____

Road/Railway Characteristics

1. # of Travel Lanes:____ **Shoulder/ Breakdown lanes:** ☐Yes ☐No **Road Surface:** ☐Paved ☐Unpaved ☐RR

2. Are any of the following conditions present that would significantly inhibit wildlife crossing over the road?

High traffic volume (> 50 cars per minute)	☐ Yes	☐ No
Steep embankments	☐ Yes	☐ No
Retaining walls	☐ Yes	☐ No
Jersey barriers	☐ Yes	☐ No
Fencing	☐ Yes	☐ No

Other (specify) ____

____

Crossing/Stream Characteristics (during generally low-flow conditions)

3. **Crossing Type:** ☐ Ford ☐ Bridge ☐ Open Bottom Arch ☐ Single Culvert ☐ Multiple culverts (# of culverts)______
4. **Condition of crossing:** ☐ Good ☐ Fair ☐ Collapsing ☐ Eroding ☐ Rusted through ☐ Broken
5. **Does the stream at the crossing contain fish?** ☐ Yes ☐ No ☐ Don't know
6. **Is the stream flowing (in the natural channel)?** ☐ Yes ☐ No
7. **Flow conditions during the survey are:**
   ☐ unusually low ☐ typical low-flow ☐ average flow ☐ higher than average
8. **Are any of the following problems present?**

Inlet drop	☐ No	☐ <6"	☐ **≥ 6"**
Outlet perch	☐ No	☐ <6"	☐ **≥ 6"**
Flow contraction	☐ Yes	☐ No	

9. **Tailwater armoring:** ☐ Extensive ☐ Not Extensive ☐ None
10. **Tailwater scour pool:** ☐ Large ☐ Small ☐ None
11. **Physical barriers to fish and wildlife passage:** ☐ Permanent ☐ Temporary ☐ None
    Describe any barriers:____

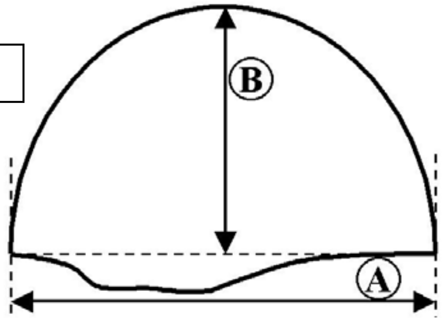
    ____
12. **Crossing Embedded?** ☐ Not embedded ☐ Partially embedded ☐ Fully embedded < 1' ☐ Fully embedded > 1'
13. **Crossing substrate:** ☐ None ☐ Inappropriate (large rip rap, concrete) ☐ Contrasting ☐ Comparable
14. **Water depth matches that of the stream?** ☐ Yes (comparable) ☐ No (significantly different)
15. **Water velocity matches that of the stream?** ☐ Yes (comparable) ☐ No (significantly different)
16. **Crossing span:** ☐ Constricts channel ☐ Spans active channel ☐ Spans bankfull width ☐ Spans channel & banks
17. **Minimum structure height at low water (from water level to the roof inside the structure)** ☐ > 6 ft. ☐ 4-6 ft. ☐ < 4 ft.
18. **Comments**____

____

____

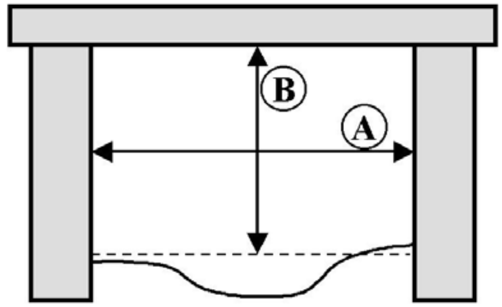
CROSSING DIMENSIONS

1.

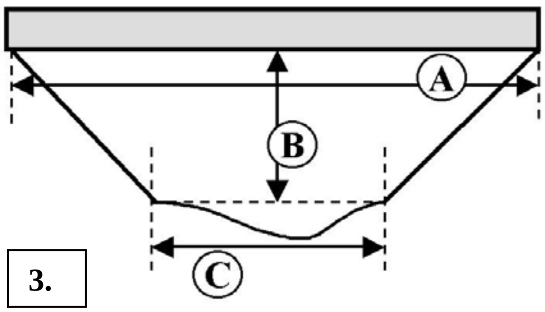


Open Bottom Arch

2.

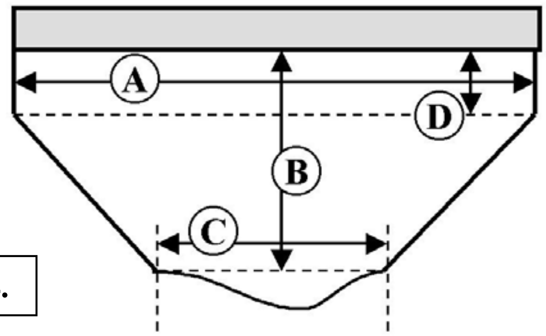


Bridge with Abutments



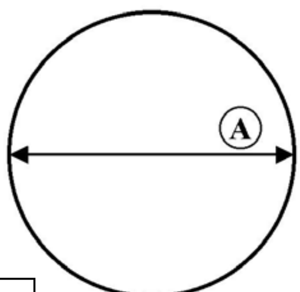
3.

Bridge with Side Slopes



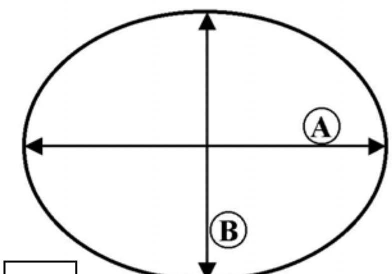
4.

Bridge w/ Side Slopes & Abutments



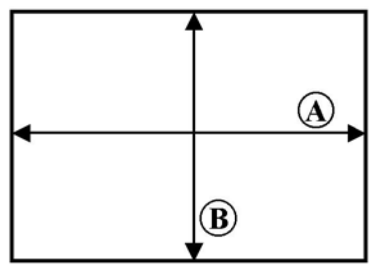
5.

Round Culvert



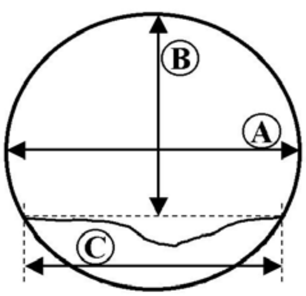
6.

Elliptical Culvert



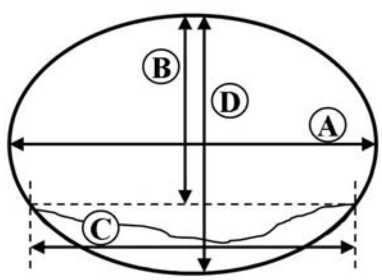
Box Culvert

7.



8.

Embedded Round Culvert



Embedded Elliptical Culvert

9.

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ Ford

Upstream Dimensions (ft or m): A) ____________ B) _______________ C) _______________ D) ________________

Downstream Dimensions (ft or m): A) __________ B) ________________ C) ______________ D) ______________

Length of stream through crossing (ft or m): ____________________

DIMENSIONS WORKSHEET FOR MULTIPLE CULVERT CROSSINGS **Crossing ID#____________________________________**

Note: *When inventorying multiple culverts, label left culvert 1 and go in increasing order from left to right from downstream end (outlet) looking upstream.*

Number of Culverts or Bridge Cells _________

Culvert or Bridge Cell 2 of _______

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ Ford

Upstream Dimensions (ft/m): A) _____________ B)______________ C) _____________ D) _____________

Downstream Dimensions (ft/m): A)____________ B)______________ C) _____________ D) _____________

Length of stream through crossing (ft/m):______________________

Culvert or Bridge Cell 3 of _______

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ Ford

Upstream Dimensions (ft/m): A) _____________ B)______________ C) _____________ D) _____________

Downstream Dimensions (ft/m): A)____________ B)______________ C) _____________ D) _____________

Length of stream through crossing (ft/m):______________________

Culvert or Bridge Cell 4 of _______

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ Ford

Upstream Dimensions (ft/m): A) _____________ B)______________ C) _____________ D) _____________

Downstream Dimensions (ft/m): A)____________ B)______________ C) _____________ D) _____________

Length of stream through crossing (ft/m):______________________

Culvert or Bridge Cell 5 of _______

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ Ford

Upstream Dimensions (ft/m): A) _____________ B)______________ C) _____________ D) _____________

Downstream Dimensions (ft/m): A)____________ B)______________ C) _____________ D) _____________

Length of stream through crossing (ft/m):______________________

Culvert or Bridge Cell 6 of _______

Crossing Type (from above): ☐ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ Ford

Upstream Dimensions (ft/m): A) _____________ B)______________ C) _____________ D) _____________

Downstream Dimensions (ft/m): A)____________ B)______________ C) _____________ D) _____________

Length of stream through crossing (ft/m):______________________

Instruction Guide for Field Data Sheet: Road – Stream Crossing Inventory

OVERVIEW

The River/Stream Continuity Project is a pilot project that trains volunteers to inventory river and stream road crossings. This information will be used to help determine if crossings are a barrier to fish and wildlife movement, and cause habitat fragmentation. Barriers that are identified will be prioritized on a watershed and town level for further remediation.

These instructions provide additional explanations for the questions on the Road – Stream Crossing Inventory Field Data Form. Remember that the data form is for the entire river or stream crossing, which might include multiple culverts or multiple cell bridges. With the exception of dimensions, answer each question for the crossing as a whole. For example, if one culvert at a multiple culvert crossing is fully embedded, then check "fully embedded" on the data form. It is not necessary that every cell of a multiple cell bridge crossing span the channel. Look instead to determine whether, for example, the combination of cells collectively spans the stream channel.

Please be sure to answer every question.

SHADED BOXES

The Survey Coordinator will provide the necessary information for these boxes. These include "Coordinator" and "Crossing ID#." Do not enter data in these boxes.

BASIC INFORMATION

Date – Date that the crossing structure was evaluated.

Stream/River – Provide the name of the stream or river. Use "unnamed" if the waterway is not named or "unknown" if you are not sure.

Road – Name of the road or "unnamed" if the road does not have a name. Use "unknown" if you are unsure whether or not the road is named or you don't know the road name.

Town – Town where the crossing occurs.

Location – Provide enough information about the exact location of the crossing so that another person using your data sheet will be confident that they are at the same crossing that you evaluated. For example "between telephone poles # 162 and 163" or "right across from the Depot Restaurant."

GPS Coordinates (lat/long) – If you have access to a GPS (Global Positioning System) unit, provide the latitude and longitude for the crossing location. Enter coordinates in the format DD°MM.MMM (e.g. 42°40.238). Enter "NA" if you don't have this information.

Observer – Your name.

Phone # - A phone number where you can be reliably reached.

Email address – Your email address if you have one. Otherwise enter "NA."

Photo IDs – If you took digital photos record the ID numbers following the photo inventory protocol. Enter "none" is you did not take photos.

ROAD / RAILWAY CHARACTERISTICS

Number of travel lanes - This refers to the total travel lanes present not counting shoulders or breakdown lanes (two each way = 4 total lanes).Record the number of tracks for railroad crossings.

Road Shoulder / Breakdown Lane - Check "Yes" if there is one present.

Road Surface - Check "Paved" or "Unpaved". Check "RR" if a railroad crossing.

Conditions inhibiting wildlife crossing – Check "Yes" if any of the following conditions exist at the stream crossing to such an extent that they would significantly inhibit wildlife crossing over the road surface: High traffic volume, Steep embankments, Retaining walls, Jersey barriers, Fencing, other.

High traffic volume. Check "yes" if the level of traffic is enough to significantly reduce the chance that wildlife will successfully cross the road or highway (e.g. greater than 50 cars per minute).

Steep embankments should be noted on the form if, in your judgment, they are steep enough and extensive enough (height and width) that they would significantly inhibit wildlife movement up and over the road.

Retaining walls are sometimes concrete, but can also be made of riprap enclosed in metal fencing or baskets, and are used to maintain steep slopes adjacent to roads.

Jersey barriers are concrete blocks that are lined up end to end past edges of roadways and are not passable to wildlife.

Fencing. Check "yes" if fencing extensive enough to block wildlife passage across the road is present on one or both sides of the road/highway.

Curbs are important to note because small wildlife, like turtles and salamanders, that can get onto the road may be blocked at the other edge if faced with even a 6" curb.

CROSSING / STREAM CHARACTERISTICS

Crossing type - See picture of ford, bridge, open bottom arch, single culvert, multiple culverts to determine crossing type.

Condition of crossing – Check off appropriate boxes – good, fair, collapsing, eroding (around culvert or underneath), rusted through, broken; if, "other" – e.g. "dented at inlet, filled with sediment", make a note in question #18 (Comments).

Does the stream at the crossing contain fish? – Check "Yes" if you see fish. If you don't see any, but don't know for a fact that there are no fish in the stream, check "Don't know."

Is the stream flowing in the natural channel? – Check "Yes" if stream is flowing in the stream upstream and downstream of the crossing. To answer "yes", actual flow (even if low) must be moving and consistent. Puddled areas separated by dry land and rocks does not constitute flow.

Flow conditions during the survey: Check the appropriate box to indicate whether flow conditions during the survey were: unusually low, typical low-flow, average flow (not low-flow), or higher than average. Survey results are most useful when data are collected during typical low-flow conditions.

Are any of the following problems present? – Check "yes" for any of the following if present.

Inlet drop: Where water level drops suddenly at the crossing inlet, causing changes in water speed and turbulence. In addition to the higher velocities and turbulence, these jumps can be physical barriers to fish and other aquatic animals when they are swimming upstream and are unable to swim out of the culvert. Check "no" if you don't observe an inlet drop, "<6" if you observe an inlet drop and it is less than 6" in height, and check ≥6" if the drop is six inches or greater.

Outlet perch: When water drops off or cascades down from the outlet, usually into a receiving pool. This may be due to the original design or erosion of material at the downstream end of crossing. Outlet drops create barriers to the upstream movement of fish and other aquatic animals that are unable to jump up over the drop. Check "no" if you don't observe an outlet drop, "<6" if you observe an outlet drop and it is less than 6" in height, and check ≥6" if the drop is six inches or greater.

Flow Contraction: When the crossing is smaller than the stream width the flow will be constricted at some flows creating flow contraction. The increased velocities and turbulence associated with flow contraction can block fish and wildlife passage. Check "yes" if flow contraction at the inlet is creating noticeable turbulence or results in an inlet drop.

<u>Tailwater armoring:</u> This includes concrete aprons, plastic aprons, riprap or other structures added to crossing outlets to facilitate flow and prevent erosion. Indicate on the data form whether tailwater armoring at the outlet of the crossing is "extensive", "not extensive" or absent ("none").

<u>Tailwater scour pool:</u> These are pools created downstream as a result of high flows exiting the crossing. A scour pool is considered present if the pool is wider than the natural stream channel and/or the banks are eroded. Check "large" if the width or depth of the pool is twice that of the natural stream channel or more. Otherwise, check either "small" if a smaller pool exists or "none" if there is no scour pool.

<u>Physical barriers to fish and wildlife passage:</u> This includes any structure that physically blocks fish or wildlife movement. If physical barriers exist, indicate whether they are "permanent" or "temporary" barriers, and describe them on the data form. Otherwise check "none." Beaver dams, debris jams, accumulations of sediment are examples of what might be considered temporary barriers. Fences, rocks, cross pipes, concrete aprons, sediment filling a culvert, weirs, baffles, and gabions are examples of structures that might be or cause permanent physical barriers. Weirs are short dams or fences in the stream that constrict water flow or fish movements. Baffles are structures within culverts that direct, constrict, or slow down water flow. Gabions are rectangular wire mesh baskets filled with rock that are used as retaining walls and erosion control structures.

<u>Crossing embedded:</u> An embedded culvert is a culvert that is installed in such a way that the bottom of the structure is below the stream bed and there is substrate in the culvert. Indicate on the data form whether or not the culvert is embedded and the degree that the culvert is embedded. If the culvert is not buried and generally lacks substrate, then check "not embedded". If the culvert is partially buried and contains substrate for half or more of its length, check "partially embedded." If the culvert is buried for its entire length but substrate depth is not at least 1 foot throughout, check "fully embedded < 1'". If the culvert is buried and contains at least 1 foot of substrate throughout, check "fully embedded > 1'." **If the crossing is a bridge, ford, or open-bottom arch check "fully embedded > 1'."**

<u>Crossing substrate:</u> Record whether the substrate in the crossing is "inappropriate", "contrasting" or "comparable". Large riprap and concrete are examples of substrates that are inappropriate for river and stream continuity. Check "contrasting" if the substrate is not wholly inappropriate, but contrasts with the substrate in the natural stream channel. For example, if the crossing's predominant substrate is boulders and large cobble on a stream where the natural stream bottom is predominantly mud/muck. Check "comparable" is the substrate in the crossing is similar to that found in the natural stream channel.

<u>Does the water depth in crossing match the stream depth?</u> – Check "yes" if water depth in the crossing is comparable to the depths upstream and downstream in the natural stream channel. Comparable means that the depth in the crossing falls within the range of depths naturally occurring in that reach of the stream. Check "no" if the water depth in the crossing is significantly different from that found in the stream.

Does the velocity of the water in crossing match that of the stream? – Check "yes" if water velocities in the crossing are comparable to the velocities in the nature stream channel upstream and downstream of the crossing. Comparable means that the velocities in the crossing fall within the range of velocities naturally occurring in that reach of the stream. Check "no" if water velocities in the crossing are significantly different from those found in the stream.

Crossing span: Check the appropriate description from the list below. Natural streams are variable in width. In selecting the appropriate category consider the average conditions in the natural stream channel outside the influence of the crossing itself.

Constricts channel: The crossing is narrower than the actively scoured streambed (see next category for a description) in the natural channel upstream and downstream of the crossing.

Spans active channel: Choose this option if the crossing spans the active channel, but not the bankfull width of the stream. The active channel is that portion of the stream that is frequently wetted during storm events. Indicators of the active channel include[1]:

- Edge of frequently scoured substrate
- Break in rooted vegetation or moss growth on rocks along stream margins
- Natural line impressed on the bank
- Shelving
- Changes in soil character

Spans bankfull width: Choose this option if the crossing spans the bankfull width of the channel, but does not include the banks the stream. Bankfull is amount of water that just fills the stream channel and where additional water would result in a rapid widening of the stream or overflow into the floodplain. Indicators of bankfull width include[2]:

- Abrupt transition from bank to floodplain. The change from a vertical bank to a horizontal surface is the best identifier of the floodplain and bankfull stage, especially in low-gradient meandering streams.
- Top of pointbars. The pointbar consists of channel material deposited on the inside of meander bends. Set the top elevation of pointbars as the lowest possible bankfull stage.
- Bank undercuts. Maximum heights of bank undercuts are useful indicators in steep channels lacking floodplains.
- Changes in bank material. Changes in soil particle size may indicate the operation of different processes. Changes in slope may also be associated with a change in particle size.
- Change in vegetation. Look for the low limit of perennial vegetation on the bank, or a sharp break in the density or type of vegetation.

Spans channel and banks: Choose this option if the crossing structure spans the bankfull channel width and one or more of the banks with sufficient headroom to allow dry passage for some wildlife.

Minimum structure height at low water – (From water level to the roof inside the structure). Measure the height within the structure and determine which category it falls in - >6ft, 4-6 ft, < 4ft – and check appropriate box.

Comments – Add anything you feel may not have been included, but is important for describing the crossing.

[1] From a draft "California Salmonid Stream Habitat Restoration Manual, Part X: Fish Passage Evaluation at Stream Crossings" by Taylor and Love, 2001.
[2] Adapted from Georgia Adopt-A-Stream "Visual Stream Survey" manual. Georgia Department of Natural Resources, 2002.

CROSSING DIMENSIONS

Crossing Type – Choose the most appropriate choice from #1-9 or Ford that describes the type of crossing.

1. Open Bottom Arch will look like a pipe culvert on the top half, but you will not see a bottom half. Instead for the bottom, it has metal footings that are sunk into concrete below the stream channel.

2. Bridge with abutments will have sides at right angles, but no bottom structure.

3. Bridge with side slopes will have angled sides, and no bottom structure.

4. Bridge with side slopes and abutments will have both sloping sides as well as sides at right angles to give the bridge height over the stream.

5. Round Culvert will be a circular pipe.

6. Elliptical Culvert will have a wider squashed look then a round pipe culvert.

7. Box Culvert will usually be made of concrete.

8. Embedded Round Culvert means that the culvert is partially buried below the stream channel so that natural sediment will flow through and you won't see the bottom of the culvert.

9. Embedded Elliptical Culvert Also known as a "pipe arch" this is an elliptical culvert where the bottom has been buried below the stream channel.

Ford is a shallow water crossing directly across the streambed, often with logs, stone, or gravel to protect or stabilize the bottom. These are rare, and are mostly found on roads that are not frequently used.

Upstream /Downstream dimensions Provide the measurements shown in the appropriate diagram for the crossing type. **(If measurements cannot be taken, please estimate and write EST. after estimated measurement.) IMPORTANT: write the measurement units, such as inches, feet, centimeters or meters.**

A. Measure interior width of crossing.

B. Measure height from underside of crossing to **water surface**. (Measure to stream bottom if there is no flow.)

C. Measure width of actual stream channel (wetted width) through crossing structure if natural bottom exists (i.e. bridges or embedded culverts).

D. Measure height of vertical abutments from underside of bridge to where sides start sloping.

Length of stream through crossing Measure the crossing from inlet to outlet by walking through it if it is large enough and safe. If walking through culvert is not possible, then hold measuring tape at inlet and let current carry it to outlet where someone else catches it and measures the length. Another option is to stand on top of it and measure length along road.

DIMENSIONS FOR MULTIPLE CULVERT CROSSINGS

When inventorying multiple culverts, label left culvert 1 and go in increasing order from left to right from downstream end (outlet) looking upstream.

Number of Culverts or Bridge Cells – How many culverts are present? Include ones that may not have any flow. How many separate channels flow beneath the bridge due to piers, footings, or debris etc.?

Upstream/ Downstream dimensions: Follow the same instructions as above.

If measurements cannot be taken, please estimate and write EST. after estimated measurement.

Glossary

→ **Active Channel –** The active channel is that portion of the stream that is frequently wetted during storm events. Indicators of the active channel include:

- Edge of frequently scoured substrate
- Break in rooted vegetation or moss growth on rocks along stream margins
- Natural line impressed on the bank
- Shelving
- Changes in soil character

→ **Bankfull Width –** Bankfull is a geometric parameter that corresponds with the amount of water that just fills the stream channel and where additional water would result in a rapid widening of the stream or overflow into the floodplain. Indicators of Bankfull width include:

- <u>Abrupt transition from bank to floodplain</u>. The change from a vertical bank to a horizontal surface is the best identifier of the floodplain and Bankfull stage, especially in low-gradient meandering streams.
- <u>Top of</u> pointbars. The pointbar consists of channel material deposited on the inside of meander bends. Set the top elevation of pointbars as the lowest possible Bankfull stage.
- <u>Bank undercuts</u>. Maximum heights of bank undercuts are useful indicators in steep channels lacking floodplains.
- Changes <u>in bank material</u>. Changes in soil particle size may indicate the operation of different processes. Changes in slope may also be associated with a change in particle size.
- Change <u>in vegetation</u>. Look for the low limit of perennial vegetation on the bank, or a sharp break in the density or type of vegetation.

→ **Culvert –** As used in these Standards, culverts are round, elliptical or rectangular structures that are fully enclosed (contain a bottom) designed primarily for channeling water beneath a road, railroad or highway. Bottomless structures, through sometimes considered culverts by others, are treated separately in these Standards.

→ **Embedded Culvert –** A culvert that is installed in such a way that the bottom of the structure is below the stream bed and there is substrate in the culvert.

→ **Flow contraction –** When culvert is significantly smaller then stream width the converging flows creates a condition called “flow contraction.” The increased velocities and turbulence associated with flow contraction can block fish and wildlife passage and scour bed material out of a crossing structure. Flow contraction also creates inlet drops.

→ **Ford –** Modified or unmodified portions of a stream or river where vehicle drive through rather than over the streambed. Vented fords provide culverts to pass water during low flows while higher flows pass over the ford.

→ **Inlet drop –** Where water level drops suddenly at an inlet, causing changes in water speed and turbulence. In addition to the higher velocities and turbulence, these jumps can be physical barriers to fish and other aquatic animals when they are swimming upstream and are unable to swim out of the culvert.

→ **Open Bottom Arch –** Arched crossing structures that span all or part of the stream bed, typically constructed on buried footings and without a bottom.

→ **Openness ratio –** Equals cross-sectional area of the structure divided by crossing length when measured in meters. For a box culvert, openness = (height x width)/ length.

→ **Orifice flows –** Flows that fill or nearly fill the entire culvert. These become problematic because there is no space within the culvert for wildlife passage and flows are typically too fast for the passage of fish and other aquatic animals.

→ **Outlet drop** – An outlet drop occurs when water drops off or cascades down from the outlet, usually into a receiving pool. This may be due to the original culvert placement or erosion of material at the downstream end of culvert. Outlet drops are barriers to fish and other aquatic animals that can't jump to get up into the culvert.

→ **Physical barriers to fish and wildlife passage –** Any feature that physically blocks fish or wildlife movement through a crossing structure as well as features that would cause a crossing structure to become blocked. Beaver dams, debris jams, fences, sediment filling culvert, weirs, baffles, aprons, and gabions are examples of structures that might be or cause physical barriers. Weirs are short dams or fences in the stream that constrict water flow or fish movements. Baffles are structures within culverts that direct, constrict, or slow down water flow. Gabions are rectangular wire mesh baskets filled with rock that are used as retaining walls and erosion control structures.

→ **Pipe Arch –** A pipe that departs from a circular shape such that the width (or span) is larger that the vertical dimension (or rise), and forms a continuous circumference pipe that is not bottomless.

→ **River/Stream Continuity –** Maintaining undisrupted the aquatic and benthic elements of river and stream ecosystems, generally through maintenance of appropriate substrates and hydraulic characteristics (water depths, turbulence, velocities, and flow patterns)

→ **Stream Simulation –** A design method in which the diversity and complexity of the natural streambed are created inside a culvert, open-bottom arch, or open-bottom box in such a way that the streambed maintains itself across a wide range of flows. The premise is that if streambed morphology is similar to that in the natural channel the crossing will be invisible to aquatic species.

→ **Tailwater armoring –** Concrete aprons, plastic aprons, riprap or other structures added to culvert outlets to facilitate flow and prevent erosion.

→ **Tailwater scour pool –** A pool created downstream from high flows exiting the culvert. The pool is wider than the stream channel and banks are eroded.

Form B: Stream Crossing Inventory Form

1) Observed By:______________ **2) Date :**_____________ **3) Map ID#** **(label on attached map):**______________________

4) Picture(s) ID: _____________________________**5) GPS:**____

6) Location of site:____

7) Road Name:_______________________________ **8)Town:**____

Complete this section for All Sites

9) Road Type: (State Owned) (State Aid) (Town Owned) (Private) **10) Road Surface:** (Gravel) (Paved)

11) Crossing Type: (Bridge) (Culvert) (Other) **12) Material:** (Metal) (Plastic) (Concrete) (Other)

13) Length of Crossing (ft): _____**14) Water Depth (ft) :** _____ **15) Stain/Rust Line Height (ft):** _______

Complete this section for Bridges

16) Span (ft): ______ **17) Height (ft):** ______ **18) Number of Piers:** _____**19) Width of Piers (total ft):**______

20) Abutment Material: (Concrete) (Rock) (Wood) (Other) **21) Ownership:** (State) (Town) (Unknown)

Complete this section for Culverts

22) Culvert Type: (Circular) (Elliptical) (Box) (Arch) **23) Condition:** (Good) (Fair) (Poor)

24) Diameter (ft): ________ **25) Substrate:** (Gravel) (Baffles) (Weirs) (Corrugated) (Smooth) (Other)

26) Headwall Material: (Concrete) (RipRap) (Wood) (Earthen) (Absent) (Other)

27) Outlet Configuration: (At Grade) (Cascade) (Free Fall/Perched)

Complete this section for All Sites

28) Slope of Crossing (%): ______ **29) Distance (ft) of outlet invert to:** streambottom_____ watersurface:____

30) Evidence of Overtopping: (Yes) (No) **31) Pool Immediately Downstream:** (Yes) (No)

32) Bed material at structure: (Bedrock) (Boulder) (Cobble) (Sand) (Other)

33) Scour present around: (Culvert) (Abutment) (Footers) (Wing walls) (None)

34) Angle of structure to channel: (Sharp bend) (Mild bend) (Naturally straight) (Channelized straight)

35) Bed degradation downstream: (Yes) (No) **36) Bed degradation upstream:** (Yes) (No)

37) Bank armoring present: (Around structure) (Along bank) (None)

38) Bank armor condition: (Intact) (Failing) (Unknown)

39) Inlet obstructed by: (Wood debris) (Sediment) (Crushing) (Beaver dam) (None) (Other)

40) % Inlet obstructed: (<25%) (25-50%) (50-75%) (>75%) **41) Flow Stage:** (Low) (Normal) (High)

Guide to Completing
Form B: Stream Crossing Inventory

1. **Observed by:** Clearly write your name(s) here
2. **Date of Observation:** Write the date that you observed the site
3. **Picture(s) ID:** If you took pictures of this site reference them here (i.e. Picture001-Picture004)
4. **GPS:** If you documented the location of the site using a GPS unit, put that information here. Be sure to include the format of the coordinates (i.e. Dec Degrees) and the coordinate system (i.e. GCS_North_American_1983)
5. **Map ID#:** <u>This is very important.</u> If you were given a map draw the location of the site on it. Label the site on the map (i.e. A or 1) keep it simple. Write the name of the map (i.e. Maranacook Watershed NE) and the label that you gave the site. (i.e. Maranacook Watershed NE – 1)
6. **Location of the site:** Use this space to make some notes about the location of the site. Use more detail if you do not have a map or GPS coordinates to reference.
7. **Road Name:** Enter the name of the road where the site is located
8. **Town:** Enter the town where the site is located
9. **Road Type:** Document who owns or maintains the road. It may be indicated on the map or you may need to inquire at a town office. *State Owned*: are roads maintained and owned by the State, *State Aid*: are roads owned by a town but maintained by the State, *Town Owned*: are roads that are owned and maintained by the town, and *Private*: are roads that are privately owned and maintained. If you are unsure if a Town road is a State Aid road, document it as Town Owned.
10. **Road Surface:** Is the road surface over the crossing gravel or paved?
11. **Crossing type:** Document the type of crossing here: Bridge, or culvert (pipe, pipe arch)
12. **Material:** What is the culvert/bridge constructed of?
13. **Length of Crossing (ft):** Length of culvert/bridge from inlet to outlet
14. **Water Depth (ft):** measure and record the **current water depth** in the culvert at the culvert inlet by measuring the distance between the culvert bottom, or invert, and the water's surface. If the culvert bottom is covered with substrate, measure the distance from the substrate to the water's surface.
15. **Stain/Rust Line Height (ft):** The lower part of a culvert or arch that is wetted several times a year during high water events will rust or stain over time. The top of this rusted or stained area indicates the elevation of typical high flows in the culvert or arch. Measure and record the height from the culvert bottom (or substrate on top of culvert bottom) or stream bed in the arch to the top of the rusted or stained area at both the inlet and outlet of the structure.
16. **Span (ft):** Length of bridge perpendicular to channel

17. **Height (ft):** Measure the distance from the stream bed to the bottom of the bridge beam or bridge deck at the locations where there is the maximum clearance (A) and the minimum clearance (B) under the bridge. Average the two heights.
18. **Number of piers:** If bridge has piers (supports that are built in the channel) how many are there?
19. **Width of piers (total ft):** Measure the width of each pier and add them together.
20. **Abutment Material:** What is the abutment made of? See Figure #1 for definition of abutment.
21. **Ownership:** Who owns the bridge? Note: bridges on town roads can be owned by the state.
22. **Culvert Type:** See Figure 2 for help determining culvert type. **Arch** – A structure that supports a roadway over a waterbody by means of an arch structure set on footers that does **not** have a constructed bottom. Often referred to as an "open-bottom arch".
23. **Condition:** Relative condition of culvert. *Good:* No signs of deterioration of structure materials. *Fair:* Some signs of deterioration of structure materials. *Poor:* Severe deterioration of structure materials.
24. **Diameter (ft):** Diameter of culvert. For elliptical or box enter width and height.
25. **Substrate:** What is in the pipe?
26. **Headwall material:** What is the headwall (if present) made of? For definition of headwall see Figure #3.
27. **Outlet Configuration:** See Figure #4
28. **Slope of Crossing (%):** **(**Inlet elevation-Outlet elevation)/Span}*100
29. **Distance (ft) of outlet invert to streambottom and water surface:** See Figure #5 and measure the distance from the culvert outlet invert (A) to the water surface (B) and to the stream bottom (C).
30. **Evidence of overtopping:** Look for evidence of high flows overtopping or outflanking the structure. If occurring, this will be especially evident as erosion and gullying of the road shoulders, particularly those on the downstream side of the structure.
31. **Pool immediately downstream:** Is there a pool at the outlet of the culvert/bridge?
32. **Bed material at structure:** the dominant sediment size (covering the majority of the stream bed area) upstream of, downstream of, and within the structure. If the stream bed within the structure is not visible, choose "unknown". See Figure #6
33. **Scour present around:** Scour is the erosive action of running water in streams, which excavates and carries away material from the bed and banks. Use Figure #1 to assist you with identifying the components of a road crossing.
34. **Angle of structure to the channel:** *Sharp Bend:* Severe angle of entry, 45 to 90 degree bend. *Mild Bend:* Gentle angle of entry, 5-45 degree bend. *Naturally Straight:* flow enters the structure straight on with no channelization. *Channelized Straight:* Channel was modified to a straight planform and flow enters the structure straight-on. Indicators of channelization include: armored streambanks, channel just upstream of straightened section is naturally sinuous, or documentation from local municipality.
35. **Bed degradation downstream:** indicate whether bed degradation has occurred downstream of the structure. To determine possible downstream bed degradation look for relatively deep scour pools just downstream of the structure and for

streambank heights downstream of the structure being greater than bank heights upstream of the structure.

36. **Bed degradation upstream:** Use guidance above
37. **Bank armoring present:** Have the inlet and outlet areas of the structure been armored with rock, concrete, wood, other?
38. **Bank armor condition:** *Intact:* Hard bank armoring is not falling into stream, there are few missing or out of place pieces of armoring material *Failing:* Parts of the hard bank armoring are falling into the stream, missing, or out of place *None:* No hard bank armoring present. *Unknown*: Unable to assess the condition or presence of hard bank
39. **Inlet obstructed by:** *Woody debris:* Woody material such as logs, branches, and trees. *Sediment:* Soil and rocks, typically transported and deposited by the stream. *Crushing:* crushed or broken structure covering structure opening. *Beaver Dam:* Material, such as wood, mud and rocks, transported and placed by beavers to create a dam.
40. **Inlet obstructed:** Estimate percent of the inlet obstructed.
41. **Flow Stage:** *Low:* flow level is below the level of average discharge, rocks and other stream bed substrate may be exposed and/or the channel may only be partially filled with flow. Typically occurs during late summer months and/or during period of drought; *Normal:* average discharge in channel, most rocks and other stream bed substrate are covered by flow and/or the entire channel bottom is covered with flow; *High:* discharge is higher then average; occurs after rains or other events, such as snow melt, channel is completely filled by discharge and flow may be high up on the banks, water may appear more turbid than usual due to recent runoff event.

Figure #1: Bridge Profile

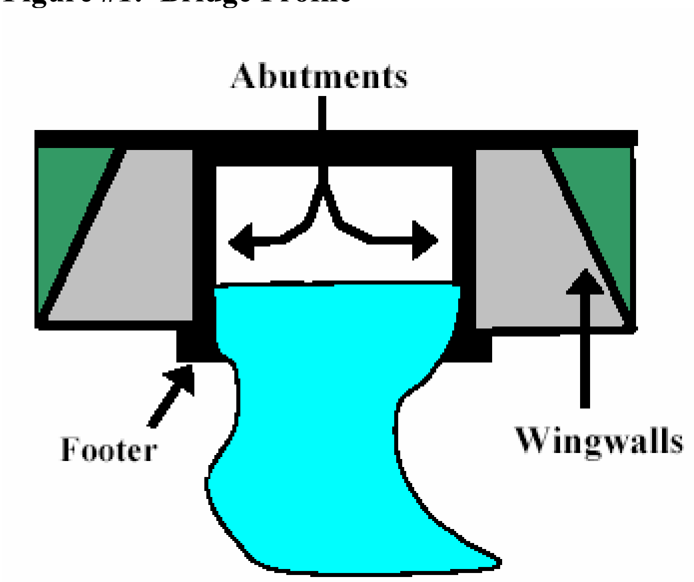


Figure #2: Culvert Types

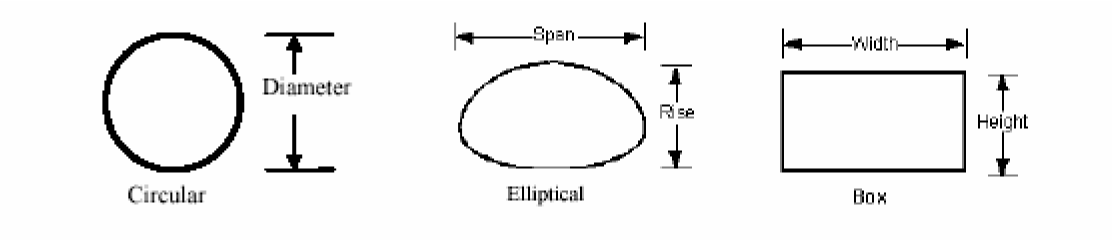


Figure #3: Culvert Profile

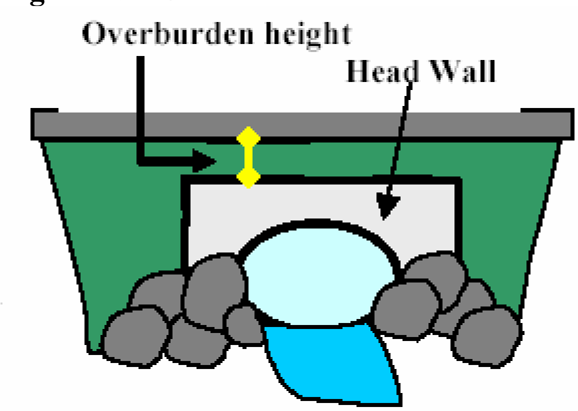


Figure #4: Outlet Configuration

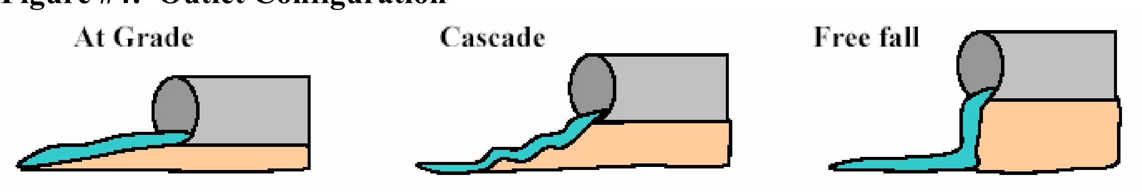


Figure #5:

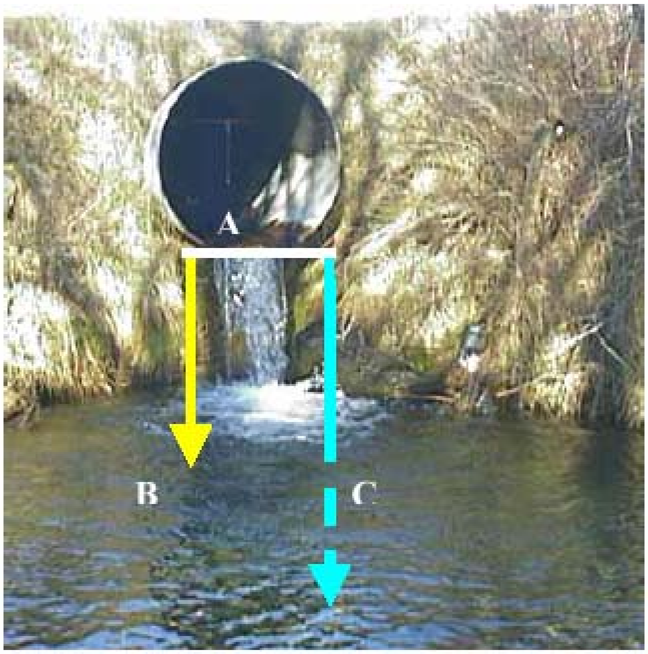


Figure #6: Particle Sizes

	Millimeters	Inches	Relative Size
Bedrock	> 4096	> 160	Bigger than a Volkswagen Bug
Boulder	256 - 4096	10.1 - 160	Basketball to Volkswagen Bug
Cobble	64 – 256	2.5 - 10.1	Tennis ball to basketball
Gravel	2 – 64	0.08 – 2.5	Pepper corn to tennis ball
Sand	0.062 – 2.00	0.002 -0.08	Silt size to pepper corn
None	Applies to culverts where absence of natural stream substrates within the culvert is the dominant condition		
Unknown	Applies when the stream bed is not visible due to deep or turbid water or darkness within the structure		

Stream Crossing Survey

Structural Crossing Tracking ID: (AutoNumber)

Stream Crossing **SC**

Watershed: Date: Name:

Survey Reach ID: Time: AM/PM Photo ID:(Camera-Pic#) -#

Site ID: (Condition-#) SC- Lat: 0 ° 0 ' 0 " Long: 0 ° 0 ' 0 " LMK: GPS: (Unit ID)

Type: ☐ Road Crossing ☐ Railroad Crossing ☐ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☐ Other:

For road/railroad crossings only

Shape: ☐ Arch ☐ Bottomless ☐ Box ☐ Elliptical ☐ Circular ☐ Other:

Barrels: ☐ Single ☐ Double ☐ Triple ☐ Other:

Material: ☐ Concrete ☐ Metal ☐ Other:

Alignment: ☐ Flow-Aligned ☐ Not Flow-Aligned ☐ Do Not Know

Dimensions: (if variable, include in sketch)

Barrel Diameter:

Height:

Condition: (Evidence of...) ☐ Cracking/Chipping/Corrosion ☐ Scouring Downstream ☐ Sediment Deposition ☐ Failing Embankment ☐ Other:

Culvert Slope: ☐ Flat ☐ Slight (2°-5°) ☐ Obvious (>5°)

Culvert Length:

Width:

Roadway Elevation:

Potential Restoration Candidate ☐ Fish Barrier Removal ☐ Culvert Repair/Replacement ☐ Upstream Storage Retrofit

☐ No ☐ Local Stream Repair ☐ Other: Desc:

Is SC Acting as Grade Control ☐ Yes ☐ Unkown

If yes for fish barrier

Extent of Physical Blockage: ☐ Total ☐ Partial ☐ Temporary ☐ Unknown

Cause:

☐ Drop Too High Water Drop: 0 in

☐ Flow Too Shallow Water Depth: 0 in

☐ Other:

Blockage Severity Severity: (select #)

5	4	3	2	1
A structure such as a dam or road culvert on a 3rd order or greater stream that would totally block the upstream movement of anadromous fish and there is no fish passage device present.		A total fish blockage on a tributary that would isolate a significant reach of stream or a partial blockage that could interfere with the migration of anadromous fish.		A temporary fish barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it. Natural fish barriers such as waterfalls.

Notes:

Volunteer Culvert Survey Field Sheet

You will need: a digital camera, a pencil, GPS unit, field forms, maps, laminated field guide. Please take a minimum of one upstream photo and one downstream photo.

Volunteer's Name and phone number:___________________________ GPS unit ____

Road Name:______________________________________ GPS DATA

Stream Name:________________________ Lat:________________

Date:___________________ Time: ________________ Lon:________________

Site ID:______________________ Map ID : ___________

Is this a bridge, arch, or culvert? (Circle) Bridge Arch Culvert

Is there natural substrate on the bottom of the structure? Yes No Can't see

What general shape is the structure? Round Oval Rectangle Multi (two or more)

Bridge: Structure that <u>spans the stream</u>, in which the road surface is supported by pillars.

Arch: <u>Has a natural bottom</u>, supported on its ends by abutments and foundations.

Culvert: A tube-like or box-like structure (<u>with both top and bottom</u>) that is embedded in soil or road fill that allows passage of water. Generally surrounded by soil or fill.

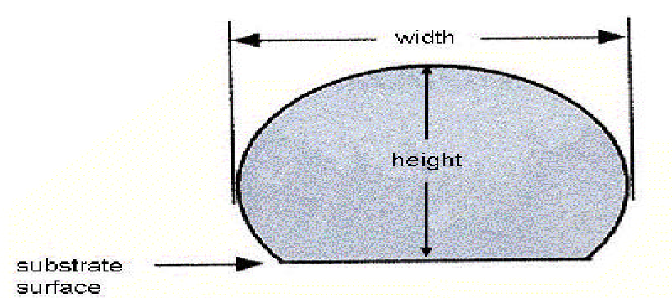
Approximate width of stream - (do not count pooled areas): ____________________________ ft

What is the approximate length of the crossing? ______________________________________ft

What is the approximate width of the structure? _______________________________________ft

What is the height of the structure? ____ft

What is the approximate water depth in the structure? _____________________inches/feet



Stream flow (circle): Dry Low Average High

Use your judgment. Low flows are indicated by exposed stream bottom, and typically occur during mid-late summer. High flows can occur during spring snowmelt and after heavy rain.

Plunge Pool: Road crossings often lead to development of pools immediately upstream or downstream of the crossing. The presence of pools, sometimes called "plunge pools" in severe cases, may be an indication of problems.

Are there pools near the structure? (Circle) Upstream Pool Downstream Pool

The photos below are examples of plunge pools

Is the velocity in the structure <u>'the same as'</u> or '<u>faster than'</u> outside of the structure? (Circle one)

Is there erosion of the stream bank downstream? No Moderate Severe

Is there erosion of the stream bank upstream? No Moderate Severe

Is the structure perched? No Yes (how high)________

Is structure crumbling, falling, corroded through or otherwise failing? Yes No

How many Photo(s) taken? Upstream __________ Downstream __________

Do you think there is a problem with this crossing? Yes No Maybe

If so why?____

____

Severe Bank Erosion Survey

Erosion Tracking ID: (AutoNumber)

Erosion **ER**

Watershed: Date: Assessed By:

Survey Reach: Time: *am/pm* Photo ID:(Camera-Pic#) -#

Site ID: (Condition-#)
ER-

Start Lat: 0 ° 0 ' 0 " Long: 0 ° 0 ' 0 " LMK:
End Lat: 0 ° 0 ' 0 " Long: 0 ° 0 ' 0 " LMK:
GPS: (Unit ID)

Process: ☐ Unknown

☐ Downcutting ☐ Bed scour
☐ Widening ☐ Bank failure
☐ Headcutting ☐ Bank scour
☐ Aggrading ☐ Slope failure
☐ Sed. Deposition ☐ Channelized

Bank of Concern ☐ LT ☐ RT ☐ Both

Location: ☐ Meander bend ☐ Straight Section ☐ Steep slop/valley wall ☐ Other

Dimensions:

Length (if not GPS) LT ft and/or RT ft Bottom Width ft
Bank Ht LT ft and/or RT ft Top Width ft
Bank Angle LT ° and/or RT ° Wetted Width ft

LandOwnership: Land Cover: ☐ Forest ☐ Field/Ag ☐ Developed Desc:

Potential Restoration Candidate: ☐ Grade Control ☐ Bank Stabilization
☐ No ☐ Other Desc:

Threat to Property/Infrastructure: ☐ No ☐ Yes (Describe):

Existing Riparian Width: ☐ < 25 ft ☐ 25 - 50 ft ☐ 50 - 75 ft ☐ 75 - 100 ft ☐ > 100 ft

Erosion Severity: (select #) Channelized= 1	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.	Pat downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.
	5 4	3 2	1
Access:	Good access: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	Fair access: Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	Difficult access. Must cross wetland, steep slope or other sensitive areas to access stream. Minimal stockpile areas available and/or located a great distance from stream section. Specialized heavy equipment required.
	5 4	3 2	1

Notes:

Reported Authorities ☐

EROSION SITE ES

Map: ______________ **Team:** _______ **Site:** _________

Date: ____/____/____ (MM DD YY) **Photo:** _______ **Survey:** _______

Type: **D**owncutting **W**idening **H**eadcutting **U**nknown

Cause: **Be**nd at steep slope, **P**ipe **O**utfall, Below **Ch**annelization, Below **R**oad **C**rossing, **Li**vestock, **L**and **U**se **C**hange Upstream, **O**ther: ___________________________

Length: ______________________ ft. **Average exposed bank height:** _______________________ ft.

Present Land Use Left Side (looking downstream): **Cr**op field, **Pa**sture, **La**wn, **Pav**ed, **Sh**rubs & Small Trees, **Fo**rest, **M**ultiflora **R**ose, **O**ther __________________________

Present Land Use Right Side (looking downstream): **Cr**op field, **Pa**sture, **La**wn, **Pav**ed, **Sh**rubs & Small Trees, **Fo**rest, **M**ultiflora **R**ose, **O**ther __________________________

Threat to Infrastructure?: **Y**es **N**o **Describe**: ____

Severity	Severe	**1**	**2**	**3**	**4**	**5**	Minor	Unknown (**–1**)
Correctability	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)
Access	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)

EROSION SITE ES

Map: ______________ **Team:** _______ **Site:** _________

Date: ____/____/____ (MM DD YY) **Photo:** _______ **Survey:** _______

Type: **D**owncutting **W**idening **H**eadcutting **U**nknown

Cause: **Be**nd at steep slope, **P**ipe **O**utfall, Below **Ch**annelization, Below **R**oad **C**rossing, **Li**vestock, **L**and **U**se **C**hange Upstream, **O**ther: ___________________________

Length: ______________________ ft. **Average exposed bank height:** _______________________ ft.

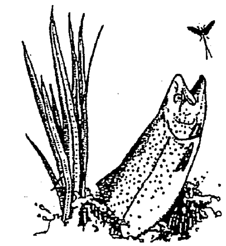
Present Land Use Left Side (looking downstream): **Cr**op field, **Pa**sture, **La**wn, **Pav**ed, **Sh**rubs & Small Trees, **Fo**rest, **M**ultiflora **R**ose, **O**ther __________________________

Present Land Use Right Side (looking downstream): **Cr**op field, **Pa**sture, **La**wn, **Pav**ed, **Sh**rubs & Small Trees, **Fo**rest, **M**ultiflora **R**ose, **O**ther __________________________

Threat to Infrastructure?: **Y**es **N**o **Describe**: ____

Severity	Severe	**1**	**2**	**3**	**4**	**5**	Minor	Unknown (**–1**)
Correctability	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)
Access	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)

Figure 9: Adopt-A-Stream Pipe Survey of ______________________ River/Brook



Segment #_________ Segment Begins: ______________

Date: ______________________________ Segment Ends: _______________

Names of observers: ____

Weather today: ____

Weather over past 48-72 hours: ____

Pipe#	Time	Pipe material and condition	Pipe size & amount of flow	Color of Flow	Odor of Flow	**Algae below pipe** Yes No Describe extent	Sediment below pipe	Comments? If pipe should be rechecked-describe location	GPS Latitude GPS Longitude: (Optional)
Sample #1	9:33 AM	Concrete in good shape	Constant Moderate Flow 1' diameter	Red-brown	fetid	Green growth coating rocks across the entire stream width and 100 yards upstream.	Sand accumulation at outfall	Should be rechecked. Downstream of Jones St. Bridge	

B. Conducting a Pipe Survey

The purpose of the Pipe Survey is to learn if storm drains and pipes are flowing in dry weather. Because storm drains are designed to bring storm water to the river, they should flow only during and just after a storm event. If they are flowing during dry weather, they may be bringing pollutants to the river. Some of the sources of these pollutants could be leaking septic systems or illegal hook ups. It is therefore very important for groups to answer questions about weather conditions on both these data sheets as well as on the basic Shoreline Survey Field Data Sheets.

Some groups do a Pipe Survey as part of their basic Shoreline Survey; other groups find that there are too many things to record to combine the two surveys. They do pipe surveys separately.

To conduct a shoreline Pipe Survey, groups walk along the river where it is accessible, drive to roads or parking lots that abut the river or tributaries. Bridges are a good location to look for pipes that are street drains but which may also have illegal tie ins or groundwater infiltration.

CAUTON: Do not cross private property without permission. Do not touch the liquid coming out of the pipe. Do not put your head or hands inside the pipe

<u>Filling out the Pipe Survey Forms</u> (see *Figure 9*. The first row has been filled in as an example. For sample pipe survey map, see *Figure 1A*.)
Pipe #: Write your numbers chronologically beginning with # 1. For a long stretch or one with many pipes, you may need to photocopy more than one sheet per section.

Date: Fill in the date you did the Shoreline Survey.

Time: Write the time you checked each pipe.

Weather today: Describe if the weather is sunny or overcast. Include the air temperature and, if possible, the water temperature.

Weather in last 48 hours: Describe the weather in terms of last rainfall.

Pipe material: Describe the material as best you can (concrete, plastic or metal.) If the pipe is cracked, corroded, or discolored mention this too.

Pipe size and amount of flow. Indicate the pipe diameter either by measuring through the center or estimate if measuring is not possible. Indicate amount of flow by drawing the water level in the pipe and describe whether the flow was roaring, moderate, a trickle or dripping.

Color of flow: Describe the color as best you can. Color can be clear, clear with a sheen, rusty brown color, reddish brown, green or whitish. If the material is very solid or has particles in it, you may want to indicate this here.

Odor: Describe the odor as best you can. Odor can range from no odor, to dank and musky, strong musky, fetid (rotting), urine, sewage, to chemical (acrid).

Comments: Note what the pipe seems to be used for. It may be a storm drain (a device for taking rain water from parking lots and roads.) The pipe could be a hose from a house or a swimming pool. If you think the pipe is one that should be monitored further or requires action, write those comments in this column.

If possible, return to drain pipes under different conditions: different times of day, different days of the week, different weather conditions, to see when they are discharging.

ABOVE ALL, BE CAREFUL. ALTHOUGH THE WORK YOU WILL BE DOING IS VERY IMPORTANT AND MUST BE ACCURATE, YOU SHOULD BE AWARE THAT AS VOLUNTEERS ANY ACCIDENTS THAT RESULT ARE ONLY COVERED BY YOUR OWN INSURANCE--USE CARE AND COMMON SENSE.

EXPOSED PIPE EP

Map: _______________ **Team:** _______ **Site:** __________

Date: ____/____/____ **Photo:** _______ **Survey:** _______
MM DD YY

Pipe is: Exposed across bottom of stream, Exposed along stream bank, Exposed manhole, Above stream, Other: __________________________________

Type of Pipe: Concrete, Smooth Metal, Corrugated Metal, Plastic, Terra Cotta, Other: ______________________

Pipe Diameter: ______________ in. **Length exposed:** ________________ ft.

Purpose of Pipe: Sewage, Water Supply, Stormwater, Unknown, Other: ___________________________

Evidence of Discharge?: **Y**es **N**o

Color: Clear, medium brown, dark brown, green brown, yellow brown, green, other: __________________

Odor: Sewage, oily, musky, fishy, rotten eggs, chlorine, none, other: __________________

Severity	Severe	**1**	**2**	**3**	**4**	**5**	Minor	Unknown (**–1**)
Correctability	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)
Access	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)

EXPOSED PIPE EP

Map: _______________ **Team:** _______ **Site:** __________

Date: ____/____/____ **Photo:** _______ **Survey:** _______
MM DD YY

Pipe is: Exposed across bottom of stream, Exposed along stream bank, Exposed manhole, Above stream, Other: __________________________________

Type of Pipe: Concrete, Smooth Metal, Corrugated Metal, Plastic, Terra Cotta, Other: ______________________

Pipe Diameter: ______________ in. **Length exposed:** ________________ ft.

Purpose of Pipe: Sewage, Water Supply, Stormwater, Unknown, Other: ___________________________

Evidence of Discharge?: **Y**es **N**o

Color: Clear, medium brown, dark brown, green brown, yellow brown, green, other: __________________

Odor: Sewage, oily, musky, fishy, rotten eggs, chlorine, none, other: __________________

Severity	Severe	**1**	**2**	**3**	**4**	**5**	Minor	Unknown (**–1**)
Correctability	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)
Access	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)

PIPE OUTFALL PO

Map: _______________ **Team:** _______ **Site:** _________

Date: ____/____/____ **Photo:** _______ **Survey:** _______
MM DD YY

Type of Outfall: Stormwater, Sewage Overflow, Industrial, Pumping Station, Agricultural, Other: __________________________

Type of Pipe: Earth Channel, Concrete Channel, Concrete Pipe, Smooth Metal Pipe, Corrugated Metal, Plastic, Other: __________________________

Location (facing downstream): left bank, right bank, head of stream, Other ___________________

Pipe Diameter: ______________ in. **Channel width:** ______________ ft.

Evidence of Discharge?: **Y**es **N**o

Color: Clear, medium brown, dark brown, green brown, yellow brown, green, other: ______________

Odor: Sewage, oily, musky, fishy, rotten eggs, chlorine, none, other: ______________

Severity	Severe	**1**	**2**	**3**	**4**	**5**	Minor	Unknown (**–1**)
Correctability	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)
Access	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)

PIPE OUTFALL PO

Map: _______________ **Team:** _______ **Site:** _________

Date: ____/____/____ **Photo:** _______ **Survey:** _______
MM DD YY

Type of Outfall: Stormwater, Sewage Overflow, Industrial, Pumping Station, Agricultural, Other: __________________________

Type of Pipe: Earth Channel, Concrete Channel, Concrete Pipe, Smooth Metal Pipe, Corrugated Metal, Plastic, Other: __________________________

Location (facing downstream): left bank, right bank, head of stream, Other ___________________

Pipe Diameter: ______________ in. **Channel width:** ______________ ft.

Evidence of Discharge?: **Y**es **N**o

Color: Clear, medium brown, dark brown, green brown, yellow brown, green, other: ______________

Odor: Sewage, oily, musky, fishy, rotten eggs, chlorine, none, other: ______________

Severity	Severe	**1**	**2**	**3**	**4**	**5**	Minor	Unknown (**–1**)
Correctability	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)
Access	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)

Stormwater Outfall Survey

Outfall Tracking ID: (AutoNumber) Outfalls **OT**

Watershed: Date: Assessed By:

Survey ID: Time: am/pm Photo ID:(Camera-Pic#) -#

Site ID: (Condition-#): OT- Lat: 0 ° 0 ' 0 " Long: 0 ° 0 ' 0 " LMK: GPS: (Unit ID)

Bank: ☐ LT ☐ RT ☐ Head

Type: ☐ Closed Pipe

Material: ☐ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:

Shape: ☐ Single ☐ Circular ☐ Double ☐ Elliptical ☐ Triple ☐ Other:

Dimensions: Diameter: 0 in

Submerged: ☐ No ☐ Partially ☐ Fully

Flow: ☐ None ☐ Trickle ☐ Moderate ☐ Substantial ☐ Other:

☐ Open Channel

☐ Concrete ☐ Earthen ☐ Other Desc

☐ Trapezoid ☐ Parabolic ☐ Other Desc

Depth 0 in
Top Width 0 in
Bottom Width 0 in

Not Applicable

Condition: ☐ None ☐ Chipped/Cracked ☐ Peeling Paint ☐ Corrosion ☐ Other:

Odor: ☐ No ☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Other:

Deposits/ Stains: ☐ No ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:

Vegetative Density: ☐ None ☐ Normal ☐ Inhibited ☐ Excessive ☐ Other:

Pipe Benthic Growth: ☐ None ☐ Brown ☐ Orange ☐ Green ☐ Other:

Pool Quality: ☐ No Pool ☐ Good ☐ Odors ☐ Colors ☐ Oils ☐ Suds ☐ Algae ☐ Float. ☐ Other:

For Flowing Only

Color: ☐ Clear ☐ Brown ☐ Grey ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:

Turbidity: ☐ None ☐ Slight Cloudiness ☐ Cloudy ☐ Opaque

Floatables: ☐ None ☐ Sewage (toilet paper, etc.) ☐ Petroleum (oil sheen) ☐ Other:

Other Concerns: ☐ Excess Trash (paper/plastic bags) ☐ Dumping (bulk) ☐ Excessive Sedimentation ☐ Needs Regular Maintenance ☐ Bank Erosion ☐ Other:

Potential Restoration Candidate ☐ No ☐ Discharge investigation ☐ Stream Daylighting ☐ Local Stream Repair/Outfall Stabilization ☐ Stormwater Retrofit ☐ Other Desc:

If yes for daylighting:

Length of Vegetative Cover from Outfall: 0 ft Type of Existing Vegetation: Slope: 0 °

If yes for stormwater:

Is stormwater currently controlled? ☐ Yes ☐ Not Investigated

Land Use Description:

Area Available:

Outfall Severity: (select one)	Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.	Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.	Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.
	5 4	3 2	1

Sketch / Notes:

Reported to authorities ☐ Yes

Trash and Debris Survey

Outfall Tracking ID (AutoNumber)

Trash and Debris **TR**

Watershed ___ Date ___ Name ___

Survey Reach ID ___ Time ___ PhotoID: Camera# ___ PhotoID: Pic#s ___

SiteID: (condition-#) TR- ___ Lat 0° 0' 0" Long 0° 0' 0" LMK ___ GPS ___

Type:	Material:			Source:	Location:	Land Ownership:
☐ Industrial	☐ Plastic	☐ Paper	☐ Metal	☐ Unknown	☐ Stream	☐ Public ☐ Unknown
☐ Commercial	☐ Tires	☐ Construction	☐ Medical	☐ Flooding	☐ Riparian Area	☐ Private
☐ Residential	☐ Appliances	☐ Yard Waste		☐ Illegal Dump	☐ Lt bank	Amount (# pickup truck loads): 0
	☐ Automotive	☐ Other ___		☐ Local Outfall	☐ Rt bank	

Potential Restoration Candidate ☐ Stream Cleanup ☐ Stream Adoption Segment ☐ Removal/prevention of dumping

☐ No ☐ Other Other Desc. ___

If yes for trash or debris removal	Equipment Needed: ☐ Heavy Equipment ☐ Trash Bags ☐ Unknown	Dumpster within 100 Ft:
	Who can do it: ☐ Volunteers ☐ Local Gov ☐ Hazmat Team ☐ Other	☐ Yes ☐ Unkown

Clean-up Potential:	A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access	A large amount of trash, or bulk items, in a small area with easy access. Trash may have been dumped over a long period of time but it could be cleaned up in a few days, possibly with a small backhoe.		A large amount of trash or debris scattered over a large area, where access is very difficult. Or presence of drums or indications of hazardous materials	
___	5	4	3	2	1

Notes

Reported to Authoritites ☐

TRASH DUMPING TD

Map: ______________ **Team:** _______ **Site:** _________

Date: ____/____/____ **Photo:** _______ **Survey:** _______
MM DD YY

Type of trash: **Re**sidential, **In**dustrial, **Y**ard **W**aste, Flotables, **Ti**res, **Co**nstruction,
Other: ____________________________

Amount of trash: ______________________ pick-up truck loads

Other measure: ______________________

Is trash confined to? **S**ingle site, **L**arge Area

Possible cleanup site for volunteers? **Y**es **N**o

Land Ownership: **Pu**blic **Pr**ivate **Un**known

If public, name: ________________________________

Severity	Severe	**1**	**2**	**3**	**4**	**5**	Minor	Unknown (**-1**)
Correctability	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**-1**)
Access	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**-1**)

TRASH DUMPING TD

Map: ______________ **Team:** _______ **Site:** _________

Date: ____/____/____ **Photo:** _______ **Survey:** _______
MM DD YY

Type of trash: **Re**sidential, **In**dustrial, **Y**ard **W**aste, Flotables, **Ti**res, **Co**nstruction,
Other: ____________________________

Amount of trash: ______________________ pick-up truck loads

Other measure: ______________________

Is trash confined to? **S**ingle site, **L**arge Area

Possible cleanup site for volunteers? **Y**es **N**o

Land Ownership: **Pu**blic **Pr**ivate **Un**known

If public, name: ________________________________

Severity	Severe	**1**	**2**	**3**	**4**	**5**	Minor	Unknown (**-1**)
Correctability	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**-1**)
Access	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**-1**)

Figure 10. **BRIDGE SURVEY DATA SHEETS**

Identify the Bridge by name or by naming the street or road. If the road crosses the river at several bridge crossings describe the neighborhood. ____.

1. Access: Is there river access? (Indicate yes or no with a "Y" or an "N")
    ____Easy carry on access for canoes?
    ____Fishing access?
    ____Boat ramp for motorized boats?
    ____Safe parking for cars? If yes, how many cars:______
    ____Posted "No Trespassing" signs?
    ____Do you know who owns the land around the bridge? If yes, circle town, state, private owner. If you know, give the owner's name.
    ____Potential for access? If so, indicate which uses by circling: (canoeing; fishing; motorized boats; parking for cars; parking for trailers)

2. Navigation: (Indicate yes or no with a "Y" or an "N")
    ____Are the bridge pylons (bridge support structures) close together?
    ____Would the current carry a boat into a bridge pylon or abutment?
    ____Is there adequate clearance under the bridge for boats?
        ____During normal flows?
        ____Even during high water?

3. Road Runoff: Are there noticeable effects of road runoff? (indicate yes or no with a "Y" or "N".)
    ____Does the road drain to the river by pipe, shoot or swale?
    If so, describe the size and location of any pipes, shoots or swales:

    ____Is there evidence of erosion caused by the drainage system?
    ____Is there evidence of sediment being deposited below the drainage pipe?
        If so, approximate the amount (in square feet)

4. Effect on river channel: Has the bridge had an impact on the river channel?
    ___If the bridge is culverted, does it prevent fish or wildlife migration?
        If so how:

    ___Is there a pool just below the bridge?
    ___Are there similar pools on the river which appear natural?
    ___Is there a difference between the bottom composition upstream and downstream or under the bridge?
    ___Has the river undercut any of the bridge abutments?

5. Floating debris:
    ___Is there evidence of floating debris collected on the upstream side of the bridge?
    ___Is the debris backing up flood water?

6. Other observations: Is it in disrepair? Is it scenic? Is there signage identifying the river or brook? Other comments?

C. Conducting a Bridge Survey

Bridges represent the intersection of human traffic and rivers. They are the most likely place for us to gain access to the stream. They are also likely places for stormwater to carry road and road maintenance impacts to the stream. You will need one data sheet for each bridge.

1. Access: You will want to identify existing access points on your map and know which ones are permanently marked and open to the public and which ones are dependent upon landowners whims. Having this data can allow your group to work to improve access. Your group may want to work with town officials, land trusts, and landowners to formalize access points. There are several ways to do this. In Norwood, MA, the town planner and the Neponset River Watershed Association recently celebrated the donation of a canoe access point from a local business. In Lincoln, the Conservation Commission has created canoe access with parking provided on conservation land. On publicly owned land, groups work with the Public Access Board to create public access. To get in touch with the Public Access Board and learn how you can work together, call Jack Sheppard, Director, Public Access Board (617-727-1843). Jack Sheppard and his staff can sometimes do site inspections to see if the area fits Public Access Board criteria. If the land is on State Highway Department land, work with the MA Highway Department and Public Access Broad. For more information, call Russ Cohen (617-626-1543) at the Riverways Office.

2. Navigation: Information from these questions could be part of a future canoe guide. For example, you would learn which bridges required portaging for canoeists. If, and when the bridge needs repair or reconstruction, your data might help redesign the bridge for better navigation purposes. (See Appendix C for suggestions about protecting rivers during bridge construction.)

3. Road runoff: Sediment, and the accompanying toxics which bind to sediment, harms river ecology by burying habitat for aquatic organisms. Direct, untreated roadway discharge can silt in a stream and alter stream chemistry. By identifying serious problem areas (ones with a great deal of sediment, or areas which are prime habitat for fish or for aquatic insects), groups can work with town officials and DPWs. Some communities have created Best Management Practices such as (1) removing asphalt from the swales (at the least, your information could help prevent new asphalt swales from replacing vegetated ones); (2) allowing vegetation to help trap the sediment; and (3) building retention basins. Recently, the Jones River Watershed Association and the North and South Rivers Watershed Association received grants to build systems that infiltrate and treat stormwater at critical areas.

4. Effect on river channel: These questions look at how the bridge affects the river itself.

> If the bridge is culverted (ie. the bottom of the stream surface is part of the bridge structure, or in other words, the stream is in a pipe or box), it can impair fish migration.
> 1) Long or steeply sloped culverts can impair migration by inland or anadromous fish.
> 2) Improperly sized culverts increase downstream velocity and scour downstream invertebrate and fish bottom habitats.
> 3) Some fish, alewives in particular, will not cross long, dark culverts.
> 4) In addition, flat culvert bottoms create shallow water which serve as barriers to inland fish species.

After floods, when backed-up water behind the bridge is released, it can scour out the stream bottom, create pools, and transport sediments downstream. This can be beneficial, creating a pool for habitat or fish, or detrimental, removing riffle areas that support aquatic insects. Degradation also occurs if the sediment from the scoured area is deposited in areas of good habitat or if the pool is undercutting the bridge. In noticing the differences in bottom composition above, under and downstream of the bridge, watch for deposits of sand, sand bars and fine silts. Look also for undercut banks.

5. Floating debris: Answers to these questions can become part of your data for determining if and where a clean up is needed.

6. Note other observations about the bridge: Is it in disrepair? Is it scenic? Is there signage identifying the river or brook? Or any miscellaneous observations you note.

IN OR NEAR STREAM CONSTRUCTION IC

Map: _______________ **Team:** _______ **Site:** __________

Date: ____/____/_____ **Photo:** _______ **Survey:** _______
MM DD YY

Type of activity: **Ro**ad, **R**oad **C**rossing, **U**tility, **Lo**gging, **B**ank **S**tabilization, **Re**sidential Development, **In**dustrial Development, **O**ther: _______________________

Sediment Control: **A**dequate **I**nadequate **U**nknown

If inadequate, why? ____

Is stream bottom below site laden with excess sediment? **Y**es **N**o

Length of stream affected: _________________________ ft.

Company doing construction: ______________________________________

Location: ____

Severity Severe **1** **2** **3** **4** **5** Minor Unknown (**-1**)

Contact office as soon as possible: (   )

IN OR NEAR STREAM CONSTRUCTION IC

Map: _______________ **Team:** _______ **Site:** __________

Date: ____/____/_____ **Photo:** _______ **Survey:** _______
MM DD YY

Type of activity: **Ro**ad, **R**oad **C**rossing, **U**tility, **Lo**gging, **B**ank **S**tabilization, **Re**sidential Development, **In**dustrial Development, **O**ther: _______________________

Sediment Control: **A**dequate **I**nadequate **U**nknown

If inadequate, why? ____

Is stream bottom below site laden with excess sediment? **Y**es **N**o

Length of stream affected: _________________________ ft.

Company doing construction: ______________________________________

Location: ____

Severity Severe **1** **2** **3** **4** **5** Minor Unknown (**-1**)

Contact office as soon as possible: (   )

Utility Impacts Survey

Utility Impacts Tracking ID: (AutoNumber)

Utility Impacts **UT**

Watershed: | Date: | Assessed By:

Survey Reach ID: | Time: *am/pm* | Photo ID:(Camera-Pic#) -#

Site ID: (Condition-#) UT- | Lat: 0 ° 0 ' 0 " Long: 0 ° 0 ' 0 " LMK: | GPS: (Unit ID)

Type:	Material:	Location:	Potential Fish Barrier:	Dimensions:
☐ Leaking Sewer ☐ Exposed Pipe ☐ Exposed Manhole ☐ Other:	☐ Concrete ☐ Corrugated metal ☐ Smooth Metal ☐ PVC ☐ Other:	☐ Floodplain ☐ Stream Bank ☐ Above Stream ☐ Stream Bottom ☐ Other:	☐ Yes	Diameter: 0 ft Length Exposed: 0 ft

Condition:
☐ Joint Failure ☐ PipeCorrosion/Cracking
☐ Protective Covering Broken ☐ Manhole Cover Absent
☐ Other:

Evidence of Discharge:		
	Color	☐ None ☐ Clear ☐ Dark Brown ☐ Lt Brown ☐ Yellowish ☐ Greenish ☐ Other:
	Odor	☐ None ☐ Sewage ☐ Oily ☐ Sulfide ☐ Chlorine ☐ Other:
	Deposits	☐ None ☐ Tampons/Toilet Paper ☐ Lime ☐ Surface Oils ☐ Stains ☐ Other:

Severity (Select #):			
	Section of pipe undermined by erosion and could collapse in the near future; a pipe running across the bed or suspended above the stream; a long section along the edge of the stream where nearly the entire side of the pipe is exposed; or a manhole stack that is located in the center of the stream channel and there is evidence of stack failure.	A moderately long section of pipe is partially exposed but there is no immediate threat that the pipe will be undermined and break in the immediate future. The primary concern is that the pipe may be punctured by large debris during a large storm event.	Small section of exposed pipe, stream bank near the pipe is stable; the pipe is across the bottom of the stream but only a small portion of the top of the pipe exposed; the pipe is exposed but is reinforced with concrete and it is not causing a blockage to upstream fish movement; a manhole stack that is at the edge of the stream and does not extend very far out into the active stream channel.

Leaking= 5   5   4   3   2   1

Notes:

☐ ReportedToAuthorities

UNUSUAL CONDITION OR COMMENT UC

Map: _______________ **Team:** _______ **Site:** _________

Date: ____/____/____ **Photo:** _______ **Survey:** _______
MM DD YY

Type: (circle one) **Unusual Condition** **Comment**

Describe: **Od**or, **Sc**um, Excessive **Al**gae, **W**ater **C**olor/Clarity, **R**ed **F**lock, **S**ewage **D**ischarge, **Oi**l

____

____

____

Potential Cause: ____

____

Severity	Severe	**1**	**2**	**3**	**4**	**5**	Minor	Unknown (**–1**)
Correctability	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)
Access	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)

UNUSUAL CONDITION OR COMMENT UC

Map: _______________ **Team:** _______ **Site:** _________

Date: ____/____/____ **Photo:** _______ **Survey:** _______
MM DD YY

Type: (circle one) **Unusual Condition** **Comment**

Describe: **Od**or, **Sc**um, Excessive **Al**gae, **W**ater **C**olor/Clarity, **R**ed **F**lock, **S**ewage **D**ischarge, **Oi**l

____

____

____

Potential Cause: ____

____

Severity	Severe	**1**	**2**	**3**	**4**	**5**	Minor	Unknown (**–1**)
Correctability	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)
Access	Best	**1**	**2**	**3**	**4**	**5**	Worst	Unknown (**–1**)

REPRESENTATIVE SITE RE

Map: ________________ **Team:** _______ **Site:** __________

Date: ____/____/____ **Photo:** _______ **Survey:** _______

MM DD YY

	Optimal	Suboptimal	Marginal	Poor
Macroinvertebrate Substrata				
Embeddedness				
Shelter for fish				
Channel Alteration				
Sediment Deposition				
Velocity and Depth				
Channel Flow				
Bank Vegetation				
Bank Condition				
Riparian Vegetation				

Wetted width: Riffles: __________ in. **Runs:** __________ in. **Pools:** __________ in.

Thalweg depth: Riffles: __________ in. **Runs:** __________ in. **Pools:** __________ in.

Bottom type: Silts, Sands, Gravel, Cobble, Boulder, Bedrock

REPRESENTATIVE SITE RE

Map: ________________ **Team:** _______ **Site:** __________

Date: ____/____/____ **Photo:** _______ **Survey:** _______

MM DD YY

	Optimal	Suboptimal	Marginal	Poor
Macroinvertebrate Substrata				
Embeddedness				
Shelter for fish				
Channel Alteration				
Sediment Deposition				
Velocity and Depth				
Channel Flow				
Bank Vegetation				
Bank Condition				
Riparian Vegetation				

Wetted width: Riffles: __________ in. **Runs:** __________ in. **Pools:** __________ in.

Thalweg depth: Riffles: __________ in. **Runs:** __________ in. **Pools:** __________ in.

Bottom type: Silts, Sands, Gravel, Cobble, Boulder, Bedrock

Shoreline Survey Priorities for Action

Adopt a Stream

Segment Begins: ___________________
Segment Ends: ____________________

Look back at your Field Data sheet and include your observations. The information from these sheets will be used to develop the Action Plan. PROBLEMS: Problems found in your segment, such as: pipes discharging in dry weather erosion, runoff trash, dense algae water quality problems (odor, color, oil, foam, sewage) degraded wetlands (phragmites, loosestrife) other problems *(describe, give location)* 1. 2.	ASSETS: Assets found in your segment, such as: Good habitat, wildlife species businesses or landowners using the river (in a friendly way) recreational access (canoe, trails, parks) potential recreational access potential park/conservation land *(describe, give location)* 1. 2.	PRIORITIES for action: List items from problems/assets columns that you feel need more work. 1. 2.