

 <p>Environment and Sustainable Resource Development</p>	<p>Title: STANDARD FOR SAMPLING OF SMALL STREAMS IN ALBERTA (Public version)</p>	<p>Date: May -2013</p>
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Principal Issues:
 Consistent collection of fish community composition and abundance during surveys of small streams facilitates data management and provides a broader temporal and spatial analysis of fish communities in Alberta.

Application:
 All who conduct fisheries inventories will follow this guideline when conducting and reporting on stream surveys where the principle objectives are fish presence/distribution, community composition and relative abundance. In circumstances where planned surveys fail to meet the '*minimum*' standard as set out in this guideline, methodologies are to be reviewed through the ESRD Area Fisheries Management contact.

Developed by:

- Development by Fisheries Management Branch Standards Committee
 - Original development data: March 2012

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<p>Approved by (Executive):</p> <p>Executive Director of Fisheries Management</p>	<p>Original Signed by: Travis Ripley</p> <p>Date: <u>Nov 4/13</u></p>
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Standard Protocol for Sampling of Small Streams in Alberta

Introduction

This standard should be considered as “minimum criteria” for surveys of small (typically less than 5m wetted width), easily wadeable streams. Easily wadeable streams are defined as typically being less than 1.0 meter in maximum depth, but should account for discharge and physical characteristics of the sampler. It is understood that portions of the stream (i.e. pool habitat) may be un-wadeable, however, effort should be made to sample other wadeable portions of the stream.

Although the information described in this standard is deemed as “minimum criteria”, the collection of any data is entirely dependent on the specific study objectives. For nearly all surveys the principle objectives are: (1) to understand species presence and distribution and, (2) to estimate the number of fish present. Environment and Sustainable Resource Development (ESRD) considers fish distribution and abundance the first steps to effective fisheries management planning and the choice of a sample site or sites should reflect these general objectives.

The scale at which information is needed will tend to direct the location and number of sample sites appropriate for surveys. For example:

- Are fish present in the watershed, basin, or sub-basin? Species richness tends to increase downstream, so choosing a site farthest downstream but still within the area of interest has the highest probability of achieving this objective. If fish distribution within the watershed is of additional interest, then sampling additional sites upstream within specific reach designations based on some logical channel characteristics (e.g. slope and elevation) is appropriate. Upper, middle and lower reach designations may not be appropriate if the habitats are unevenly distributed.
- Are fish present at a particular stream crossing location (e.g. road or pipeline crossing)? Sample above and below the crossing, as local conditions permit, at an intensity and scale appropriate for the size of the habitat and the fish species expected.

- Are rare or endangered species likely to occur and is it important to detect them (e.g., pygmy whitefish)? Choose a site(s) that has the highest probability of capturing the fish of interest (based on known habitat characteristics, utilization, etc.) and sample with sufficient intensity appropriate for the size of the habitat.

Fish and Fish Habitat Data; Minimum Requirements for Surveys

The small stream inventory standard is designed to capture essential data from descriptions of habitat, fish community composition and fish abundance. An example of a field form that is designed to capture these data requirements is presented in Appendix 1. Completion of all the parameters on the form is desirable, but may not always be possible depending on specific study objectives that require unique methodologies. However, for routine surveys, certain parameters are essential in providing a meaningful description of the fish community and habitat, and thus should be included in the survey design. Such parameters are stated below as 'mandatory' reporting requirements.

All the relevant information for any data collection method used should be recorded in conjunction with the data. Electrofishing should be the first choice for sampling fish. Any electrofishing conducted must adhere to the Alberta Fisheries Management Division Electrofishing Policy Respecting Injuries to Fish (found on the ESRD external webpage under Fish and Wildlife – Fish Research). Other fish collection methodologies should be considered only when electrofishing is not a viable option or in conjunction with electrofishing.

Definitions, Methods and Data Recording Procedures

Each of the following consecutively numbered elements corresponds to the same numbered box in the Field Forms (Appendix I). A definition, intent (where applicable), methodology (where applicable) and recording procedure is provided for each element.

Site Descriptors:

(1) Waterbody Name (Mandatory)

Definition: the official name of the waterbody being surveyed, and any local names.

Method: Gazetteer of Canada; Alberta.

Recording Procedure: enter official name, if not named enter "unnamed".

Local names should be recorded in the comments section.

(2) Waterbody ID (Mandatory)

Definition: A unique number assigned to water bodies in Alberta and located in the Fish and Wildlife Management Information System (FWMIS).

Method: Query FWMIS prior to fieldwork to obtain Waterbody ID number (WBID). Note: Although most water bodies in Alberta have a WBID number assigned, it is possible that some may not yet be catalogued. For those that do not have an FWMIS WBID number, a notification of FWMIS managers through the ASRD Area Fisheries Management contact is required so that a WBID number may be assigned.

Recording Procedures: Enter the specific water body code as it appears in the FWMIS database.

(3) Activity Date (Mandatory)

Definition: The specific date on which the field portion of the stream survey was conducted.

Recording Procedures: Record the date when the field portion of the stream survey was conducted using FWMIS loadform format.

(4) Crew (Mandatory)

Definition: The individuals who conducted the survey, including the recorder.

Intent: Names are to be recorded so that appropriate persons may be contacted to validate or verify data.

Recording Procedures: Record the initials of the crew-members using a maximum of 3 letters per member (e.g. TDB/CW/IG). Full names are to be recorded in the comments section.

(5) Start UTM Easting (Mandatory)

Definition: The Universal Transverse Mercator (UTM) number that identifies the latitudinal location of the downstream boundary of the stream reach or sampling site.

Intent: To provide a geographical reference point for the commencement of any sampling that occurs at a single location, or traverses a stream reach in either an upstream (common) or downstream (uncommon) direction.

Method: Record position from a GPS unit. In situations where a GPS reading cannot be obtained (e.g. deep canyon) record UTM coordinates from an appropriate NTS map.

Recording Procedures: UTM data must include the Zone (e.g. 11 or 12) and Datum in which the data was collected; NAD83 is preferred but WGS84 may be used. Use the comments section to record direction of sampling traverses (upstream or downstream) and the 'Finish UTM Easting' position.

(6) Start UTM Northing (Mandatory)

Definition: The Universal Transverse Mercator (UTM) number that identifies the longitudinal location of the downstream boundary of the stream reach or sampling site.

Intent: See above (point 5).

Method: See above (point 5).

Recording Procedures: UTM data must include the Zone (e.g. 11 or 12) and Datum in which the data was collected; NAD83 is preferred but WGS84 may be used. Use the comments section to record the 'Finish UTM Northing' position of sampling traverses.

(7) Site Location Notes (Mandatory)

Definition: A concise description of the geographic location of the reach or site surveyed based on permanent or named features on published maps.

Method: Ground observation or map reference.

Recording Procedures: Enter description, using measurements if possible, referring to mapped reference points (e.g. 'point' - 100 m upstream of Hwy 91 crossing or, 'reach' - between the confluence of Fisher Creek and Threepoint Creek).

(8) Site No. (Mandatory)

Definition: A number unique within a specified sampling unit or season, or project area assigned to a section of stream.

Recording Procedures: Assign the specific site number as an integer from 1-999 unique to the sampling unit or season, or project area code number. The number does not have to be in sequential order, nor should it be assumed to have reference to a hierarchical watershed code.

Habitat Descriptors:

(9) Water Temperature (Mandatory)

Definition: Water temperature measured where water column is thoroughly mixed.

Intent: Water temperature influences the nature and distribution of biota, influences electrofishing efficiency, hence catchability (q), and provides a means of subsequent data stratification during analysis.

Method: Use of an appropriately calibrated thermometer is required. Water temperature should be measured as near to mid-afternoon (approximate time of MAX temperature) as possible.

Recording Procedures: Record the temperature in degrees Celsius (°C) to the nearest degree. Record the time of day and the ambient temperature to the nearest degree Celsius.

(10) Conductivity (Mandatory)

Definition: The capacity to transmit electricity, dependent on the total concentration of ionized substances dissolved in water.

Intent: Conductivity provides a crude index to productivity, influences electrofishing efficiency, hence catchability (q), and provides a means of subsequent data stratification during analysis.

Method: Use of a portable, calibrated conductivity meter is required.

Recording Procedures: Record conductivity to the nearest microsiemens/cm (µS/cm) standardized to 25°C.

(11) Stream Stage (Mandatory)

Definition: The relative water level in a stream at the time of survey.

Intent: Stream stage influences electrofishing efficiency, hence catchability (q), and provides a means of subsequent data stratification during analysis.

- Dry (D): Water not present or only as unconnected pools or standing in bottom depressions; essentially no flow.
- Low (L): Water flowing as threads within the channel; most bed material is exposed and little of the lower banks are wet.
- Moderate (M): Water flowing throughout the normal bed and in contact with the lower portions of banks; some bars are exposed.
- High (H): Water fills most of the channel and is in contact with the middle and upper portions of banks.
- Flood (F): Water is bankfull or over banks and into the floodplain.

Method: Subjectively rate stream stage based on aerial or ground reconnaissance.

Recording Procedures: Circle the appropriate rating on the form.

(12) *Transect Data* (Recommended)

Definition: Channel measurements beginning at the downstream location of the survey section (T0) and repeating at 50 meter intervals for a minimum of 250 meters (T5).

Intent: Channel surface area influences electrofishing effort and efficiency, hence catchability (q), and provides a mechanism for standardizing CUE.

Method: For elements 12 through 15 use of a Hip-Chain (HC), Surveyors Chain (SC), Tape (T) is preferred; but Aerial Estimate (AE), Ground Estimate (GE), or Range Finder (RF) is permissible.

Recording Procedures: Record appropriate methods code and channel measurements to the nearest 0.1 meters.

(13) *Wetted Width* (Mandatory): The width of the water surface measured at right angles to the direction of flow at the time of survey, at each transect.

(14) *Rooted Width* (Recommended): The width of the channel measured at right angles to the direction of flow, between and at the base of permanently rooted vegetation, at each transect. This may also be considered *bank-full width*, and for braided channels its measurement

should include any islands not covered by permanently rooted vegetation. Under some circumstances of low flow the rooted (or bank-full) width may greatly exceed the wetted width.

(15) Maximum Depth (Mandatory): The depth of water measured at the deepest point between the wetted banks, on each transect.

(16) Section Data (Recommended)

Definition: Reach characterization based on the pool/riffle/run ratio observed at the survey location.

Intent: Reach characterization is intended to provide a broad perspective of productivity, and provides a mechanism for stratifying data during subsequent analysis.

Method: Hip-Chain (HC), Surveyors Chain (SC), or Tape (T) preferred; Aerial Estimate (AE), Ground Estimate (GE), or Range Finder (RF) permissible. For elements 17 through 19, measure the area (length X width) of all pools encountered within the study section and, calculate the area of other habitats by subtracting the area of the pools from the total area of the study section.

Recording Procedures: Record the percentage of each habitat type represented in individual 50 m segments, to the nearest 5%, for each survey section. Record the appropriate methods code.

(17) Percent Pool: Proportion of the stream with reduced current velocity at low flow, little to no surface turbulence, and water deeper than surrounding areas.

(18) Percent Riffle: Proportion of the stream where water flows swiftly over completely or partially submerged bed materials to produce surface turbulence.

(19) Percent Run: Proportion of the stream with uniform but swift flow without surface waves, and surface slope roughly parallel to the mean reach gradient

(20) Photo Number (Recommended)

Definition: The frame number (or digital photo number) for photographs taken during the stream survey.

Recording Procedures: Record the number of each photograph. If possible, embed photo number, date and time on each photograph.

(21) Photo Description (Recommended)

Definition: Brief description of the details of each photo for later reference to structures, etc.

Recording Procedures: Record relevant details of each photo for later reference (e.g. #1/5 – T0 facing upstream).

(22) Evidence of Barriers (Recommended)

Definition: Any structure or natural formation observed within the study reach or in close proximity to the study reach that may block or hinder fish movement.

Method: Aerial Estimate (AE), Ground Estimate (GE), Measured (MS)

Recording Procedure: If "yes", supply an appropriate description of the barrier.

(23) If Yes, what type (Recommended)

Recording Procedures: For each obstruction, record the height (to the nearest 0.5 meter), the type and the location (nearest 0.1 km from stream mouth). Barrier types are to be designated as beaver dam (BD), cascade/chute (CC), culvert (CV), dam (DM), falls (FS), rock (RK), or log jam (XX). Document under comments any additional information on each obstruction (e.g. barrier to specific species or life stage, present at certain water stages only, whether barrier is partial or complete, etc.).

(24) Comments (Optional)

Definition: Supplementary information that is relevant to the stream survey.

Recording Procedures: Detail relevant information (e.g. channel stability, debris, management concerns, etc.).

Electrofishing Descriptors:

(25) Time Fished (Mandatory)

Definition: Electrofishing effort in seconds.

Method: Ensure the timer on specific electrofisher(s) in use is functional, reset to zero at the beginning of each E-fishing run.

Intent: Knowing effort is crucial to judging the validity of capture data and understanding the potential biases introduced by reduced effort.

Recording Procedures: Note the time (seconds) for each electrofishing run.

(26) Distance Fished (Mandatory)

Definition: Distance Electrofished.

Intent: Distance electrofished is crucial for quantifying relative abundance. In addition, the probability of encountering all species inhabiting the study section is significantly increased when the section length is, at minimum, 40X the mean wetted width (Reynolds, et. al., NAJFM 23:450-461, 2003). Fish sampling sections should be 300 meters or 40X the mean wetted width, whichever is greater.

Method: Measure section length along the channel thalweg using a hip-chain, GPS receiver, or range finder.

Recording Procedures: Note the distance (nearest meter) electrofished.

(27) Pulse width (Mandatory)

Definiton: The pulse width used to target specific species or sizes of fish.

Method: Manipulate settings on the electrofisher to the desired pulse width based on the responses observed by the species or the size of fish of interest.

Recording Procedures: Note the pulse width(s) used.

(28) Frequency (Mandatory)

Definition: The frequency used to target species or sizes of fish.

Method: Manipulate settings on the electrofisher to the desired output frequency based on the responses observed by the species or the size of fish of interest.

Recording Procedures: Note the frequency used.

(29) Shocker Settings (Mandatory)

Definition: The VOLTAGE settings applied during an electrofishing run.

Method: Adjust and apply settings until the desired effect, based on the responses observed by the species or the size of fish of interest, is achieved.

Recording Procedures: Note the VOLTAGE settings used.

Angling Descriptors (Mandatory when used):

(30) *Number of Anglers*

Definition: Number of anglers in the survey party.

Recording Procedures: Note the total number of anglers participating in the survey.

(31) *Hours fished per Angler*

Definition: Total duration of fishing by each angler participating in the survey.

Method: Use a reliable clock or stop watch.

Recording Procedures: Record hours fished for each angler (nearest 15 minute interval – note minimum effort is 15 minutes per location). In the comment section provide a simple description of gear (e.g. surface fly fishing, spin fishing, etc.).

Seine Haul Descriptors (Mandatory when used – also see Standard for Sampling Small-Bodied Fish in Alberta):

(32) *Mesh Size*

Definition: Size of all netting (mm) used to construct seine net.

Recording Procedures: Record the mesh size of the seine net used. Mesh size should be appropriately sized to capture the smallest anticipated fish species and life stage. In the comment section provide the dimensions of the seine net used as length (nearest 0.5 m) and depth (nearest 0.1 m). The minimum dimension of the seine net will be dependant on stream width, stream depth, and discharge. A bag of a smaller mesh size is recommended for incorporation into the middle of the seine to help facilitate capture/retention of small fish.

(33) *Area Sampled*

Definition: Area covered for each seine haul.

Intent: To estimate the total area sampled so that seine net catches may be expressed relative to habitat area.

Method: Use a surveyor's tape or GPS unit to measure the dimensions of the surveyed area or, measure distance traversed multiplied by seine length. There is no defined area which must be seined, but the length of each seine haul should be 30 continuous metres where possible.

Recording Procedures: Record the area covered (nearest meter²) for each individual seine haul. The fish/species caught are to be reported in number/m². Specify in the comments section if 30 continuous meters was not achievable and/or if smaller sections were necessary (provide reasons why).

Gill Netting Descriptors (Mandatory when used – see Standard for Sampling Small-Bodied Fish in Alberta):

(34) *Date Set*

Recording Procedures: Record the date that nets were set using FWMIS loadform format.

(35) *Time Set*

Recording Procedures: Record the time that nets were set using 24 hour clock notation, e.g. 08:00 hrs for 8:00 AM, 16:00 hrs for 4:00 PM, etc.

(36) *Date Lifted*

Recording Procedures: Record the date that nets were lifted using FWMIS loadform format.

(37) *Time Lifted*

Recording Procedures: Record the time that nets were lifted using 24 hour clock notation; 08:00 hrs for 8:00 AM, 16:00 hrs for 4:00 PM, etc.

(38) *Mesh Size*

Definition: The size of mesh (mm) in each individual net panel used.

Method: Measure the knot-to-knot stretched mesh dimension in millimetres.

Recording Procedures: Record the mesh size(s) used

(39) *Length of Net Set*

Definition: Length in meters of the gill net or nets deployed.

Intent: To estimate relative catch rates based on effort, in this case, per 100 m².

Recording Procedures: Record the length (nearest 0.5 m) of each net panel deployed.

(40) *Depth of Set*

Definition: The depth (nearest 0.5 m) of water in which the gill nets were deployed.

Method: Use appropriate measuring device depending on anticipated water depth.

Recording Procedures: Record water depth (nearest 0.5 m) at the location where nets were deployed.

(41) *Depth of Net*

Definition: The height of the gill net gear deployed.

Recording Procedures: Record the height (nearest 0.1 m) of the net gear deployed.

Trap Netting Descriptors (Mandatory when used – see Standard for Sampling Small-Bodied Fish in Alberta):

(42) *Date Set*

Recording Procedures: Record the date that trap nets were set using FWMIS loadform format.

(43) *Time Set*

Recording Procedures: Record the time that trap nets were set using 24 hour clock notation, e.g. 08:00 hrs for 8:00 AM, 16:00 hrs for 4:00 PM, etc.

(44) *Date Lifted*

Recording Procedures: Record the date that trap nets were lifted using FWMIS loadform format.

(45) *Time Lifted*

Recording Procedures: Record the time that trap nets were lifted using 24 hour clock notation, e.g. 08:00 hrs for 8:00 AM, 16:00 hrs for 4:00 PM, etc.

(46) Trap Type

Definition: The type of trap deployed (e.g. minnow, G-trap, fyke trap, etc.).

Recording Procedures: Record the type of trap used. Provide details pertaining to trap dimensions in the comment section.

(47) Number of Traps

Recording Procedures: Record the total number of traps of each type deployed. Record description of bait used in the comments section.

Fisheries Descriptors:

(48) Capture Method (Mandatory)

Recording Procedures: Record the method(s) used to capture fish (e.g. electrofishing/angling/seining/gill netting/trap netting).

(49) Sample Number (Mandatory)

Recording Procedures: Sequential number of fish sampled for length and weight. When greater than 50 fish are sampled use additional data forms, or the reverse side of initial form, to record information.

(50) Species (Mandatory)

Recording Procedures: Enter name code of each fish sampled according to naming convention in Mackay, et al. 1990. If large numbers of fish are encountered (e.g. WHSC juveniles) explain the method of estimation in the comments section (e.g. volume displacement and count of sub-sample).

(51) Fork Length (Mandatory)

Definition: The linear distance measured from the tip of the snout to the natural fork of the tail when the fish is resting on a flat measuring device.

Recording procedures: Record the fork length of each fish captured to the nearest millimetre (mm).

(52) Total Body Weight (Optional)

Definition: The round, or undressed, body weight including all viscera and gonads.

Recording Procedures: Record the total weight of each fish captured to the nearest gram (g).

(53) Injuries/Comments (Mandatory)

Definition: Unnatural deformities, lesion(s) or growth(s), or parasites appearing on the fins, skin, scales and/or gills.

Recording Procedures: Record nature and extent of injury, or additional comment, for each observation (e.g. lymphocystis – minor growth; *Ergasilus* – abundant).

(54) General Fisheries Comments

Recording Procedures: Record any other relevant information that may be required to elucidate sampling procedures or unusual features or occurrences. If required, use the back of the field form to record information.

Literature Cited

- Reynolds, L., A. T. Herlihy, P.R. Kaufman, S. V. Gregory, and R. M. Hughes. 2003. Electrofishing Effort Requirements for Assessing Species Richness and Biotic Integrity in the Western Oregon Streams. *North American Journal of Fisheries Management* 23: 450-461.
- Mackay, W.C., G.R. Ash, and H.J. Norris. 1990. Fish ageing methods for Alberta. R.L. & L. Environmental Services Ltd. in assoc. with Alberta Fish and Wildl. Div. and Univ. of Alberta, Edmonton. 113p.

Appendix I. Example field forms for surveys of small streams in Alberta.

1. Waterbody Name:	\ UNNAMED	3. Activity Date: (month/day/year)
2. Waterbody ID: (office use)		4. Crew:

5. Start UTM EASTING	6. Start UTM NORTHING	7. Site Location Notes:		
		8. Site No.:		
9. Water Temperature(C)	9a. Time of Day	9b. Ambient Temperature(C)	10. Conductivity (µS/cm)	11. Stream Stage
				D L M H F

12. Transect No.	13. Wetted Width (m)	14. Rooted Width (m)	15. Maximum Depth (m)	16. Section Ref. (50 m intervals)	17. '% Pool	18. '% Riffle	19. '% Run
T0				T0 - T1			
T1				T1 - T2			
T2				T2 - T3			
T3				T3 - T4			
T4				T4 - T5			
T5				T5 - u/s			

20. Photo Number:	21. Description:

22. Evidence of Barriers?	23. If Yes, what type?
Y / N	

24. COMMENTS:
If more space required use back of page 3.

ELECTROFISHING

25. Time Fished (s)	26. Distance Fished (m)	27. Pulse Width (ms)	28. Frequency (hz)	29. Shocker Settings

ANGLING

30. Number of Anglers	31. Hours Fished per Angler

SEINE HAULS

32. Mesh Size (mm)	33. Area Sampled (m ²)

GILL NETTING

34. Date Net Set (m/d/yr)	35. Time Net Set	36. Date Net Lifted	37. Time Net Lifted	38. Mesh Size (mm)	39. Length of Net Set (m)

GILL NETTING

40. Depth of Set (m)	41. Depth of Net (m)

TRAP NETTING

42. Date Trap Set	43. Time Trap Set	44. Date Trap Lifted	45. Time Trap Lifted	46. Trap Type	47. Number of Traps

FISHERIES DATA

48. Cap. Met.	49. Sam. No.	50. Spp.	51. Fork Lgth (mm)	52. Wght (g)	53. Injuries/ Comments
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48. Cap. Met.	49. Sam. No.	50. Spp.	51. Fork Lgth (mm)	52. Wght (g)	53. Injuries/ Comments
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Cont' on page 3

48. Cap.	49. Sam.	50. Spp.	51. Fork	52. Wght	53. Injuries/
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48. Cap.	49. Sam	50. Spp.	51. Fork	52. Wght	53. Injuries/
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Met.	No.		Lgth (mm)	(g)	Comments
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Met.	No.		Lgth (mm)	(g)	Comments
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54. GENERAL FISHERIES COMMENTS