Manual of Instructions

End of Spring Trap Netting (ESTN)

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1.0 INTRODUCTION

End of Spring Trap Netting (ESTN) is a standard live release trap netting program designed to estimate the relative abundance of a fish stock, and provide other biological measures to assess the status of walleye populations in Ontario.

Fall Walleye Index Netting (FWIN) (Morgan, 2002) is the preferred standard netting procedure for monitoring Ontario walleye populations. FWIN should be used where mortality is not an issue as it samples a greater diversity of habitat (i.e. not just shoreline/littoral zone) and provides better information on the forage fish community, especially yellow perch. FWIN also allows for better age determination through the use of otoliths and can provide information on fecundity and maturity. ESTN provides a standard procedure to accommodate managers of fisheries where walleye mortality associated with gill netting is not acceptable. Fish attribute data such as age structure, growth, condition and recruitment can also be collected through ESTN, but since it is a live release method, data on maturity and fecundity are not collected.

 ESTN is an adaptation of the Nearshore Community Index Netting (NSCIN) program (Stirling, 1999) that was designed to provide trend through time information on nearshore fish communities. The ESTN method was proposed because the population density of walleye is better reflected when trap netting is completed in late spring and early summer, rather than during the NSCIN period of August and early fall (Sampling Standards and Diagnostics Working Group, Percid Synthesis, 1998). A properly conducted ESTN should, at a minimum, provide fisheries managers with abundance and biological attribute data that can be used to make relative comparisons to provincial benchmark values from other lakes in Ontario. Preliminary analysis of data from lakes studied by Quetico-Mille Lacs Fisheries Assessment Unit and Kawartha Lakes Fisheries Assessment Unit indicate that there is a strong relationship between ESTN catches and relative abundance of walleye greater than 200 mm.   Benchmarks are currently being refined and will be documented in a future Fisheries Assessment Unit report.

A successful index netting program requires stringent standardization of gear and methods in order to reduce sampling variability. This manual describes the standardized methods and provides the technical information necessary for project leaders and field crews to conduct the ESTN field program. It provides detailed sampling standards with regard to gear specifications, deployment of gear, selection of sampling locations, determination of sample size requirements, procedures for processing fish and procedures for data entry. Standard ESTN data collection techniques have been designed to be compatible with the software packages FISHNET2 and FISHNET3 provided by the Ontario Ministry of Natural Resources (OMNR). A standard ESTN data entry template is available in FISHNET3.

ESTN may not be suitable for monitoring walleye in all lakes. Lake size, littoral zone slope, and the amount of aquatic vegetation are just three factors that may limit the number of acceptable netting sites for the ESTN standard trap nets. Anyone considering this standard netting program should familiarize themselves with this manual's Gear Description (section 3.0) and Site Selection (sections 4.1 and 5.1) sections to determine if the ESTN program is suited to the lake they wish to study. Examination of a lake contour map, or an actual visit to the lake, may be required to determine whether a particular lake is suitable for assessing with this program.

2.0 SURVEY DESIGN AND METHODS

The ESTN method utilizes a random sampling design in which the individual sampling units are selected without replacement. Sampling sites should be selected in a spatially random fashion to avoid any biases in the site selection process (e.g., to avoid selecting sites that are closest to the lake's access point or sites that represent preferred habitat for a particular fish species).

Sites must not be rejected without a valid reason (e.g. water too shallow or too deep, areas with high shoreline development, impeding boat and seaplane traffic, unsuitable topography, etc.) The selection of sample sites is essentially a map exercise that is completed in the office using a random number table to select specific sites.

2.1 Sampling Methods

The basic sampling methods for ESTN are summarized in Table 1. The field survey occurs in late spring when surface waters reach 12° C and may continue until the surface temperature reaches 18°C. This temperature window allows the post-spawning redistribution of walleye from spawning sites and ensures that sampling is completed before fish leave the nearshore zone for deeper water. In most parts of Ontario, the sampling window begins in mid-May and extends to mid-June (a 4 week sampling period).

A standardized six foot spring-haul trap net (see section 3.2) is set and left to fish overnight. The duration of the set is 24 hours, acknowledging that this is a target only and some reasonable variance is acceptable. The number of sites which can be sampled in a day will depend on catch size, daily travel time to the waterbody, waterbody size, crew experience and fish sampling protocols. For a typical lake, a crew of two people should be able to lift, process the fish, and reset at least two spring-haul trap nets per day. At that rate, at least 16 random sites could be sampled in 9 consecutive working days or in 2 standard 5-day work weeks. On small lakes with low to moderate catch rates, crews could likely handle up to 4 spring-haul trap nets per day.

Table 1: Summary of methods for ESTN

Criteria	Target
Season	• Spring when surface water temperature is between 12 and 18°C
Set Duration	• 24 hours
Orientation	• $70\text{-}90^{o}$ to shoreline
Gear	• 6 foot spring haul trap net
Spatial Stratification	• Not required for all lakes. Large lakes with more than one basin or more than one fish stock may require stratification

Site, set, lift, fish catch and fish sampling information are recorded for each netting effort on standard ESTN data forms (Appendix B). The acceptable ranges of the net setting criteria (in round brackets) are also included on the forms to provide a quick reference for field crews. The required data collection for each netting effort has been selected and designed to minimize observational error and subjectivity, without requiring an inordinate amount of field collection time.

2.2 Sample Size

Sample size decisions may be influenced by a variety of factors. Practical considerations such as cost and availability of manpower or equipment, but more importantly, decisions on sample size should be linked to the survey objectives. If the objective is to test a hypothesis and statistically detect differences in abundance between years or lakes then the sample size should be chosen so that the test is performed at a reasonable level of power. Power is the probability of detecting a difference if it exists. If the objective of the survey is to obtain estimates of fish abundance at a point in time (i.e., a "snap shot"), then sample size should be dictated by a desired level of precision in estimating the mean catch. For instance, a fisheries manager may want to know if a lake fits into a "good" or "bad" category for a certain fish species, compared to other lakes in the province. Relative comparisons based on such categories usually require less precision and therefore fewer net sets than most hypothesis testing analyses. When the number of samples per lake increases, the precision level increases. Therefore, the appropriate number of samples to collect (i.e., nets to set) depends on the purpose for doing the ESTN program.

A minimum sample size of 16 sets per lake is recommended for making relative comparisons of fish abundance (i.e., comparing results to provincial benchmark categories). More sampling should be considered for relatively large lakes and spatial stratification may also be advantageous to reduce the logistical problems associated with long travel distances between sites. Based on within-year variability in catch from previous ESTN projects, 16 sets per lake will usually produce (on average) a 95% confidence interval whose total width is approximately 100% of the mean. Increasing the sample size to 20 sets per lake should produce 95% confidence intervals that are approximately 88% of the mean.

A minimum sample size of 30 sets per lake is recommended where higher precision is required (e.g., FAUs statistically testing for differences between years or lake characteristics). For high precision targets, increasing the sample size to 30 sets per lake should produce 95% confidence intervals that are approximately 70% of the mean.

In addition to the number of sets per lake, **it is recommended that ESTN be conducted on each study lake for at least 2 consecutive years.** Using the mean of two years greatly increases the chances of obtaining a mean catch value that more accurately reflects the actual population abundance, rather than a mean catch value influenced by unique weather conditions or other phenomena that occurred during only one sampling period.

3.0 GEAR DESCRIPTION

A trap net is a passive fishing device that entraps fish as a result of their own movement and subsequent reactions to the net. The net consists of two main parts, a leader, and a head. The leader, constructed of mesh netting, is designed to impede the normal movements of fish and subsequently lead fish out to the head. The head, also constructed of mesh netting, is designed to capture fish by funneling them into a box-shaped crib. The most common type of trap net used to conduct the ESTN program is a spring-haul trap net. Spring-haul refers to the method of setting the net without the use of pulleys (down-hauling), lifting the net by bringing it in over the boat, and the location of the zipper near the house end of the crib. Down-haul trap nets may also be used, but are not recommended due to the extra rigging and net handling time required. For this reason, the gear requirements and net handling methodology presented in this manual are based on the spring-haul trap net (see Figure 1).

Figure 1. Spring-Haul Trap Net

leader anchor

leader anchor line

leader identification tag

float

leader marker

leader

leader identification tag

OMNR

wing bridle

wing

heart

house

head

crib

Diagram Not Drawn To Scale

OMNR

wing marker buoy

snap hook

wing marker line

wing anchor

wing line

tunnel
(funnel shaped wall between house and crib)

zipper

flashing caution light & information message buoy

CAUTION ! OMNR RESEARCH GEAR

head identification tag

wooden brail

king marker buoy

king marker line

lift marker

lift line

OMNR

metal brail

brail line

king line

weight

toggle ring (or brail ring)

king anchor (or head anchor)

3.1 How Fish are Captured

Fish moving in the littoral zone often travel parallel to shore and lake bottom contours where they encounter the trap net leader that is set perpendicular to shore. Very small fish may pass through the mesh leader, while larger fish swim around or away from the obstacle. Other fish may actually be attracted to the net as it offers a source of cover, and some fish may be attracted to fish already trapped in the net. Eventually, some of these larger fish will encounter the heart or wing of the trap net. To follow the heart, wing or leader away from the net requires that the fish swims back towards shore. Alternatively there is a gap between the leader and

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heart. Fish that pass through the gap enter into the heart and house of the net where they may continue to move about. Due to the shape and location of the gap opening created by the trap net hearts, fish rarely encounter the gap opening at the appropriate angle to exit the net's enclosure. The funnel-shaped tunnel at the back of the house gradually leads fish into the narrow restricted end of the tunnel where there is another opening. Fish dart through the final tunnel opening and into the crib. Once trapped in the box-shaped crib, the only available escape route is the tunnel opening suspended in the middle of the crib. Due to the shape and location of the tunnel, fish following the crib walls rarely encounter the tunnel opening and rarely escape.

The entire net must be set properly for fish to successfully make the journey along the leader, through the gap, through the tunnel, and into the crib. A proper set requires that the leader is relatively straight, tight, and not twisted. The gap opening must be held open by the heart and wings that are relatively tight, at proper angles, and not twisted. The sides of the heart and house should be taut. The tunnel must be clear of obstructions and suspended in the crib. There must not be any holes in the mesh netting that will allow fish to escape from any area of the net. The net should be well secured with anchors to prevent wind and wave action from loosening the net and thus reducing its efficiency.

3.2 The Standard ESTN Trap Net

Any trap net (e.g., spring-haul or down-haul) used to conduct the ESTN program should conform to the standard set of specifications. Standard mesh sizes, colour, measurements, etc., are provided on the following two Standard Trap Net Description Forms (see Figures 2 and 3). Mesh size and colour should be identical to the ESTN standards. Net dimensions should be within at least 10 percent of the standards. If trap nets do not conform to these standards, then fishing results will not be valid for comparative purposes.

The spring-haul ESTN trap net can be constructed using either heavyweight or lightweight materials. The lightweight net is less bulky and about 18 percent lighter and may be preferred for lakes where access is more difficult (e.g., fly-in or portage access lakes) or when smaller boats are being used. The heavyweight net is likely more durable and is recommended for more severe conditions when strong winds and hard lake bottoms can result in increased net wear.

The lightweight trap net is about 10 percent cheaper to build at approximately $2250, while the heavyweight net costs approximately $2500 (as of 2003). Two net builders in Ontario that can supply these specific ESTN trap nets are:

Niagara Netting
1838 Port Robinson Road
RR#1 Port Robinson, Ontario
L0S 1K0
(905) 384-9807
Net Builder: Mr. John Radford

Superior Net and Twine Company
2095 B Paquette Road
Thunder Bay, Ontario
P7B 5E2
(807) 767-4064
Net Builder: Mr. George Sameluk

The specifications in the following Standard Trap Net Description Forms provide the information necessary to build either version:

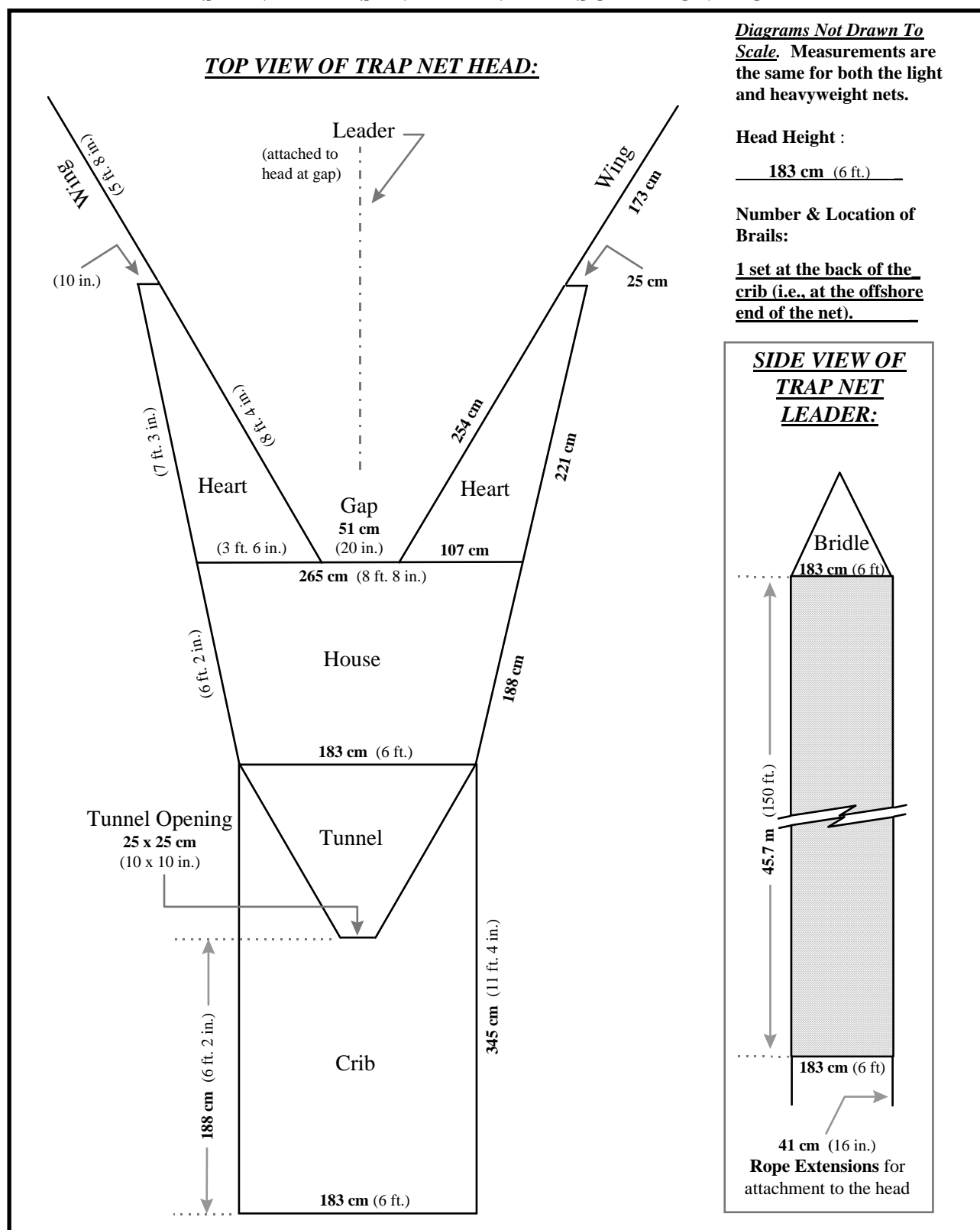**Figure 2:** Standard Specifications for ESTN Trap Nets - Form 1

THE STANDARD ESTN TRAP NET DESCRIPTION - FORM 1

FEATURES	DESCRIPTION	
	Heavyweight Trap Net	**Lightweight Trap Net**
Mesh Colour	**Black**	**Black**
Mesh Material	Polypropylene	Polypropylene
Yarn Type (knotted or knotless)	Knotted	Knotted
Twine Size		
- on leader	400-24	380-18
- on top & bottom of house & heart	400-24	380-18
- on remainder of head	400-21	380-18
Mesh Size (stretched – knot centers)		
- on leader	**6.4 cm (2 ½ in.)**	**6.4 cm (2 ½ in.)**
- on top & bottom of house & heart	**6.4 cm (2 ½ in.)**	**6.4 cm (2 ½ in.)**
- on remainder of head	**4.4 cm (1 ¾ in.)**	**4.4 cm (1 ¾ in.)**
Net Preservative	not used on polypropylene nets	not used on polypropylene nets
Line Material (rope frame & brail lines)	Black Polypropylene 3-strand twist rope 0.95 cm (3/8 in.) in diameter	Black Polypropylene 3-strand twist rope 0.95 cm (3/8 in.) in diameter
Wooden Brail	Common Two-by-Four 5 x 10 x 244 cm (1 ½ x 3 ½ x 96 in.)	Common Two-by-Four 5 x 10 x 244 cm (1 ½ x 3 ½ x 96 in.)
Metal Brail	Steel Pipe 4.5 x 244 cm (1 ¾ x 96 in.)	Steel Pipe 3.2 x 244 cm (1 ¼ x 96 in.)
Float Type*	Black Plastic Cylinder 482 g (17 oz.) buoyancy 23 x 6 cm (9 x 2 3/8 in.)	Black Plastic Cylinder 482 g (17 oz.) buoyancy 23 x 6 cm (9 x 2 3/8 in.)
Float Spacing on Leader* (centers)	spaced 3 m (10 ft.) apart	spaced 3 m (10 ft.) apart
Weight Type* (irons, leads, chains, etc.)	Cylindrical Lead Weights approx. 250 g (8.8 oz.) each	Cylindrical Lead Weights approx. 250 g (8.8 oz.) each
Weight Spacing on Leader* (centers)	spaced 81 cm (32 in.) apart	spaced 91 cm (36 in.) apart
Dry Weight (head & leader combined)	approx. 75 kg (165 lbs.)	approx. 63 kg (139 lbs.)

Construction Specifications (To ensure a well built and durable spring-haul trap net)**:**

1. Double salvage lines of black polypropylene twine must be attached around the entire perimeter of the mesh netting before attachment to the black 0.95 cm (3/8 in.) polypropylene lines.

2. Double salvage lines are to be attached to the black 0.95 cm (3/8 in.) polypropylene lines with a minimum of 3 hitches per mesh using no less than #15 black treated nylon twine or equivalent.

3. Black 0.95 cm (3/8 in.) polypropylene chafing lines are to be attached across the entire bottom of the leader and head. The chafing lines are to be attached to the 0.95 cm (3/8 in.) polypropylene lines, that the mesh was attached to in #2 above, with a minimum of 3 half hitches at every third mesh, using no less than #15 black treated nylon twine or equivalent. **NOTE:** The chafing line may be omitted on the leader of the lightweight net at the purchaser's discretion.

4. Wing and leader bridles, brails, brail lines, lift line and marker, toggle ring (brail ring), and anchor lines are to be attached, and a zipper installed at the house end of the crib, such that the net is "ready to fish."

* Features identified by asterisks are at the net builder's discretion and may be substituted with products that provide equivalent results. Float ropes or metal float cans are not recommended as substitutes for plastic floats. Steel chain is a common and acceptable substitution for weights along the leader - but may increase the total weight of the net.

NOTE: For use in ESTN - Mesh size and colour should match these standards & net dimensions should be within at least 10% of the standards found on "The Standard ESTN Trap Net Description - Form 2"

THE STANDARD ESTN TRAP NET DESCRIPTION - FORM 2

Diagrams Not Drawn To Scale. **Measurements are the same for both the light and heavyweight nets.**

Head Height :

183 cm (6 ft.)

Number & Location of Brails:

1 set at the back of the crib (i.e., at the offshore end of the net).

TOP VIEW OF TRAP NET HEAD:

Leader
(attached to head at gap)

Wing (5 ft. 8 in.)

Wing 173 cm

(10 in.)

25 cm

(7 ft. 3 in.)

(8 ft. 4 in.)

254 cm

221 cm

Heart

Heart

Gap
51 cm
(3 ft. 6 in.) (20 in.) **107 cm**

265 cm (8 ft. 8 in.)

(6 ft. 2 in.)

House

188 cm

183 cm (6 ft.)

Tunnel Opening
25 x 25 cm
(10 x 10 in.)

Tunnel

345 cm (11 ft. 4 in.)

188 cm (6 ft. 2 in.)

Crib

183 cm (6 ft.)

SIDE VIEW OF TRAP NET LEADER:

Bridle
183 cm (6 ft)

45.7 m (150 ft.)

183 cm (6 ft)

41 cm (16 in.)
Rope Extensions for attachment to the head

4.0 PRE-FIELD ACTIVITIES

Before beginning the fieldwork, the following activities should be performed to ensure that the field crew is properly prepared.
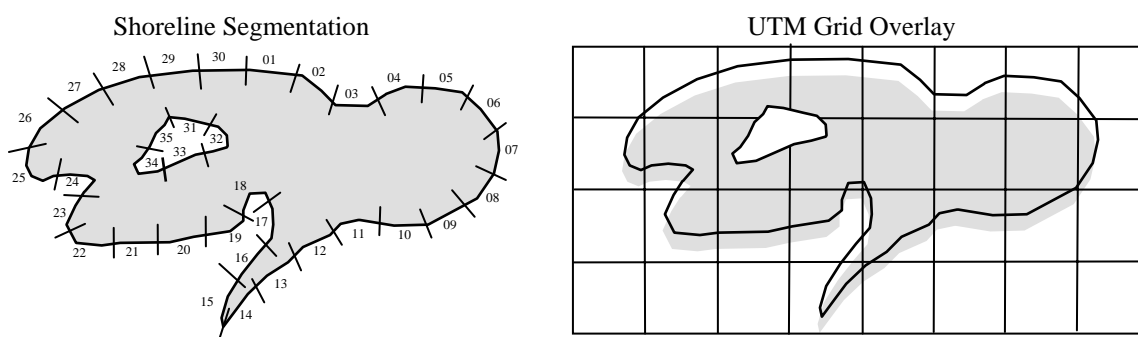
4.1 Site Selection

Prior to the random site selection process, field crews may want to visit the lake or examine lake contour maps and/or aerial photographs to eliminate littoral zone areas that are definitely not suitable for setting trap nets (see section 5.1). This technique can save the field crew a considerable amount of time, as they will not be traveling long distances to obviously unsuitable locations (e.g., too deep, too shallow, marine hazard, etc.). Be careful not to eliminate areas that are marginal, as the sampling specifications do allow some flexibility and site conditions will often vary depending on seasonal water levels and recreational activity.

The first step in the site selection process is to partition or divide the shoreline into sampling sites or units. Two common methods include dividing the shoreline into equal length segments or delineating sites based on the boundaries of Universal Transverse Mercator (UTM) grids.

The shoreline segment method requires some preparation time to measure, draw, and number the equal length segments on a lake map (see Figure 4). On large lakes, this task can be quite time consuming. The length of the segments must be determined so that there are enough segments to allow for the required number of net sets, each segment provides some leeway within the site for net placement, and the segments are at a workable scale. Common shoreline segments used on previous ESTN and NSCIN projects range from 100 to 250 metres in length.

The UTM grid system is provided on both Topographic Maps (Canada Department of Energy, Mines and Resources) and Ontario Base Maps (OMNR). The UTM grid system is geographically referenced, which can simplify the process of transferring the netting sites and associated data into a Geographic Information System (GIS). Use of UTM grids will result in netting sites of different sizes, depending on the shoreline orientation with the UTM grid system (note the different lengths of shoreline in each grid on the island in Figure 4). UTM grids are 1000 metres or 1 kilometre long on each side of the grid. The UTM grids may be divided into smaller sub-grids which are more suitable for the size of waterbody being sampled (e.g., 4 sub-grids = 500 m per side, 16 sub-grids = 250 m per side, 100 sub-grids = 100 m per side). A convenient method to divide a UTM grid is to use a clear plastic overlay sheet with the sub-grid boundaries marked on it. The grids or sub-grids that actually overlay or intersect the lake shoreline must be labeled with a numeric code and recorded on a list for the random site selection process.

Figure 4: Random Site Selection by Shoreline Segments and UTM Grid Overlay

The second step of the site selection process is to <u>randomly</u> select the appropriate number of segments or grids (or sub-grids) using a random numbers table. Randomly selected sites can then be used to prepare a sampling schedule that will direct the field crew about which sites to use on each sampling day. Remember to select more sites than the target number of net sets, as some sites may be unsuitable when visited in the field, and alternate sites may be required. Avoid selecting the same site more than once (i.e., make selection without replacement) unless the number of useable sites on your lake is severely limited. If the same site is to be used more than once, then when preparing the sampling schedule, keep in mind that **a trap net must not be reset within 500 metres of where it or any other trap net was set over the previous 48 hour period** (see section 5.1).

Project leaders should provide the field crew with copies of the lake map and sampling schedule for field use. The field crew will ultimately determine the specific netting location.

4.2 Preparation of Field Forms

Prior to the first field sampling day, crews will need to prepare enough ESTN Effort/Catch Forms, ESTN Fish Sampling Forms and ESTN Length Class Tally Forms to record their results while in the field (see sections 5.3, 5.5, and 5.7). One Effort/Catch Form, several Fish Sampling Forms and several Length Class Tally Forms will be required for each net set. Blank copies of standard ESTN forms and tips on photocopying and printing are included in the Forms Section (Appendix B).

If additional fish sampling is required (e.g., extra data for species of interest), then the appropriate paperwork for that task should also be prepared at this time. All paperwork (forms, manual, maps, schedule, scientific collectors permit, information sheets, scale envelopes, etc.) should be placed in plastic bags and sealed in a suitable storage container for protection from wind and water damage.

ESTN forms can be printed (laser printers only) or photocopied on weatherproof or waterproof paper for working in inclement weather. It is recommended that a small set of weatherproof or waterproof forms be available to the field crew for the days when such forms would be required.

4.3 Preparing a Public Information Notice

If working on a lake with extensive shoreline development, it is a good idea to prepare an Information Sheet to give to property owners and other members of the public when encountered near your sampling sites (see Figure 5). Public Information Sheets can be left on docks or between doors of residents that appear to be away for the day. These Information Sheets tend to satisfy most people's curiosity and significantly reduce the occurrence of negative reactions that can lead to net tampering or unnecessary complaints (Local Conservation Officers should also be made aware of the project).

In some cases, project leaders may want to contact local interest groups (e.g., cottage associations, First Nations, angler groups, etc.) prior to conducting the field program, to inform them about the ESTN program. A typical Information Sheet or contact letter should identify who is conducting the ESTN program, why it is being conducted, its duration, and provide a telephone number to call for more information. Be sure to mention that ESTN is a live release program.

Figure 5: Example of a Public Information Sheet

TO CHEMONG LAKE RESIDENTS AND VISITORS

The Kawartha Lakes Fisheries Assessment Unit of the Ontario Ministry of Natural Resources monitors the status of fish populations in Chemong Lake and other Kawartha Lakes. This Season, we will be collecting information on walleye, smallmouth bass, yellow perch, black crappie, and other fish species that inhabit the nearshore areas of Chemong Lake. For this purpose, live release "trap" nets will be set during the months of May and June. They extend 60m - 75m (150 to 200 feet) from the shoreline out into the water.

These nets will be moved to a new site every day and are clearly marked with a yellow flashing light and numerous orange flagged marker buoys.

The nets and sampling procedures we use are **not harmful to the fish**. The fish are measured for length and weight, aging tissue is collected, and all fish are released alive at the capture site.

It is very important for your safety and for the integrity of our programs that the nets are not disturbed. If these nets cause any inconvenience, or you have any questions or concerns about our monitoring programs, please call the Kawartha Lakes Fisheries Assessment Unit at (705) 324-2879.

4.4 Preparation of Equipment

The following gear should be assembled, checked and organized to prepare for field activities:

- Standard ESTN trap nets *(see section 3.2)*
- Trap net anchors *(5 per net - 1 king, 2 wings, 1 leader, 1 for caution/info. buoy)*
- Marker buoys *(5 to 6 per net - 1 king, 2 wings, and 2 to 3 along leader)*
- Flashing caution light and information buoy *(light used to warn boaters during poor visibility)*
- Snap hooks *(optional - to attach marker buoys &/or wing anchors)*
- Plastic cable ties *(to seal the trap net zipper)*
- Sounding line *(at least 5 m long with 0.1 m graduations)*
- Depth sounder *(optional - simplifies the site selection process)*
- Thermometer *(attach 1 m string if using a hand held model for water temperatures)*
- Tele-thermometer *(optional - excellent for water temperatures)*
- Com pass *(to measure wind direction)*
- Anemometer *(optional - provides accurate wind speeds)*
- Secchi Disc
- Dip net *(recommend a fine knotless mesh to capture small fish)*
- Fish holding tub *(fish packers, large coolers, or outboard mesh holding pens work well)*
- Pail *(recommend 10 litre plastic pails - for filling & emptying the fish tub)*
- Fish measuring board *(metric)* and measuring tape *(back-up)*
- Cotton gloves *(assists fish handling and protects hands while pulling nets and anchor lines)*
- Weigh Scales *(different capacities to cover expected range of weights - e.g. 100g,1kg,3kg,6kg)*
- Net twine *(#15 treated black nylon twine - for minor net repairs)*
- Twine shuttle (net needle) *(optional - simplifies net mending process)*
- Spare rope *(0.95 cm (3/8 in.) polypropylene 3-strand twist)*
- Spare batteries *(for caution lights, depth sounder, tele-thermometer, anemometer, etc.)*
- Knife &/or wire cutters *(to remove the plastic cable ties which seal the trap net zipper)*
- Watch
- Clipboard
- HB pencils *(recommend several pencils & a pencil sharpener)*
- ESTN Manual of Instructions
- ESTN Effort/Catch Forms *(one per net set)*
- ESTN Fish Sampling Forms *(several per net set)*
- ESTN Length Class Tally Forms *(both small and large fish sizes, several per net set)*
- Sampling schedule *(list of randomly selected trap net sites)*
- Lake map *(with trap net site boundaries, i.e., shoreline segments or UTM grids)*
- GPS Unit
- Fish identification reference key *(optional - may assist inexperienced crews)*
- Collection Techniques for Fish Ageing Structures (Mann 1992) *(optional)*
- List of user designed fish acronyms or OMNR fish species code numbers *(optional)*
- Storage box and plastic bags *(to protect forms and other gear from water damage)*
- First Aid Kit
- Boat/Outboard motor/Gasoline/Boat Safety equipment *(as appropriate for the vessel/waterbody)*
- Optional fish sampling equipment *(knives, scale envelopes, weigh bags, etc.)*
- Personal gear *(rain suit, rubber boots, sun block lotion, hat, sun glasses, lunch, etc.)*

4.5 Rigging the Trap Net

Before selecting any trap net for use in ESTN, it must be checked to ensure that it conforms to ESTN standards (these are identical to NSCIN net standards). ESTN Trap Net Description Forms (Appendix B) should be completed for each trap net and compared to the Standard ESTN Trap Net Description (see section 3.2). **Mesh size and colour should be identical to the standard ESTN trap net**. Net building is a hand craft that results in slight variations between nets, however, **all net dimensions should be within at least 10 percent of the ESTN Standard Trap Net Description**. The leader and head should each be labeled with a unique identifier to ensure that the performance of each net can be tracked and its history of use and repairs documented.

Before using the trap nets, they must be inspected for any rips or holes in the mesh. Minor repairs to the mesh and lashing can be made during the pre-field inspection using size #15 treated black nylon twine. Spring-haul trap nets should come from the supplier complete with wood and metal brails, brail lines, toggle ring (brail ring), lift line, lift marker, king line, leader bridle, wing bridles, and wing lines (see Figure 1, section 3.0). If any of these parts are missing from the net, they can be attached during the pre-field inspection using polypropylene 3-strand twist rope, 0.95 cm (3/8 in.) in diameter. Make sure the rope used on the wing lines will float when not submerged by an anchor. The polypropylene rope mentioned above is good for this purpose.

Marker buoys, snap hooks, marker lines, anchors, yellow flashing lights, information message signs or flags, identification tags, and leader markers are usually manufactured and purchased separately from the rest of the trap net (see Figure 1, section 3.0). Also, most of these items (except identification tags) are not attached to the net until it is being set in the water. The king anchor and wing anchors should be rigged prior to field use by attaching the marker lines and then wrapping the marker line around the tines of the anchor. Optional snap hooks can be rigged at this time and used in the field to attach wing anchors and marker buoys. These quick release snap hooks make attaching and removing these items faster and simpler. On large bodies of water, it may be necessary to attach a steel thimble to a braided loop in the rope where a snap hook is repeatedly attached. This will provide protection from the chafing that occurs between the metal snap hook and the rope caused by movement from wave action. An information message, identifying the net's owner, address, and contact telephone number, should be prepared in the form of a sign or flag attached to a highly visible marker buoy. To warn boaters traveling in poor visibility conditions (e.g., in fog or at night), a flashing caution light can be attached to the information message buoy. The flashing light should be pre-assembled, tested, and attached to the information buoy. On large bodies of water, the flashing light and message buoy should be rigged so it can be anchored separately, so that extensive wave action on the buoy will not affect the net set. The light sensitive switch on the flashing light can be turned off until the first day of use. Finally, the net's zipper should be closed and sealed (plastic cable ties work well) prior to packing the net for transportation to the lake. These ties prevent the zipper from coming undone accidentally and indicate if tampering has occurred.

When packing or setting a spring-haul trap net, the standard procedure is to ensure that the wooden brail is at the bottom of the bundle and is closest to the shore (i.e. "wood to shore"). This practice ensures that the head will not be accidentally set upside-down after setting the leader.

4.6 Training

This manual describes the techniques and provides the information necessary to conduct the ESTN field program. However, to successfully perform this survey, at least one of the field crew members should have the following skills and knowledge:

Safe Boat Operation

This program requires safe boating skills and knowledge to successfully maneuver the boat while setting and lifting trap nets, and to navigate between netting sites. Such tasks involve operating a vessel, often very close to shore, and often near its maximum load capacity, while coping safely with the effects of inclement weather and high waves. While setting the trap net, the boat is often reversed with the transom traveling directly into large on-shore waves which, if large enough, can swamp the boat. Therefore, extreme care, good judgment, and safe boating practices should be exercised at all times. This manual does not include safe boating instructions nor does it attempt to identify the legally required marine safety equipment.

First Aid

As with any field project, professional medical services are seldom close by. Therefore, all staff should receive first aid training before beginning their fieldwork. Likewise, all crews must carry a fully equipped first aid kit.

Knowledge of Applicable Laws

This program involves both fishing and boating activities that require knowledge of a variety of legislation. These include, but are not limited to, the Federal Fisheries Act, Fish and Wildlife Conservation Act, Canadian Boating Regulations, Trespass to Property Act, etc. Field crews should be aware of their responsibilities with issues such as a Licence to Collect Fish for Scientific Purposes, setting nets that may interfere with boat traffic, speed limits on lakes, necessary safety equipment, etc.

Fish Identification

It is essential that field crews are able to identify the fish they capture. Project leaders should take the time before fieldwork begins to ensure that the field crew can identify the fish species that are likely to be caught. A reference identification key may be a useful tool to include in the crew's field gear. If a unique species is encountered that is new to the lake or difficult to identify, then a reference sample could be collected.

5.0 FIELD PROCEDURES

These standard procedures must be followed to properly conduct the field portion of the ESTN program.

5.1 Site Selection

Use the sampling schedule and lake map prepared in section 4.1 (Site Selection) to determine where and when to set each trap net. When the predetermined random site is reached, verify that the location is suitable by observing the area for marine hazards (e.g., high traffic area, swim area, dock access, etc.). If the site is free from marine hazards, then measure the water depth at a distance offshore approximately equal to the length of the trap net leader (46m).

Use the water depth and offshore distance values to determine whether this site is a suitable sampling location as per the following ESTN criteria:

Table 2: Sampling Specifications

CRITERIA	TARGET	ACCEPTABLE
Trap Net Separation Distance	500 m (1640 ft.)	500 m (1640 ft.)
Reuse Of Trap Net Sites	no reuse of sites	after 2 nights net free
Trap Net Set Duration	24 hours	overnight (usually average ~ 22 hrs.)
Leader Length In Water	46 m (150 ft.)	30 to 46 m (100 to 150 ft.)
Leader To Shore Distance	0 m	0 to 20 m (0 to 65 ft.)
Leader Angle From Shore	90 degrees	70 to 90 degrees
Leader Start Depth	0 to 0.3 m (0 to 1 ft.)	0 to 1.0 m (0 to 3 ft.)
Water Depth At Gap	2.0 to 2.5 m (6 ½ to 8 ft.)	1.7 to 3.5 m (5 ½ to 11 ½ ft.)

Refer to the Set Description portion of section 5.3 (Information to Record at Set) for a detailed description of the last 5 net setting criteria from Table 2.

If the site is not suitable, use a predetermined method to select an alternate site. An alternate site selection method must not introduce a bias to the selection process and should be easy to execute. A common method is to assess the two adjacent sites, and if neither of these is acceptable, then go to the next closest randomly selected site that is a suitable distance away from any other sets. **A trap net must not be reset within 500 metres (1640 ft.) of where it or any other trap net was set over the previous 48 hour period (i.e., 2 nights net free).** This is to eliminate over-fishing an area by providing at least a 2 net-night break from sampling the same lake area.

5.2 Setting the Net

1)   Survey the site to ensure that you are aware of all obstacles that may affect the trap net set. Estimate 46 metres (150 ft.) offshore and measure the water depth there with a graduated sounding line or depth sounder to determine a suitable placement for the trap net gap. Use the offshore distance and water depth measurement to develop a net setting plan which will ensure that the trap net will be set within the acceptable ESTN sampling specifications, and as close to the target specifications as possible (see section 5.1).

2)   For a new set, with the spring-haul trap net laying "wood to shore" across the bow of the boat, untie the rope that was used to pack the net bundle during transportation and use this rope to attach the leader anchor to the shore end of the leader. If resetting, the leader anchor will still be attached from the previous set. To reset, the trap net does not have to be orientated across the bow, but rather it can be reset out over the side of the boat (the reverse of how it was retrieved).

3)   Set the leader anchor as close to shore as possible so that the gap will be located within the acceptable depth range. Set the leader by reversing the boat away from shore while maintaining a course that is as close to perpendicular from shore as possible. Guide the leader material out to ensure that it does not get twisted, tangled, or snagged on the

boat. In some cases, the leader can be tied directly to a tree or stump along the shoreline (this should only be practiced on Crown Land).

4)   Once the leader is set, check the water depth before setting the wings to ensure that the gap will indeed be set within the acceptable depth range. If the depth is unacceptable, retrieve the leader and adjust the leader anchor accordingly. If the depth looks good, throw the wings out on their appropriate sides of the leader and as far out as possible to avoid any chance of tangling. Ensure that the wing lines are floating freely as they must be retrieved later in the net setting process.

5)   Continue to reverse the boat while letting out the remainder of the trap net head. When it is time to let out the brails, make sure the brail lines are free from tangles and not looped around the ends of the brails. While holding the four brail lines, this is a good time to double check that the zipper is closed and sealed. If all looks good (i.e., no tangles, zipper sealed), ease the brails into the water and grasp the king line.

6)   If the lake bottom is rough and not conducive to allowing the head to slide along the bottom, this is a good time to carefully pull the net tight in a straight line, while the head is being pulled up off the lake bottom. Carefully use the power of the reversing boat in combination with a few strong arm pulls to achieve a taut set.

7)   With the king line in hand, double check that the king line knot at the toggle ring (brail ring) is secure, and throw out the lift marker and line ensuring that it is not tangled (this marker must be floating for future retrieval). If setting the net for the first time (i.e., not resetting) - then this is a good time to attach the king anchor to the offshore end of the king line. A clove hitch with a locking half hitch is recommended for securing the king anchor. Attach the king marker buoy to the king marker line with a secure knot or optional snap hook and unravel the marker line from the tines of the king anchor so that the whole rig can be deployed without any interruptions.

8)   While maintaining some tension on the king line, continue to reverse the boat and let the king line out. When you reach the king anchor, **carefully** pull the entire net tight so that the leader float line, head center line, and king line all form one long straight line.

NOTE: On some boats, this pulling can be done by hooking the anchor tines inside the front bow and letting the carefully controlled reversing boat motor do the work (be prepared to release the anchor by lifting the king marker line). Otherwise, the crew member will have to hold the anchor while their partner carefully reverses the boat. When using a low powered motor, the reverse thrust can be improved by surging the boat back and forth. With a firm grip on the anchor and your feet well planted, while the boat motor is thrusting backwards, pull the anchor towards you about an arms length, and then relax letting the motor surge backward with the slack rope you created, until the rope pulls tight again. Continue this procedure until the net is tight and straight. **Be careful**, because this surging technique requires sure footing, good balance, and a strong back. Boat drivers must always pay close attention to the net setter and be prepared to quickly reduce the amount of reverse thrust.

9)   When the net is tight and straight, continue to slowly reverse while letting the anchor sink to the bottom by carefully letting out the king marker line. Ensure that the king anchor does not get flipped upside-down while being lowered if you are using one-sided anchors. When the anchor hits bottom, give it a couple of tugs to drag it back along the

bottom as far as possible before releasing the marker line with the marker buoy attached.

> **NOTE:** If the reverse tugging method does not result in a tight set, then the king line may be tightened at the toggle ring (brail ring) by dragging the anchor towards the net, so that the anchor tines will dig in or get caught on something. This method is sometimes necessary in lakes with extremely soft or hard bottoms (i.e., the anchor tines fail to dig into the substrate or the substrate is not stable enough to hold the tines). Be careful not to lift the toggle ring (brail ring) too high when untying the king line knot. Pull the king line through the toggle ring (brail ring) until the net is tight and then re-tie the king line. Be careful not to drag the king anchor too close to the net. Long king lines are usually more helpful in poor anchoring conditions.

10)   While traveling to the wing line, prepare a wing anchor by unraveling the marker line from the anchor's tines and attach the marker buoy with a secure knot or snap hook.

11)   Retrieve one of the floating wing lines with the boat orientated so that you can reverse away from the gap/wing area at about a 45° angle towards shore and away from the leader (i.e., extend the wing away from the net). Pull the wing line and wing mesh to the water's surface and ensure that the wing is not twisted or tangled. Attach the wing anchor to the wing line using either a clove hitch with a locking half hitch or a large, heavy load snap hook.

12)   Reverse away from the net while lowering the wing anchor with the marker line so that the anchor is dragged along bottom until the wing is snug. Ensure that the anchor does not get flipped upside-down and be careful not to over pull as it can sometimes pull the head out of shape and cause a slack leader.

13)   Repeat steps 10 to 12 for the other wing.

14)   Carefully approach the net near the gap to verify that the net is properly set. Ensure that the leader is not slack or bowed. The wings should be tight and at the correct angles so that the gap opening is not restricted. The house and crib should form a box that is not collapsed or slack on any side. If adjustments are required, the leader and head can usually be straightened and/or tightened by pulling the king marker line and resetting the king anchor. A wing can be adjusted by simply dragging the wing anchor to the correct location by pulling on the wing marker buoy.

15)   The trap net can now be classified as set and fishing. Note the set time. While at the gap, accurately measure the water depth with a graduated hand line. Continue by attaching or setting any extra markers (i.e., leader markers and flashing caution light with information message) and then measure, observe, and record the appropriate net set information (see section 5.3).

5.3 Information to Record at Set

Net set information is recorded with an HB pencil on the standard ESTN Effort/Catch Form (see Figure 6). For each trap net sampling effort, one Effort/Catch Form is completed to document site location, set description, lift data, fish catch summary, and comments. The first part of this form is filled out at the time of the set. The remainder of the form is used on the following day to record the lift and catch data. All fields are mandatory except for substrate and cover data.

The set information should be completed on the ESTN Effort/Catch Form as follows:

Site Description → These 13 fields identify which net was set, and where.

Project Code

Record the unique project code that has been assigned to your ESTN project. Project codes are created by combining the Fisheries Office acronym, the Project Type acronym (IA for index adult with ESTN) with the Year, and the user defined Project Identification code or acronym (e.g. *KLA_IA02_CH1*).

Waterbody Name

Record the official name of the waterbody in which the trap net was set (e.g., *CHEMONG LAKE*).

UTM or Lat/Long Coordinates

Record the location of the net in UTM coordinates or in Latitude and Longitude.

TN Head Tag id #

Record the trap net head identification tag number or code that specifies which net head was set (e.g., *TP-05*).

TN Leader Tag id #

Record the trap net leader identification tag number or code that specifies which leader is attached to the trap net head (e.g., *06*).

Sample #

Record the sequential fishing effort number that refers to each particular net set (i.e., the first set of the project would be Sample # *001,* and the next set would be Sample # *002*).

Area #

Record the number or code (field length equals 2 characters) used to define the area of the waterbody (e.g., sector *03*). This field is usually only used on large lakes that are spatially stratified. If the waterbody is not spatially stratified, record *N/A* to indicate that this field is "not applicable" to this project.

Grid #

If using the UTM grid method of shoreline partitioning, record the UTM reference number used to identify the specific geographic location of the netting site (e.g., *0802*). If not using the UTM grid method, record *N/A* to indicate that this field is "not applicable" to this project.

Site #

If using the shoreline segment method of shoreline partitioning, record the segment number used to identify the specific geographic location of the netting site (e.g., *16*).

If using the UTM grid method of shoreline partitioning, this field can be used to record a sub-grid location within the larger UTM grid reference number recorded in the above Grid # field (e.g., *C13*). If using the UTM grid method without any sub-grids, then this field may not be applicable. Record *N/A* if Site # is "not applicable" to your project.

Site Type (optional)

Record the substrate code and cover code that best describe the lake bottom materials and availability of fish cover for the <u>visible</u> area 100 m (328 ft.) on each side of the net. If water clarity is limited so that you can not see the lake bottom out to the depth of the trap net gap, then describe the site based on the limited observations available in shallow water and/or use terrestrial indicators (e.g., emergent vegetation, shoreline substrate, etc.). **Note any limited visibility situations in the Comments section of the Effort/Catch Form**. Use the following Site Type – General Substrate codes and Site Type – Fish Cover Level codes as found on the Effort/Catch Form to categorize the area in which the trap net is fishing:

<u>Site Type – General Substrate codes:</u>

1 = gravel/pebble/sand mix	At least 75% of the area must be represented by a combination of gravel/pebble <u>and</u> sand mixed together. If sand alone makes up more than 75% of the area substrate, then use code number 3 (sand).
2 = boulder/rubble/cobble mix	At least 75% of the area must be represented by boulder <u>or</u> rubble/cobble <u>or</u> any combination of these two substrate types.
3 = sand	At least 75% of the area must be represented by sand substrate only.
4 = soft mix	At least 75% of the area must be represented by silt <u>or</u> muck <u>or</u> detritus <u>or</u> soft clay <u>or</u> any combination of these four substrate types.
5 = bedrock	At least 75% of the area must be represented by bedrock substrate only.
6 = other	At least 75% of the area must be represented by a substrate type <u>or</u> a combination of substrate types that do <u>not</u> fit into any of the above five categories (e.g., > 75% marl <u>or</u> 30% bedrock & 30% sand & 40% muck).

1 = no cover		The area does not provide any cover for fish.
2 = low		1 to 25% of the area provides cover for fish.
3 = moderate		25 to 75% of the area provides cover for fish.
4 = high		More than 75% of the area provides cover for fish.

Bottom Type (optional)

Record a list of all the substrate types identified within the visible area 100 m (328 ft.) on each side of the net. If water clarity is limited such that you can not see the lake bottom out to the depth of the trap net gap, then describe the site based on the limited observations available in the shallow water and/or use terrestrial indicators (e.g., emergent vegetation, shoreline substrate, etc.). **Note any limited visibility situations in the Comments section of the Effort/Catch Form**. The following substrate descriptions have been taken from the OMNR Manual of Instructions for Aquatic Habitat Inventory Surveys (OMNR 1987) and expanded for quick, effective field assessment. Use the following substrate acronyms as found on the ESTN Effort/Catch Form to record the substrate composition:

Substrate Acronyms:

BR = bedrock	Exposed bedrock with no overburden (i.e., solid bedrock, not individual rocks).
BO = boulder	Large rocks estimated to be over 25 cm (10 in.) in diameter. Visualize rocks larger than volleyballs.
RC = rubble/cobble	Stones estimated to be 8 to 25 cm (3 to 10 in.) in diameter. Visualize stones ranging in size from tennis balls to volley balls.
GP = gravel/pebble	Small stones estimated to be 0.2 to 8 cm (1/12 to 3 in.) in diameter. Visualize stones smaller than tennis balls.
SA = sand	A grit like material of crystalline rock origin estimated to be less than 0.2 cm (1/12 in.) in diameter, but large enough to be palpable as grit. Sand feels gritty and settles quickly in water.
SI = silt	A fine inorganic material of various origins, but not palpable as grit and without a greasy or sticky feel. Silt is like a very fine powder, almost impossible to mold or feel in the water, but when dried it has a floury feel. Silt is easily stirred-up in the water where it remains suspended for a considerable length of time.
CL = clay	A very fine material of inorganic origin with a greasy or sticky feel and often a moldable plasticity.
MU = muck	A soft material consisting of well-decomposed organic matter intermixed with mineral matter such as silt and clay, but not sand or gravel. Muck is

	dark in colour, often gaseous, and feels like a very soft mud.
DE = detritus	An organic material in which large pieces of sticks, leaves, decaying aquatic plants, etc. form <u>at least 85%</u> of the total mass. Detritus is like partly decayed compost.
MA = marl	A calcareous material composed principally of carbonates derived from mollusc shells and the photosynthetic activity of algae. It is primarily light grey in colour. It is not a widely distributed substrate type.

Fish Cover Type (optional)

Record a list to describe <u>all</u> the cover types identified within the <u>visible</u> area 100 m (328 ft.) on each side of the net. If water clarity is limited such that you can not see the lake bottom out to the depth of the trap net gap, then describe the site based on the limited observations available in the shallow water and/or use terrestrial indicators (e.g., emergent vegetation, shoreline substrate, etc.). **Note any limited visibility situations in the Comments section of the Effort/Catch Form**. The following list of cover types has been taken from the Stream Surveys section of the OMNR Manual of Instructions for Aquatic Habitat Inventory Surveys (OMNR 1987). Only those cover types that apply to lake habitat, and the size of fish captured by the trap nets, have been included. Use the following cover acronyms as found on the ESTN Effort/Catch Form to record the cover description. If any cover types fit into the "other" category, be sure to describe those cover types in the Comments section of the form.

BO = boulder	If boulders (see substrate composition) are large enough and distributed such that they provide cover to fish, include "BO" in Fish Cover Type.
MA = macrophytes	If aquatic vegetation is large enough and distributed such that it provides cover to fish, include "MA" in Fish Cover Type.
LT = log/tree	If fallen trees, logs, stumps, and large branches that are sunken or floating are providing cover for fish, include "LT" in Fish Cover Type. Old logs that are partially buried in the substrate are not included unless they offer cover to fish.
UB = undercut bank	If there is an undercut bank that could provide cover for fish, include "UB" in Fish Cover Type.
OD = organic debris	If organic debris (other than logs and trees) is large enough and distributed such that it provides cover to fish, include "OD" in Fish Cover Type.
OT = other	If any other type of structure provides cover for fish (e.g., docks, rafts, boathouses, overhanging terrestrial vegetation, abandon cribs, etc.), then **that specific cover type should be described and recorded.** Enter "OT" in Fish Cover Type and use the Comments field to describe the other cover types.

NC = no cover	If there are no cover types in the area, record "NC" to confirm your observation.

Set Description → These 9 fields describe who set the net, when, and how.

Net Set Crew

Record the names or initials of the field crew members that set the net (e.g., *C. McCauley & G. Cimbura*).

Set Date

Record numerically the date that the trap net was set, in the order <u>year, month, day</u> (i.e., May 20, 2002 would be recorded as *02-05-20*).

Set Time

Record the time that the trap net **began fishing** to the nearest ¼ hour (15 minutes) on the 24 hour clock (i.e., 2:15 p.m. would be recorded as *14:15 hrs.*). This time is noted after both wings have been anchored and the net has been checked at the gap to verify that it is indeed properly set (see section 5.2, step #15).

Leader Length

Record the length of leader that was set in the water to the nearest metre. Ideally, it is best to use the entire length of leader. If absolutely necessary, up to 16 metres (52 ft.) of leader can be piled on shore in situations where there is a significant lack of ideal sites. If less than the full 46 metre (150 ft.) leader was used, calculate the length of leader used by subtracting the estimated length of leader piled on shore from the full leader length (i.e., if 6 metres of leader is not used, then the leader length would be 46 minus 6 and recorded as *40 m*).

Dist. Off Shore

Record the estimated distance between the shore and the start (shore end) of the leader to the nearest metre. Short distances less than 1 metre should be recorded to the nearest 0.1 metre (e.g., *0.4 m*). Ideally, it is best to start the leader at the shoreline. To accommodate shallow netting areas, the start (shore end) of the leader can be set up to 20 metres (65 ft.) off shore provided that it starts in an acceptable depth of water (see Start Depth).

Angle To Shore

Record the estimated angle between the leader and the shoreline in degrees (e.g., *90°*). The objective is to set the leader so that it intersects the bottom contours at right angles. To accommodate irregular shorelines, deep, or windy netting areas, the leader can be set up to 20° off perpendicular to shore, making the acceptable range 70° to 90° from shore.

Start Depth

Record the water depth at the start (shore end) of the leader to the nearest 0.1 metre (e.g., *0.3 m*). Ideally, it is best to start the leader at the shoreline. To accommodate

steep shorelines (small cliff edges) and off-shore sets, the start (shore end) of the leader can be set in depths up to 1.0 metre (3.3 ft.).

Mid Depth

Record the water depth mid way along the length of the leader to the nearest 0.1 metre (e.g., *1.5 m*). There is no target or acceptable depth specifications for this measurement. However, crews should avoid setting in areas where the leader drops into a deep hole or runs up over a very shallow shoal, even though the start depth and gap depth are within acceptable ranges.

Gap Depth

Record the measured water depth at the gap of the trap net to the nearest 0.1 metre (e.g., *2.4 m*). Ideally, the gap should be set in 2.0 to 2.5 metres (6 ½ to 8 ft.) of water. To accommodate more variable sites, the gap can be set in 1.7 to 3.5 metres (5 ½ to 11 ½ ft.) of water. An efficient ESTN trap net set should be in water deep enough to allow the head to be fully expanded, but less than twice the height of the head.

Comments→ This field is used to document any useful descriptions or additional information.

Crews should provide any information that may help to explain the uniqueness of a site, the net set, or events that took place while netting at this location (e.g., *Met adjacent property owners and gave them our Public Information Sheet*).

Figure 6: Information Recorded at Set on the ESTN Effort/Catch Form

ESTN - Effort/Catch Form

SITE DESCRIPTION

Project Code	Waterbody Name	UTM or Lat/Long Coordinates	TN Head Tag id #	TN Leader Tag id #	Sample #
KLA_IA02_CH1	Chemong Lake	17 – 706632 - 4917024	TP-05	06	007

Area #	Grid #	Site #	Site Type (substrate)[1]	Site Type (fish cover)[2]	Bottom Type[3] (all types 100 m each side of net)	Fish Cover Type[4] (all types 100 m each side of net)
N/A	N/A	16	4	3	MU, SI, BO	Some MA, a few BO, 2 pipe docks

SET DESCRIPTION (recorded at time of set)

Net Set Crew	Set Date (yy.mm.dd)	Set Time (24hh:mm)	Leader Length (30 - 46 m)	Dist. Off Shore (0 - 20 m)	Angle to Shore (70° - 90°)	Start Depth (m)	Mid Depth (m)	Gap Depth (1.7 - 3.5 m)
C. McCauley G. Cimbura	02-05-20	14:15	40.0	0.4m	90	0.3m	1.5m	2.4m

LIFT DESCRIPTION (recorded at time of lift)

Net Lift Crew	Lift Date (yy.mm.dd)	Lift Time (24hh:mm)	Effort Status[5]	Duration (fishing hours)	Water Temp (°C)	Secchi Depth (m)	Cloud Cover (in eighths)	Precip. Type[6] (codes 00-95)	Wind Direction (1-360°)	Speed (in knots)

General Weather Through Set	
Precipitation[7]	Surface Conditions[8]

FISH CATCH SUMMARY

Species/ Group	Total Catch	# Counted Only	# Length Tallied	# Biosampled	# Marks/Tags Applied	# Marks/Tags Recaptured

COMMENTS

Met adjacent property owners and gave them our info. sheet.

_____

_____

_____

Fish sampling data: Form(s) _____ Scale envelope(s): _____ Length Tallies: _____

[1]**Site Type – General Substrate codes:**
1=gravel/pebble/sand mix (GP+SA >75%);
2=boulder/rubble/cobble mix (BO+RC >75%);
3= sand (SA >75%);
4=soft mix (SI+MU+DE+ soft CL>75%);
5= bedrock (BE >75%);
6 =other

[2]**Site Type – Fish Cover Level codes:**
1=no cover; 2=low (1-25%);
3=moderate (25-75%); 4=high (>75%);

[3]**Bottom Type codes:**
BR = bedrock; BO=boulder;
RC= rubble/cobble; GP=gravel/pebble;
SA=sand; SI=silt; CL=clay; MU=muck;
DE=detritus; MA=marl

[4]**Fish Cover Type codes:**
BO=boulders; MA=macrophytes;
LT=log/tree; UB=undercut bank;
OD=organic debris; OT=other;
NC=no cover

[5]**Effort Status codes:**
1=no problem; 2= minor problem;
3=major problem

[6]**Precip. Type codes:**
00=no precipitation at lift time; 10=mist;
40=fog; 61=light rain; 65=heavy rain;
71=light snow; 75=heavy snow;
95=thunderstorm

[7]**Precipitation Through Set codes:**
1=no precip. during set;
2= <4 hrs. of precip.;
3= >4 hrs. of precip.;
4= constant precip.
9=unknown

[8]**Surface Conditions Through Set codes:**
1=calm waters for entire set duration;
2=mostly calm waters & some rough;
3=mostly rough waters & some calm;
4= rough waters for entire set duration;
9=unknown

5.4 Lifting the Net

1) To lift the spring-haul trap net for fish removal, approach the lift marker at a 90° angle to the king line and retrieve the lift marker. Using the lift line, bring the brail lines and king line up and over the bow of the boat and slide the lines back until they are across the boat amidship.

2) Turn the outboard motor off, note the lift time and status of the net set. With a person on each side of the brail lines, pull the boat sideways towards the brails. Continue to pull the boat toward the zipper by lifting the brails up across the boat and over the other side.

    NOTE: Keep the net up high enough to allow fish to slide back towards the zipper side of the net. Do not allow any fish to cross over to the other side of the boat.

3) Continue pulling the net over the boat until the net's zipper is accessible alongside the gunwale. At this point the fish should be concentrated in a bag of netting formed by the wall separating the house and crib (tunnel netting) and the crib floor which has been pulled up over the boat. This will work as a holding pen while you remove the catch for processing.

    NOTE: Only fish that were captured by passing through the tunnel and into the crib can be considered part of the catch. Other improperly caught fish (e.g., trapped in hearts, gilled in leader, etc.) are not considered as part of the catch.

4) Prepare a fish holding tub with fresh lake water. Remove the zipper seal (plastic cable tie) and open the zipper. Use a dip net to remove as many fish as can be readily processed and place them in the holding tub.

    NOTE: The tunnel mesh is usually over the top of the fish in the middle of the bagged holding pen area. This tunnel tends to interfere with the dip netting process. Therefore, the mesh of the tunnel will often need to be pulled off to one side, to create a large enough area to scoop up the fish with the dip net.

    If the fish that remain in the trap net are stressed due to overcrowding (common with large catches or high sided boats), then close the zipper and lower the trap net further into the water by simply sliding the net back over the nearshore side of the boat. Keep the net up over the boat so that the tunnel opening is out of the water to prevent any fish from entering or exiting the crib. Some crews prefer to remove all the fish at once and place them in a large mesh holding pen alongside the boat.

5) Record the appropriate net lift information (see section 5.5) and sample the catch (see sections 5.6 and 5.7).

6) After the fish have been removed from the crib of the net, pull the remainder of the crib into the boat to verify that all the fish have been removed. Close the zipper and seal it (plastic cable ties work well) in preparation for the next sampling occasion.

    NOTE: If you want to leave this net where it is, but you do not want it to continue fishing, then the tunnel can be sealed off. This technique is valuable when the net must be abandoned due to severely inclement weather. To seal off the tunnel, simply tie a rope tightly around the tunnel, which is accessible through

the zipper opening. A method that does not require breaking the zipper seal, is
to wrap a rope around the entire house area and cinch it tight.

7)   When you are ready to remove the trap net from this site, return the net to the water by
simply sliding the net off over the bow of the boat. Begin removing the net immediately
as otherwise it will begin to catch fish again (see section 5.8).

5.5 Information to Record at Lift

Net lift information is recorded at the time of lift on the ESTN Effort/Catch Form (see Figure 7).
The first part of this form was filled out when the net was set on the previous day. The same
form is required on lift day to complete the lift data and fish catch summary sections. The lift
data section should be completed as follows:

Lift Data → These 13 fields describe who lifted the net, when, and under what conditions.

Net Lift Crew

Record the names or initials of the field crew members that lifted the net (e.g., *C.
McCauley & G. Cimbura*).

Lift Date

Record numerically the date that the trap net was lifted, in the order <u>year, month, day</u>
(i.e., May 21, 2002 would be recorded as *02-05-21*).

Lift Time

Record the time that the trap net was lifted to the nearest ¼ hour (15 minutes) on the
24 hour clock (i.e., 1:30 p.m. would be recorded as *13:30 hrs.*). This time is noted after
the net has been lifted and before the fish are processed (see section 5.4, step #2).

Effort Status

Record the condition of the set as per the codes found on the ESTN Effort/Catch Form:

<u>Effort Status Codes:</u>

1 = no problem	i.e., the net fished properly.
2 = minor problem, likely OK	e.g., small log drifted into the leader.
3 = major problem, affected catch	e.g., the net was tampered with.

NOTE: If codes 2 or 3 are used, record an explanation in the Comments section.

Duration

Calculate and record the total duration that the trap net was fishing in hours (e.g., the
number of hours that passed from the set time of 14:15 hrs. until the lift time of 13:30
hrs. equals *23.25 hrs.*). At the project leader's discretion, the Duration field on the ESTN
Effort/Catch Form can be completed at the time of the lift, or at another more convenient
time (e.g., at the end of the day, at the end of the field program, or during the computer
data entry process). FISHNET3 calculates this field automatically.

Water Temp.

Record the surface water temperature in degrees Celsius as measured with a thermometer or tele-thermometer, at the time of lift, beside the trap net, and at a depth of 0.3 to 0.5 metres (1 to 1 ½ ft.).

Secchi Depth

Measure and record the secchi depth to the nearest 0.1 metre.

Cloud Cover

Record the estimated fraction of the sky, in eighths, that is covered by cloud at the time of the lift - as per the following descriptions:

0 = sky is clear (no clouds)	**5 = 5/8 of sky is covered by cloud**
1 = 1/8 of sky is covered by cloud	**6 = 6/8 of sky is covered by cloud**
2 = 2/8 of sky is covered by cloud	**7 = 7/8 of sky is covered by cloud**
3 = 3/8 of sky is covered by cloud	**8 = sky is totally covered by cloud**
4 = 4/8 of sky is covered by cloud	**9 = sky obscured by fog, snow, etc.** (cloud cover cannot be estimated)

Precip. Type

Record the type of precipitation, fog, or mist, occurring at the time of lift, as per the following codes found on the ESTN Effort/Catch Form:

Precip. Type Codes (at lift):

00 = none	**61 = light rain**	**75 = heavy snow**
10 = mist	**65 = heavy rain**	**95 = thunderstorm**
40 = fog	**71 = light snow**	

Wind Direction & Speed

Record the wind direction, expressed in degrees, and the wind speed, expressed in knots, at the time of lift. Use a compass to measure the direction that the wind is coming from. Record the wind direction to the nearest degree (e.g., a wind originating slightly south of due west may be measured and recorded as *264°*). While measuring the wind direction, estimate (or measure with an anemometer) the velocity of the wind. Record the wind speed to the nearest knot (e.g., *7 knots*). A knot equals one nautical mile per hour, or 1.9 kilometres per hour (1.2 mph).

General Weather for Set Duration

Use the following Precipitation and Surface Conditions Through Set codes as found on the ESTN Effort/Catch Form to document the weather that occurred at the trap net site over the duration of the net set:

Precipitation Through Set codes:

1 = no precipitation occurred during the entire set duration

2 = precipitation occurred for less than 4 hours during the set

3 = precipitation occurred for more than 4 hours during the set

4 = constant precipitation during the entire set duration

9 = unknown

Surface Conditions Through Set codes:

1 = calm waters (wave height < 0.3 metres) for the entire set duration

2 = mostly calm waters with some rough periods during the set duration

3 = mostly rough waters with some calm periods during the set duration

4 = rough waters (wave height > 0.3 metres) for the entire set duration

9 = unknown

Comments → This field is again used to document any useful descriptions or information.

Crews should provide any information that may help to explain the uniqueness of the net set (e.g., *Leader slightly bowed at lift because a few small logs drifted into it).*

Figure 7. Information Recorded at Lift on the ESTN Effort/Catch Form

ESTN - Effort/Catch Form

SITE DESCRIPTION

Project Code	Waterbody Name	UTM or Lat/Long Coordinates	TN Head Tag id #	TN Leader Tag id #	Sample #
KLA_IA02_CH1	Chemong Lake	17 – 706632 – 4917024	TP-05	06	007

Area #	Grid #	Site #	Site Type (substrate)[1]	Site Type (fish cover)[2]	Bottom Type[3] (all types 100 m each side of net)	Fish Cover Type[4] (all types 100 m each side of net)
N/A	N/A	16	4	3	MU, SI, BO	Some MA, a few BO, 2 pipe docks

SET DESCRIPTION (recorded at time of set)

Net Set Crew	Set Date (yy.mm.dd)	Set Time (24hh:mm)	Leader Length (30 - 46 m)	Dist. Off Shore (0 - 20 m)	Angle to Shore (70° - 90°)	Start Depth (m)	Mid Depth (m)	Gap Depth (1.7 - 3.5 m)
C. McCauley G. Cimbura	02-05-20	14:15	40.0	0.4m	90	0.3m	1.5m	2.4m

LIFT DESCRIPTION (recorded at time of lift)

Net Lift Crew	Lift Date (yy.mm.dd)	Lift Time (24hh:mm)	Effort Status[5]	Duration (fishing hours)	Water Temp (°C)	Secchi Depth (m)	Cloud Cover (in eighths)	Precip. Type[6] (codes 00-95)	Wind Direction (1-360°)	Speed (in knots)
C. McCauley G. Cimbura	02-05-21	13:30	2	23.25	15.1	2.6	2	61	264	7

General Weather Through Set	
Precipitation[7]	Surface Conditions[8]
2	2

FISH CATCH SUMMARY

Species/ Group	Total Catch	# Counted Only	# Length Tallied	# Biosampled	# Marks/Tags Applied	# Marks/Tags Recaptured

COMMENTS

Met adjacent property owners and gave them our info. sheet.

Leader slightly bowed at lift because a few logs drifted into it.

Fish sampling data: Form(s) _____ Scale envelope(s): _____ Length Tallies: _____

[1]**Site Type – General Substrate codes:**
1=gravel/pebble/sand mix (GP+SA >75%);
2=boulder/rubble/cobble mix (BO+RC >75%);
3= sand (SA >75%);
4=soft mix (SI+MU+DE+ soft CL>75%);
5= bedrock (BE >75%);
6 =other

[2]**Site Type – Fish Cover Level codes:**
1=no cover; 2=low (1-25%);
3=moderate (25-75%); 4=high (>75%);

[3]**Bottom Type codes:**
BR = bedrock; BO=boulder;
RC=rubble/cobble; GP=gravel/pebble;
SA=sand; SI=silt; CL=clay; MU=muck;
DE=detritus; MA=marl

[4]**Fish Cover Type codes:**
BO=boulders; MA=macrophytes;
LT=log/tree; UB=undercut bank;
OD=organic debris; OT=other;
NC=no cover

[5]**Effort Status codes:**
1=no problem; 2= minor problem;
3=major problem

[6]**Precip. Type codes:**
00=no precipitation at lift time; 10=mist;
40=fog; 61=light rain; 65=heavy rain;
71=light snow; 75=heavy snow;
95=thunderstorm

[7]**Precipitation Through Set codes:**
1=no precip. during set;
2= <4 hrs. of precip.;
3= >4 hrs. of precip.;
4= constant precip.
9=unknown

[8]**Surface Conditions Through Set codes:**
1=calm waters for entire set duration;
2=mostly calm waters & some rough;
3=mostly rough waters & some calm;
4= rough waters for entire set duration;
9=unknown

5.6 Fish Sampling

A number of biological attributes can be collected from fish. A minimum requirement for ESTN surveys is that all walleye be completely sampled and all other species should be sampled for total and fork length. Complete sampling of all species is preferred, but time constraints and study objectives may dictate the extent to which sampling should be done for species other than walleye. If catches are exceedingly large, species of interest (other than walleye) may be selected for bio-sampling based on size-stratification by fork length.

For walleye and other species of interest, the following are to be collected: fork length, total length, round weight and aging structures. In addition to a scale sample, one other aging structure (except for northern pike and muskellunge) must be collected (Table 3).

For the remaining species, total length and fork length should be measured, unless the catch size is deemed too large, in which case 1cm size bins (based on fork length) will be used to provide a length class tally. Collection of aging structures from these species is optional. Refer to the OMNR Northwest Region Science and Technology Technical Report #73 for guidance on what structures should be collected for aging other species (Mann 1992).

Table 3: Structures to be collected for aging purposes.

Species	Age Structures
Walleye	Scales and first 3 dorsal spines
Northern Pike/Muskellunge	Scales
Bass/Other Centrarchids	Scales and first 3 dorsal spines
Lake Trout, Other Salmonids, Whitefish and Other Coregonids	Scales and first 4 marginal pectoral fin rays
Others	See Mann 1992 for guidance

1)   A crew of two people can sample the fish. Designate one person as the data recorder and another person as the fish handler.

2)   The data recorder initiates the fish sampling process by completing the header on the ESTN Fish Sampling and ESTN Length Tally Forms. Record the Waterbody, Lift Date, Net Location, and Sample # as they correspond to the information on the ESTN Effort/Catch Form for that set (see section 5.7).

3)   Look in the fish holding tub or holding pen to identify the majority of the species caught. Use this information to set-up the ESTN Length Class Tally Forms (if applicable) by recording an appropriate species acronym or species number code at the top of each Species column (see section 5.7).

4)   The fish handler should select a fish from the fish holding tub or holding pen, identify the fish species, and call out the species name to the data recorder.

5)   Place that fish on the measuring board so that the snout is snug against the zero end of the board and the fish is laying flat across the graduated ruler (see Figure 8).

Figure 8: Measuring the Fork and Total Lengths
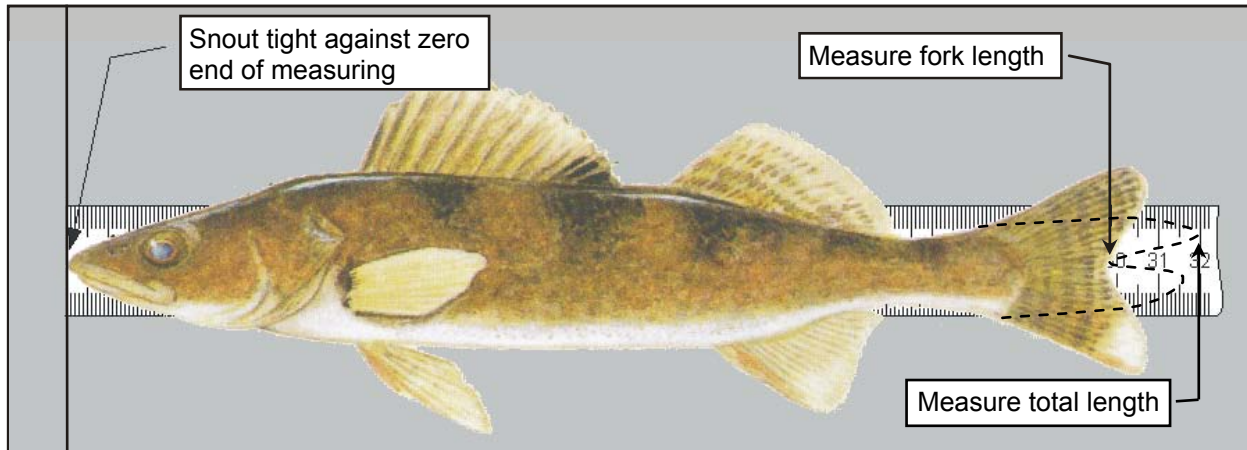
6) Keeping the fish snug against the end and flat across the ruler, measure the fork length to the nearest millimetre. Call out the fork length to the data recorder.

7) If fish of this species are length tallied only, the data recorder records the measurement by placing a tally dot in the appropriate size class under the appropriate species column on the ESTN Length Class Tally Form (see section 5.7). If additional fish sampling is required (i.e., all walleye and other species of interest), then the data recorder enters the Species, Fish # and Fork Length (mm) on the ESTN Fish Sampling Form (see section 5.7).

8) The fish handler proceeds to collect additional information for all walleye and other species of interest (steps 9 –12). The data recorder records the additional data on the Fish Sampling Form and scale envelopes, or may record the data on the Fish Sampling Form only and use scale envelopes for storing aging tissues. The project leader should provide guidance prior to the field program on the data capture method to use.

9) Measure the total length to the nearest 1mm and record it on the ESTN Fish Sampling Form. To measure the total length, compress the upper and lower lobes of the caudal fin rays to obtain the maximum length (see Figure 8).

10) Weigh the fish using a hand held spring-loaded weigh scale or electronic balance. Hand held spring-loaded scales should be calibrated each day and tared with the damp weigh sock. Weigh fish with the appropriate capacity scale. **Do not record weights of fish that are <10% of the scale capacity (100 g for a 1 kg scale) when spring-loaded mechanical scales are used (i.e., do not weight a 80 g fish on the 1 kg scale, use the 100 g scale).** Enter the weight of the fish on the ESTN Fish Sampling Form.

11) Scale samples should be collected as backup aging structures for misplaced dorsal spines or fin rays. To collect a scale sample, gently wipe away, with the blade of your knife, any excess mucous and dirt from the area to be sampled. Clean the knife blade carefully by wiping with a cloth or rinsing in water. With the tip of the knife gently pull the scales from the left side of the body and place in a scale envelope. For spiny rayed fish (walleye, sauger, yellow perch, smallmouth bass etc.) remove at least 10 scales from below the lateral line and posterior to the insertion of the pectoral fin. For soft rayed fish (northern pike, muskellunge, salmonids, coregonids etc.) remove at least 20

scales from above the lateral line and anterior to the dorsal fin. The following information should be recorded on scale envelopes:

Scale Sample Envelope		**Data to Record**	
Species		Species	
Party No.		Sample Number	
No.		Fish Number	
Date		Lift Date	
Locality	Area/Grid/Site		Number
Age	Aging		Structures Collected

12)   Dorsal spines or fin rays (see Table 3) should be collected and used as the primary structure for age interpretation. They should be wrapped in waxed paper and placed in the scale envelope that has been labeled above. Record the type of structures that were collected on the ESTN Fish Sampling Form.

13)   When all the required information has been collected, release the fish by gently tossing it back into the water on the offshore side of the boat. If fish are released on the nearshore side of the boat, they may remain around the gap and heart of the trap net and thus may be recaptured during the net removal procedure.

14)   Continue sampling by species until the entire catch has been processed.

15)   Once all of the fish have been processed, the fish handler resumes net handling by closing the zipper and re-sealing it (see section 5.4, steps 6 and 7). The data recorder determines the total catch from the Length Tally Form(s) and Fish Sampling Form(s) and transfers the totals to the Fish Catch Summary section of the ESTN Effort/Catch Form (see section 5.8).

5.7 Recording Fish Data

Fish catch information is recorded with an HB pencil while processing the catch, on ESTN Length Class Tally Forms (see Figure 9), Fish Sampling Forms (see Figure 10) and/or scale envelopes.   After sampling the entire catch (i.e., all fish that were captured in the crib) of a particular net set, a catch summary is completed on the ESTN Effort/Catch Form (see Figure 11). The following is a description of each of these forms:

5.7.1 ESTN Length Class Tally Forms

There are two Length Class Tally Forms to cover the wide range of fish sizes: One for small fish (less than 400 millimetres fork length) and one for large fish (greater than 399 millimetres fork length). There are also blank size class rows on each tally form to enable the crew to assign unique size classes if/when exceptionally small or large fish are encountered. Each tally form has four species columns. Therefore, if more than four species are length tallied, more than one tally form will be required. The ESTN Length Class Tally Forms should be completed as follows:

Waterbody

Record the official name of the waterbody in which the trap net was set (e.g., *CHEMONG LAKE*). This field must correspond to the ESTN Effort/Catch Form.

Lift Date

Record numerically the date that the trap net was lifted, in the order <u>year, month, day</u> (i.e., May 21, 2002 would be recorded as *02-05-21*). This field must correspond to the ESTN Effort/Catch Form.

Net Location

Record the shoreline segment number or UTM reference number used to identify the specific geographic location of the netting site (e.g., *Site #16* or *Grid #0802-Site #C13*). This field must correspond to the information recorded on the ESTN Effort/Catch Form.

Sample #

Record the unique and sequential fishing effort number that refers to this particular net set (i.e., the first set of the project would be Sample # *001,* and the next set would be Sample # *002*). This field must correspond to the ESTN Effort/Catch Form.

Species

Record the appropriate heading to identify the fish species or species group tallied in that column. This field is relatively short as it is designed to record a fish acronym or number code (e.g., *SMB* or *316* for smallmouth bass). Some crews prefer to use their own series of distinguishable acronyms for recording fish species in the field, as fish number codes can be difficult to remember and can be easily confused. See Appendix A for a complete list of OMNR fish species codes.

Dot Tally

Use this space to record a dot tally on the appropriate size class rows. Use the "box ten" method (i.e., four dots in a square, then four lines to connect the dots, then two lines crossed in the middle of the box to form an X).

Total

Record the sum for each species size class row (i.e., count the dot tally and record the total number of fish measured, in each size class, for each species).

Use the bottom row of this column to record the total number of fish, of each particular species, that were length class tallied (i.e., combine all size classes per species). Each species total is copied to the # Length Tallied column in the Fish Catch Summary section of the ESTN Effort/Catch Form.

NOTE: Only fish that were captured by passing through the tunnel and into the crib can be considered part of the catch. Other improperly caught fish (e.g., trapped in hearts, gilled in leader, etc.) should be recorded as a comment only.

Figure 9. A completed ESTN Length Class Tally Form for Small Fish (<400 mm)

ESTN LENGTH CLASS TALLY FORM – Small Fish (< 400 mm)

Waterbody: ____Chemong_____   Lift Date:___02-05-21__   Net location:___16_____   Sample #: _007___

Fork Length Class (mm)	Species: ___163_____		Species: __331_____		Species: ____311_____		Species: ___313_____		Fork Length Class (mm)
	Dot Tally	**Total**	**Dot Tally**	**Total**	**Dot Tally**	**Total**	**Dot Tally**	**Total**	
90 - 99									90 - 99
100 - 109									100 - 109
110 - 119									110 - 119
120 - 129					• •	2	•	1	120 - 129
130 - 139					• • •	3			130 - 139
140 - 149									140 - 149
150 - 159									150 - 159
160 - 169									160 - 169
170 - 179									170 - 179
180 - 189			•	1					180 - 189
190 - 199			•	1					190 - 199
200 - 209									200 - 209
210 - 219			• •	2					210 - 219
220 - 229			• •	2					220 - 229
230 - 239									230 - 239
240 - 249			• •	2					240 - 249
250 - 259			•	1					250 - 259
260 - 269			•	1					260 - 269
270 - 279			•	1					270 - 279
280 - 289									280 - 289
290 - 299	•	1							290 - 299
300 - 309	• •	2							300 - 309
310 - 319	• • •	3							310 - 319
320 - 329	• • • •	4							320 - 329
330 - 339	• • • • •	5							330 - 339
340 - 349	⬚	6							340 - 349
350 - 359	⬚	7							350 - 359
360 - 369	⬚	8							360 - 369
370 - 379	⬚	9							370 - 379
380 - 389	⬚	10							380 - 389
390 - 399									390 - 399
TOTAL		55		11		5		1	TOTAL

33

5.7.2 ESTN Fish Sampling Form

The first part of the ESTN Fish Sampling Form is identical to and should correspond with the first part of the ESTN Length Class Tally Forms. The ESTN Fish Sampling Forms are completed to record fish data at a specific net set and should correspond and be attached to the ESTN Effort/Catch Form for that lift. The ESTN Fish Sampling Form should be completed as follows:

Waterbody

Record the official name of the waterbody in which the trap net was set (e.g., *CHEMONG LAKE*). This field must correspond to the ESTN Effort/Catch Form.

Lift Date

Record numerically the date that the trap net was lifted, in the order <u>year, month, day</u> (i.e., May 21, 2002 would be recorded as *02-05-21*). This field must correspond to the ESTN Effort/Catch Form.

Net Location

Record the shoreline segment number or UTM reference number used to identify the specific geographic location of the netting site (e.g., *Site #16* or *Grid #0802-Site #C13*). This field must correspond to the information recorded on the ESTN Effort/Catch Form.

Sample

Record the unique and sequential fishing effort number that refers to this particular net set (i.e., the first set of the project would be Sample # *001,* and the next set would be Sample # *002*). This field must correspond to the ESTN Effort/Catch Form.

Species/Group

Record the fish species or species group. This field is relatively short as it is designed to record a fish acronym or number code (e.g., *SMB* or *316* for smallmouth bass). Some crews prefer to use their own series of distinguishable acronyms for recording fish species in the field, as fish number codes can be difficult to remember and can be easily confused. See Appendix A for a complete list of OMNR fish species codes.

Fish # (optional)

A serial number assigned to the individual fish being sampled for identification purposes. This number is also used to link all information for a single fish (the number on the Fish Sampling Form must correspond to the fish number on the scale sample envelope). The recommended protocol is to assign the first fish sampled in the survey the number 1, with each subsequent fish numbered consecutively upwards until the last fish in the entire ESTN survey is sampled.

Fork Length (mm)

The length (measured to the nearest 1 mm) of an individual fish from the anterior tip of the snout, with the mouth closed, to the posterior edge of the median caudal fin rays (i.e., the fork in the caudal fin). For fish without a fork in their caudal fin (e.g., burbot or brown bullhead), fork length is the same as total length.

Total Length (mm)

The length (measured to the nearest 1 mm) of an individual fish from the anterior tip of the snout, with the mouth closed, to the most distant lobe of the caudal fin (compress the upper and lower lobes of the caudal fin rays to obtain the maximum total length).

Round Weight (g)

The round weight of individual fish, measured in grams with hand held spring-loaded scales or electronic balance. Hand held spring-loaded scales should be calibrated each day and tarred with the damp weigh sock. Weigh fish with the appropriate capacity scale. **Do not record weights of fish that are <10% of the minimum scale capacity (100 g for a 1 kg scale) when spring-loaded mechanical scales are used; spring-loaded scales are too insensitive for weighing such small fish (i.e., do not weight a 80 g fish on the 1 kg scale, use the 100 g scale).**

Age Structures Sampled

Code listing calcified structures collected for the purpose of age determination. The codes for age structures are: blank = no data, 0 = no structure sampled, 1= scales (any side), 2 = scales (left side), 3 = scales (right side), 4 = pectoral ray, 5 = pectoral spine, 6 = pelvic ray, 7 = dorsal spine, A = otolith, B = operculum, C = sub-operculum, D = cleithrum, E = centrum, F = branchiostegal, and G = other.

Clips Observed

Code for the location of up to 5 clips observed on capture. The codes for clips on capture are: blank = no data, 0 = no clip, 1 = right pectoral, 2 = left pectoral, 3 = right pelvic, 4 = left pelvic, 5 = adipose, 6 = anal, 7 = anterior dorsal, 8 = posterior dorsal, A = lower caudal, B = mid caudal, C = right opercular, D = left opercular, E = right maxillary, F = left maxillary. (e.g. 15 = right pectoral, adipose combination).

Clips Applied

Code for the locations of up to 5 clips applied to a fish.   The codes are the same as for Clips Observed.

Tag Ident.

The serial number on a fish tag.

Tag Status

Indicates whether a tag existed on **C**apture or was **A**pplied. If observed on capture, the disposition and condition of the tag site are also recorded here. Record up to 4 characters as follows: **First Character** is the "tag status" code, C = existed on Capture, A = Applied; **Second Character** is the "tag disposition" code, 0 = no change, 1 = retied same tag, 2 = replaced lost tag, 3 = removed, 4 = not known; **Third Character** is the "tag condition" code, 1 = securely tied, 2 = some slack, 3 = loose, 4 = unknown; **Fourth Character** is the "fish condition" code, 1 = healed, 2 = bit raw, 3 = festering, 4 = wear on fin, 9 = unknown. (e.g. C = tag observed but no other information on disposition or condition recorded; C13 = existing tag was retied because it was loose).

Figure 10. A Completed ESTN Fish Sampling Form

ESTN - Fish Sampling Form

Waterbody:____Chemong_Lake_____ **Lift Date:**__02-05-21____ **Net Location:**_____16_____ **Sample #:**____007____

Species/ Group	Fish #	Fork Length (mm)	Total Length (mm)	Round Weight (g)	Age Structures Sampled[1]	Clips Observed [2]	Clips Applied[2]	Tag Ident.	Tag Status[3]	Selection Type[4]
334	43	428	455	775	27					1
334	44	414	445	650	27					1
334	45	497	527	1250	27					1
334	46	390	414	600	27					1
334	47	377	401	600	27					1
334	48	520	556	1750	27					1
334	49	404	435	650	27					1
334	50	362	387	510	27					1
334	51	368	395	650	27					1
334	52	425	451	900	27			MNR-C4078	C13	1
334	53	455	488	950	27					1
334	54	471	501	1225	27					1
334	55	428	456	800	27					1
334	56	409	436	700	27					1
334	57	300	322	350	27					1
334	58	374	399	530	27					1
334	59	442	470	1025	27					1
334	60	299	319	305	27					1
334	61	423	450	800	27					1
334	62	448	480	850	27					1
334	63	364	385	575	27					1
334	64	367	380	500	27					1
334	65	419	450	850	27					1
334	66	460	497	1200	27					1
334	67	377	400	560	27					1
334	68	349	373	520	27					1
319	69	145	157	60	27					1
319	70	193	203	140	27					1
319	71	210	222	160	27					1
319	72	212	224	140	27					1

[1]**Age Structures Sampled:** blank=no da ta, 0=no structure sampled, 1= scales any side, 2=scales left side, 3= scales right s ide, 4=pectoral r ay; 5=pectoral spine, 6=pelvic ray, 7=dorsal spine, A=otolith, B=operculum, C=sub-operculum, D=cleithrum, E=centrum, F=branchiostegal, G=other
[2]**Clips Observed/Applied:** blank=no data; 0=no clip; 1=right pectoral; 2=left pectoral; 3=right pelvic; 4=left pelvic; 5=adipose; 6=anal; 7=anterior dorsal; 8=posterior dorsal, A=lower caudal, B=mid-caudal, C=right opercular, D=left opercular, E=right maxillary, F=left maxillary.
[3]**Tag Status:** Record up to 4 characters as follows: **First Character** is the tag status code, C=existed on Capture, A=Applied; **Second Character** is the tag disposition code, 0=no change, 1= retied same tag, 2=replaced lost tag, 3=removed, 4=not known; **Third Character** is the tag condition code, 1= securely t ied, 2=some slack, 3=loose, 4=unknown; **Fourth Character** i s the f ish condition c ode, 1= healed, 2=b it r aw, 3=festering, 4=wear on f in, 9=unknown
[4] **Selection Type**: 0=not defined in survey, 1=defined in survey

Selection Type

A single character code used to record the reason for selecting a fish for sampling biological characteristics other than size (weight, age, sex, maturity, parasites etc.). The codes are: 0 = not defined in survey, 1 = defined in survey.

5.7.3 ESTN Effort/Catch Form

The Effort portion of the ESTN Effort/Catch Form was filled out when the net was set and lifted.   The same form is required to complete the Fish Catch Summary section. The ESTN Length Class Tally Forms and Fish Sampling Forms that are completed to record fish data at a specific net set should correspond and be attached to the ESTN Effort/Catch Form for that lift. The Fish Catch Summary section of the ESTN Effort/Catch Form should be completed as follows:

Fish Catch Summary → These 7 fields summarize the catch by fish species.

Species/Group

Record the appropriate fish species represented in that row. This field is relatively short as it is designed to record a fish acronym or number code (e.g., *SMB* or *316* for smallmouth bass). Some crews prefer to use their own series of distinguishable acronyms for recording fish species in the field, as fish number codes can be difficult to remember and can be confusing. See Appendix A for a complete list of OMNR fish species codes.

Total Catch

Record the total number of fish per species that were captured in the crib of the trap net (i.e., the sum of the # Counted Only, # Length Tallied and # Biosampled columns for that species).

 # Counted Only

Record the total number of fish per species that were counted only (i.e. these fish are not included in the # Length Tallied column).

 # Length Tallied

Record the total number of fish per species that were length tallied only as per the totals on the ESTN Length Class Tally Form.

 # Biosampled

Record the number of fish per species that were sampled for additional biological information (i.e. the total number of fish per species that had weights taken and/or scales collected).

 # Marks/Tags Applied

The number of fish of a particular species that were caught and a mark or tag was applied.

 # Marks/Tags Recaptured

The number of fish of a particular species that were caught and already had a mark or tag.

Comments → This field is again used to document any useful descriptions or information.

Crews should provide any more information that may help to explain the uniqueness of the catch. (e.g., *3 SMB released from TN heart were not included in the total catch*).

Fish Sampling Data → This area is used to identify the number of other forms associated with this effort.

Enter the number of Fish Sampling Forms, Scale Envelopes and Length Class Tally Forms associated with this set.

Figure 11. A Completed ESTN Effort/Catch Form

ESTN - Effort/Catch Form

SITE DESCRIPTION

Project Code	Waterbody Name	UTM or Lat/Long Coordinates	TN Head Tag id #	TN Leader Tag id #	Sample #
KLA_IA02_CH1	Chemong Lake	17 – 706632 – 4917024	TP-05	06	007

Area #	Grid #	Site #	Site Type (substrate)[1]	Site Type (fish cover)[2]	Bottom Type[3] (all types 100 m each side of net)	Fish Cover Type[4] (all types 100 m each side of net)
N/A	N/A	16	4	3	MU, SI, BO	Some MA, a few BO, 2 pipe docks

SET DESCRIPTION (recorded at time of set)

Net Set Crew	Set Date (yy.mm.dd)	Set Time (24hh:mm)	Leader Length (30 - 46 m)	Dist. Off Shore (0 - 20 m)	Angle to Shore (70° - 90°)	Start Depth (m)	Mid Depth (m)	Gap Depth (1.7 - 3.5 m)
C. McCauley G. Cimbura	02-05-20	14:15	40.0	0.4m	90	0.3m	1.5m	2.4m

LIFT DESCRIPTION (recorded at time of lift)

Net Lift Crew	Lift Date (yy.mm.dd)	Lift Time (24hh:mm)	Effort Status[5]	Duration (fishing hours)	Water Temp (°C)	Secchi Depth (m)	Cloud Cover (in eighths)	Precip. Type[6] (codes 00-95)	Wind Direction (1-360°)	Speed (in knots)
C. McCauley G. Cimbura	02-05-21	13:30	2	23.25	15.1	2.6	2	61	264	7

General Weather Through Set	
Precipitation[7]	Surface Conditions[8]
2	2

FISH CATCH SUMMARY

Species/ Group	Total Catch	# Counted Only	# Length Tallied	# Biosampled	# Marks/Tags Applied	# Marks/Tags Recaptured
132	1	0		1		
163	55	0	55			
186	11	0	11			
311	5	0	5			
313	1	0	1			
317	19	0		19		1
319	4	0		4		
331	11	0	11			
334	59	0		59		1

COMMENTS

Met adjacent property owners and gave them our info. sheet.

Leader slightly bowed at lift because a few logs drifted into it.

3 SMB released from TN heart were not included in the total catch.

Fish sampling data: Form(s) __3__ Scale envelope(s): __43__ Length Tallies: __2__

[1]**Site Type – General Substrate codes:**
1=gravel/pebble/sand mix (GP+SA >75%);
2=boulder/rubble/cobble mix (BO+RC >75%);
3= sand (SA >75%);
4=soft mix (SI+MU+DE+ soft CL>75%);
5= bedrock (BE >75%);
6 =other

[2]**Site Type – Fish Cover Level codes:**
1=no cover; 2=low (1-25%);
3=moderate (25-75%); 4=high (>75%);

[3]**Bottom Type codes:**
BR = bedrock; BO=boulder;
RC=rubble/cobble; GP=gravel/pebble;
SA=sand; SI=silt; CL=clay; MU=muck;
DE=detritus; MA=marl

[4]**Fish Cover Type codes:**
BO=boulders; MA=macrophytes;
LT=log/tree;   UB=undercut bank;
OD=organic debris; OT=other;
NC=no cover

[5]**Effort Status codes:**
1=no problem; 2= minor problem;
3=major problem

[6]**Precip. Type codes:**
00=no precipitation at lift time; 10=mist;
40=fog; 61=light rain; 65=heavy rain;
71=light snow; 75=heavy snow;
95=thunderstorm

[7]**Precipitation Through Set codes:**
1=no precip. during set;
2= <4 hrs. of precip.;
3= >4 hrs. of precip.;
4= constant precip.
9=unknown

[8]**Surface Conditions Through Set codes:**
1=calm waters for entire set duration;
2=mostly calm waters & some rough;
3=mostly rough waters & some calm;
4= rough waters for entire set duration;
9=unknown

5.8 Moving or Removing the Net

1) To remove the spring-haul trap net for use at another site, lift one wing buoy and its marker line and retrieve the anchor from the lake bottom. Remove the anchor from the wing line. Cast the wing line back into the water. While traveling to the next wing, separate the recently retrieved marker buoy from its marker line, neatly wrap the marker line around the tines of the anchor, and safely place the anchor and buoy out of your way (some prefer to hang the anchors on the inside of the gunwale). Repeat this step for the other wing.

2) Retrieve the king anchor by lifting its marker line and pull the boat towards the net along the king line. The king anchor and marker buoy can remain attached if you are moving to another site to reset the net. Lay the king line and brail lines neatly on the floor of the boat while you pull the boat up parallel to the brails.

   NOTE: If you are removing the net for transportation to another lake or back to the office, remove the king anchor and marker buoy, and safely store the gear out of your way.

3) With a person at each end of the brails, grasp the metal brail in one hand, the wooden brail in the other hand, and pull the brails into the center of the boat. Spread the brails about 1 metre (3 ft.) apart to provide a platform to lay the rest of the net on.

   NOTE: If removing the net for transportation, a tighter bundle can be created by flipping the brail formed platform over twice to retain the "wood to shore" arrangement. Keep the brails 1 metre apart (3 ft.) while flipping. This wraps the mesh of the crib around the brails and creates a sturdier platform.

4) Neatly place the king line and brail lines on top of the mesh platform.

5) Grasping the net's side lines (float and lead lines along each side of the net), quickly pull the net into the boat and continue piling it on the platform created between the two brails. A fast net retrieval will reduce the amount of drifting caused by the wind and thus reduce the probability of net tangles and snags. In extremely windy and wavy conditions, the leader anchor can be removed first while the boat is being controlled by the field crew. This allows the crew to retrieve and pile the net without having to get too close to shore. Following the side lines, you should retrieve the net working your way along the outside of the crib, house, heart, and wings.

   NOTE: A few fish may be trapped in the hearts and should be shaken back down the heart to the gap where you can reach in and pull the fish out. These fish are **not** part of the catch, as they did not find their way into the crib via the tunnel. Be careful not to lift the heart too high when shaking fish towards the gap. There is a chance that you could shake fish down into the tunnel and eventually into the crib. The crib is buried under the piled net and sealed shut, making the removal of these fish very difficult.

6) Continue retrieving the wings, placing each wing separately on each side of the pile, so that you will not be confused about which wing belongs to which side of the net when resetting. Similarly, continue retrieving the wing lines and place them on top of their respective wing.

7)   With one person pulling on the float line and the other person pulling on the lead line, retrieve the leader folding it neatly back and forth on top of the net pile. Be sure not to allow a twist to occur in the leader at this point.

8)   Pull in the leader anchor and safely place it on the floor or over the inside of the gunwale. This anchor can usually remain attached for the next set.

> **NOTE:** If removing the trap net for transportation to another lake or back to the office, untie the leader anchor and place it safely out of your way. A tight carrying bundle can be created by laying the last metre (3 ft.) of leader over the net pile, like a "hair net", and tucking the sides and ends in under the mesh piled on the platform. This helps to keep pieces of the net from falling out of the bundle.
>
> Next, use a reasonable length of rope (leader anchor line works well) to wrap around the bundle. Starting at one end, wrap the rope around the bundle and link each subsequent wrap with one turn around the previous wrap. Use a wrap about every 30 to 40 cm (12 to 16 in.) along the length of the bundle. Pull each wrap tight to make the bundle as small and compact as possible. One person can help to steady the net and provide enough room to get the rope around the bundle by lifting one end at the brails. Wrap any extra rope around the ends of the bundle where most of the weights or floats are packed.

6.0 POST- FIELD ACTIVITIES

The following activities should be conducted within a couple days of completing the field portion of the ESTN program.

6.1 Controlling the Spread of Invasive Species

The following precautions should be taken to prevent the spread of invasive species <u>every time</u> boats and equipment are moved between waterbodies.

Boats

- Inspect boat, trailer and boating equipment and remove any visible mud, plants or animals before leaving any waterbody; and
- Drain water from motor, live well, bilge and transom wells while on land before leaving the waterbody; and
- Wash/Dry boat and equipment to kill harmful exotic species that were not seen at the boat launch. Some species can survive for several days out of water, it is important to:
    - rinse   boat and equipment with hot water (>40 ^{o}C); or
    - spray boat and equipment with high pressure water (250 psi); or
    - dry boat and equipment for at least five days, before transporting to another waterbody.

Nets and Floats

Nets, lines and anchors could harbor unwanted organisms and plants, especially if they have been set for longer than 24 hours.

Prior to moving nets to new waterbodies a routine cleaning to remove plants and debris is recommended. In order to reduce the chance that smaller organisms, resting eggs or other tiny life stages survive, take the following precautions:

- Inspect equipment and remove any mud, plants, organisms, other debris; and
- Ensure all water is drained from equipment (if floats leak they should be replaced); and
    - spray equipment with high pressure water (250 psi); or
    - submerse equipment in hot water (>40°C); or
    - submerse equipment in salt water (1/2 cup salt to 1 gallon water); or
    - submerse equipment in mild bleach solution (1 tablespoon to 1 gallon water); or
    - dry equipment for at least five days (drying can occur inside or outside if the weather is warm and dry and the equipment is not sensitive to sunlight).

6.2 Net Storage

If the trap nets are clean at the end of the fieldwork, they can be dried by being blocked up in a warm storage room. Make sure that each net is exposed to the air all the way around the bundle, and that any water running off will drain away from the net. Ensure that your storage room is sealed to prevent mice or squirrels from getting to the nets. These animals can damage the nets by chewing on the netting materials, and will often build nests and over-winter in the net bundles.

If a net has weeds or algae clinging to it, the net should be unpacked and cleaned by pressure spraying and/or hanging on a drying rack. If quickly dried, algae will break down and fall off the net. If drying outside, do not expose the net to the sunlight for a long period of time, as the sun will deteriorate the netting materials. **Do not leave a dirty net tightly bundled.** The plants and algae will hold moisture in the bundle and cause the net to rot. Polypropylene nets are more resistant to rotting than other traditional materials and will last much longer if properly maintained and stored in a building where they are protected from sunlight, moisture, and nuisance animals.

The trap nets must be carefully inspected during the off season for rips and tears. This inspection should be completed at the beginning of the storage period to provide ample time to conduct, or budget for, the appropriate repairs. Watch for areas where the mesh has separated from the lead line (bottom of net) as a result of damaged lashing. When feasible, major repairs should be done by the manufacturer to ensure that the correct techniques and materials are used.

6.3 Gear Log

Trap net inspections, repairs, and field seasons, should be recorded in a trap net gear log to document the net's status and history. Since these nets are often stored for long periods of time and/or loaned to other users, it is very useful and informative to keep track of what happens to each net. In this way, project leaders are less likely to be surprised with costly repair expenses, scheduling conflicts, or biased fishing results that can arise from being unaware of a net's status.

7.0 DATA MANAGEMENT

The information recorded on the ESTN forms are in a format compatible with the software package FISHNET3 - provided by the **Ontario Ministry of Natural Resources**. Therefore, data entry can be done directly from the forms using the ESTN Project Template (a modified Index Adult Template) available in FISHNET3. Projects entered into FISHNET3 can be automatically submitted to the Provincial Database.

8.0 PROJECT ASSISTANCE

Please contact the Kawartha Lakes Fisheries Assessment Unit (KLFAU) (address below) for assistance in any of the following areas:

- Data entry procedures for ESTN

- Submission of completed projects to the provincial ESTN database

- Copies of the standard ESTN forms

- Any other ESTN inquiries

> → **Ontario Ministry of Natural Resources**
> **Kawartha Lakes Fisheries Assessment Unit, Mike Rawson**
> **C/O Agriculture and Food**
> **322 Kent Street West**
> **Lindsay, ON**
> **K9V 4T7**
> **Tel: (705) 324-2879**
> **Fax: (705) 324-1638**

Acknowledgements

The majority of the Gear Descriptions and Field Procedures were adapted from the Nearshore Community Index Netting (NSCIN) Manual (Stirling, 1999). Many of the classifications and data coding conventions were adapted from standards reported in the OMNR FISHNET User Manual (Lester et al. 1996) and the OMNR Manual of Instructions for Aquatic Habitat Inventory Surveys (OMNR 1987). Mike Fruetel's dedication and insight in the early testing of this methodology was instrumental in defining the best temperature/timing window. Mike Rawson provided a clear definition of the ESTN sampling procedures and conducted field testing. Beth MacKay provided the section on the control of invasive species. A special thanks to Brad Allan, Chuck Brady, Terry Marshall and Mike Rawson who reviewed the final draft of this manual.

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Appendix A: Master List of Species Codes and Common Names of Ontario Fish (May 1998)

010.   PETROMYZONTIDAE - Lampreys

    011.   American brook lamprey - *Lampetra appendix*
    012.   northern brook lamprey - *Ichthyomyzon fossor*
    013.   silver lamprey - *Ichthyomyzon unicuspis*
    014.   sea lamprey - *Petromyzon marinus*
    015.   *Ichthyomyzon sp.*
    016.   chestnut lamprey - *Icthyomyzon castaneus*

020.   POLYODONTIDAE - Paddlefishes

    021.   paddlefish - *Polyodon spathula*

030.   ACIPENSERIDAE - Sturgeons

    031.   lake sturgeon - *Acipenser fulvescens*
    032.   caviar

040.   LEPISOSTEIDAE - Gars

    041.   longnose gar - *Lepisosteus osseus*
    042.   spotted gar - *Lepisosteus oculatus*
    043.   *Lepisosteus sp.*

050.   AMIIDAE - Bowfins

    051.   bowfin - *Amia calva*

060.   CLUPEIDAE - Herrings

    061.   alewife - *Alosa pseudoharengus*
    062.   American shad - *Alosa sapidissima*
    063.   Gizzard shad - *Dorosoma cepedianum*
    064.   *Alosa sp.*

    SALMONIDAE - Trouts:

070.   SALMONINAE - Salmon and Trout subfamily

    071.   pink salmon - *Oncorhynchus gorbuscha*
    072.   chum salmon - *Oncorhynchus keta*
    073.   coho salmon - *Oncorhynchus kisutch*
    074.   sockeye salmon - *Oncorhynchus nerka*
    075.   chinook salmon - *Oncorhynchus tshawytscha*
    076.   rainbow trout - *Oncorhynchus mykiss*
    077.   Atlantic salmon - *Salmo salar*
    078.   brown trout - *Salmo trutta*
    079.   Arctic char - *Salvelinus alpinus*
    080.   brook trout - *Salvelinus fontinalis*
    081.   lake trout - *Salvelinus namaycush*

082.   splake - *Salvelinus fontinalis x Salvelinus namaycush*
083.   Aurora trout - *Salvelinus fontinalis timagamiensis*
084.   *Oncorhynchus sp.*
085.   *Salmo sp.*
086.   *Salvelinus sp.*

090.   COREGONINAE - Whitefish subfamily

091.   lake whitefish - *Coregonus clupeaformis*
092.   longjaw cisco - *Coregonus alpenae*
093.   cisco (lake herring) - *Coregonus artedi*
094.   bloater - *Coregonus hoyi*
095.   deepwater cisco - *Coregonus johannae*
096.   kiyi - *Coregonus kiyi*
097.   blackfin cisco - *Coregonus nigripinnis*
098.   Nipigon cisco - *Coregonus nipigon*
099.   shortnose cisco - *Coregonus reighardi*
100.   shortjaw cisco - *Coregonus zenithicus*
101.   pygmy whitefish - *Prosopium coulteri*
102.   round whitefish - *Prosopium cylindraceum*
103.   chub - *Coregonus sp.* (Cisco species other than C. artedi)
106.   *Coregonus sp.*
107.   *Prosopium sp.*

110.   THYMALLINAE - Grayling subfamily

111.   Arctic grayling - *Thymallus arcticus*

120.   OSMERIDAE - Smelts

121.   rainbow smelt - *Osmerus mordax*

130.   ESOCIDAE - Pikes

131.   northern pike - *Esox lucius*
132.   muskellunge - *Esox masquinongy*
133.   grass pickerel - *Esox americanus vermiculatus*
134.   *Esox sp.*
135.   chain pickerel - *Esox niger*

140.   UMBRIDAE - Mudminnows

141.   central mudminnow - *Umbra limi*

150.   HIODONTIDAE - Mooneyes

151.   goldeye - *Hiodon alosoides*
152.   mooneye - *Hiodon tergisus*

160.   CATOSTOMIDAE - Suckers

161.   quillback - *Carpiodes cyprinus*
162.   longnose sucker - *Catostomus catostomus*

163.	white sucker -	*Catostomus commersoni*
164.	lake chubsucker -	*Erimyzon sucetta*
165.	northern hog sucker -	*Hypentelium nigricans*
166.	bigmouth buffalo -	*Ictiobus cyprinellus*
167.	spotted sucker -	*Minytrema melanops*
168.	silver redhorse -	*Moxostoma anisurum*
169.	black redhorse -	*Moxostoma duquesnei*
170.	golden redhorse -	*Moxostoma erythrurum*
171.	shorthead redhorse -	*Moxostoma macrolepidotum*
172.	greater redhorse -	*Moxostoma valenciennesi*
173.	river redhorse -	*Moxostoma carinatum*
174.	black buffalo -	*Ictiobus niger*
176.	*Catostomus sp.*	
177.	*Moxostoma sp.*	
178.	*Ictiobus sp.*	

180.   CYPRINIDAE - Carps and Minnows

181.	goldfish -	*Carassius auratus*
182.	northern redbelly dace -	*Phoxinus eos*
183.	finescale dace -	*Phoxinus neogaeus*
184.	redside dace -	*Clinostomus elongatus*
185.	lake chub -	*Couesius plumbeus*
186.	common carp -	*Cyprinus carpio*
187.	gravel chub -	*Erimystax x-punctatus*
188.	cutlips minnow -	*Exoglossum maxillingua*
189.	brassy minnow -	*Hybognathus hankinsoni*
190.	eastern silvery minnow -	*Hybognathus regius*
191.	silver chub -	*Macrhybopsis storeriana*
192.	hornyhead chub -	*Nocomis biguttatus*
193.	river chub -	*Nocomis micropogon*
194.	golden shiner -	*Notemigonus crysoleucas*
195.	pugnose shiner -	*Notropis anogenus*
196.	emerald shiner -	*Notropis atherinoides*
197.	bridle shiner -	*Notropis bifrenatus*
198.	common shiner -	*Luxilus cornutus*
199.	blackchin shiner -	*Notropis heterodon*
200.	blacknose shiner -	*Notropis heterolepis*
201.	spottail shiner -	*Notropis hudsonius*
202.	rosyface shiner -	*Notropis rubellus*
203.	spotfin shiner -	*Cyprinella spiloptera*
204.	sand shiner -	*Notropis stramineus*
205.	redfin shiner -	*Lythrurus umbratilis*
206.	mimic shiner -	*Notropis volucellus*
207.	pugnose minnow -	*Opsopoeodus emiliae*
208.	bluntnose minnow -	*Pimephales notatus*
209.	fathead minnow -	*Pimephales promelas*
210.	blacknose dace -	*Rhinichthys atratulus*
211.	longnose dace -	*Rhinichthys cataractae*
212.	creek chub -	*Semotilus atromaculatus*
213.	fallfish -	*Semotilus corporalis*
214.	pearl dace -	*Margariscus margarita*
215.	silver shiner -	*Notropis photogenis*

216.	central stoneroller - *Campostoma anomalum*	
217.	striped shiner - *Luxilus chrysocephalus*	
218.	ghost shiner - *Notropis buchanani*	
219.	grass carp - *Ctenopharyngodon idella*	
220.	rudd - *Scardinius erythrophthalmus*	
221.	*Phoxinus sp.*	
222.	*Hybognathus sp.*	
223.	*Nocomis sp.*	
224.	*Notropis sp.*	
225.	*Pimephales sp.*	
226.	*Rhinichthys sp.*	
227.	*Semotilus sp.*	
228.	*Hybopsis sp.*	
229.	*Luxilus sp*	

230.   ICTALURIDAE - Bullhead Catfishes

231.	black bullhead - *Ameiurus melas*
232.	yellow bullhead - *Ameiurus natalis*
233.	brown bullhead - *Ameiurus nebulosus*
234.	channel catfish - *Ictalurus punctatus*
235.	stonecat - *Noturus flavus*
236.	tadpole madtom - *Noturus gyrinus*
237.	brindled madtom - *Noturus miurus*
238.	margined madtom - *Noturus insignis*
239.	flathead catfish - *Pylodictis olivaris*
241.	*Ictalurus sp.*
242.	*Noturus sp.*
243.	*Ameiurus sp.*
244.	northern madtom - *Noturus stigmosus*

250.   ANGUILLIDAE - Freshwater Eels

251.	American eel - *Anguilla rostrata*

260.   CYPRINODONTIDAE - Killifishes

261.	banded killifish - *Fundulus diaphanus*
262.	blackstripe topminnow - *Fundulus notatus*

270.   GADIDAE - Cods

271.	burbot - *Lota lota*

280.   GASTEROSTEIDAE - Sticklebacks

281.	brook stickleback - *Culaea inconstans*
282.	threespine stickleback - *Gasterosteus aculeatus*
283.	ninespine stickleback - *Pungitius pungitius*
284.	fourspine stickleback - *Apeltes quadracus*

290.   PERCOPSIDAE - Trout-perches

291.	trout-perch - *Percopsis omiscomaycus*

300.   PERCICHTHYIDAE - Temperate Basses

    301.   white perch - *Morone americana*
    302.   white bass - *Morone chrysops*
    303.   *Morone sp.*

310.   CENTRARCHIDAE - Sunfishes

    311.   rock bass - *Ambloplites rupestris*
    312.   green sunfish - *Lepomis cyanellus*
    313.   pumpkinseed - *Lepomis gibbosus*
    314.   blue gill - *Lepomis macrochirus*
    315.   longear sunfish - *Lepomis megalotis*
    316.   smallmouth bass - *Micropterus dolomieu*
    317.   largemouth bass - *Micropterus salmoides*
    318.   white crappie - *Pomoxis annularis*
    319.   black crappie - *Pomoxis nigromaculatus*
    320.   *Lepomis sp.*
    321.   *Micropterus sp.*
    322.   *Pomoxis sp.*
    323.   warmouth - *Lepomis gulosus*
    324.   orangespotted sunfish - *Lepomis humilis*

330.   PERCIDAE - Perches

    331.   yellow perch - *Perca flavescens*
    332.   sauger - *Stizostedion canadense*
    333.   blue pike (blue pickerel) - *Stizostedion vitreum glaucum*
    334.   walleye (yellow pickerel) - *Stizostedion vitreum*
    335.   eastern sand darter - *Ammocrypta pellucida*
    336.   greenside darter - *Etheostoma blennioides*
    337.   rainbow darter - *Etheostoma caeruleum*
    338.   Iowa darter - *Etheostoma exile*
    339.   fantail darter - *Etheostoma flabellare*
    340.   least darter - *Etheostoma microperca*
    341.   johnny darter - *Etheostoma nigrum*
    342.   logperch - *Percina caprodes*
    343.   channel darter - *Percina copelandi*
    344.   blackside darter - *Percina maculata*
    345.   river darter - *Percina shumardi*
    346.   tessellated darter - *Etheostoma olmstedi*
    347.   *Stizostedion sp.*
    348.   *Etheostoma sp.*
    349.   *Percina sp.*
    350.   ruffe - *Gymnocephalus cernuus*

360.   ATHERINIDAE - Silversides

    361.   brook silverside - *Labidesthes sicculus*

365. GOBIIDAE – Gobies

    366.   round goby - *Neogobius melanostomus*
    367.   tubenose goby - *Proterorhinus marmoratus*

370.   SCIAENIDAE - Drums

    371.   freshwater drum - *Aplodinotus grunniens*

380.   COTTIDAE - Sculpins

    381.   mottled sculpin - *Cottus bairdi*
    382.   slimy sculpin - *Cottus cognatus*
    383.   spoonhead sculpin - *Cottus ricei*
    384.   deepwater sculpin - *Myoxocephalus thompsoni*
    385.   *Cottus sp.*
    386.   *Myoxocephalus sp.*
    387.   fourhorn sculpin - *Myoxocephalus quadricornis*

390.   CYCLOPTERIDAE - Lumpfishes

    391.   lumpfish - *Cyclopterus lumpus*

395.   PLEURONECTIDAE - Righteye Flounders

    396.   European Flounder - *Platichthys flesus*

400.   SALMONIDAE - Hybrids

420.   SALMONINAE - Hybrids

450.   COREGONINAE - Hybrids

500.   ESOCIDAE - Hybrids

    501.   *Esox lucius x Esox americanus vermiculatus*
    502.   *Esox lucius x Esox masquinongy*

550.   CATOSTOMIDAE - Hybrids

    551.   *Ictiobus* hybrids

600.   CYPRINIDAE - Hybrids

    601.   *Carassius auratus x Cyprinus carpio*
    602.   *Phoxinus* hybrids
    603.   *Phoxinus eos x Phoxinus neogaeus*
    604.   *Phoxinus eos x Margariscus margarita*
    605.   *Phoxinus neogaeus x Margariscus margarita*
    610.   *Notropis* hybrids
    611.   *Luxilus cornutus x Notropis rubellus*
    612.   *Luxilus cornutus x Semotilus atromaculatus*
    620.   *Pimephales promelas x Pimephales notatus*

650.   ICTALURIDAE - Hybrids

    651.   *Ameiurus melas x Ameiurus nebulosus*

700.   CENTRARCHIDAE - Hybrids

   701.   *Lepomis* hybrids
   702.   *Lepomis gibbosus x Lepomis macrochirus*
   703.   *Lepomis cyanellus x Lepomis gibbosus*
   704.   *Lepomis cyanellus x Lepomis megalotis*
   705.   *Lepomis cyanellus x Lepomis macrochirus*
   706.   *Pomoxis annularis x Pomoxis nigromaculatus*

750.   PERCIDAE - Hybrids

   751.   *Stizostedion canadense x Stizostedion vitreum*

800. COTTIDAE - Hybrids

   801.   *Cottus bairdi x Cottus cognatus*

Appendix B: ESTN Forms

The following blank copies of the ESTN forms are required to record the results from your ESTN program. To facilitate direct photocopying for field use, the forms are full size and intentionally not labeled with the instruction manual page numbers. Save these forms as master copies for use in future ESTN field programs.

- ESTN Trap Net Description - Form 1 and 2
- ESTN Effort/Catch Form
- ESTN Fish Sampling Form
- ESTN Length Class Tally Form - Small Fish (< 400 mm)
- ESTN Length Class Tally Form - Large Fish (> 399 mm)

Electronic copies of the ESTN forms are available for re-printing purposes (see sections 4.4 and 8.0). Photocopied or laser printed versions are often more field worthy than versions made with ink printers. Ink printed versions tend to smear and the ink will run if the forms get wet. The toner used in photocopiers and laser printers tends to hold up very well to water damage.

ESTN TRAP NET DESCRIPTION - FORM 1

Features	Description	Features	Description
Head Identification #		**Net Type** (heavyweight or lightweight)	
Leader Identification #		**Mesh Colour**	
Mesh Material		**Yarn Type** (knotted, knotless)	
Twine Size - on leader - on top & bottom of house & heart - on remainder of head	_____ _____ _____	**Mesh Size** (stretched - knot centers) - on leader - on top & bottom of house & heart - on remainder of head	_____ _____ _____
Net Preservative		**Line Material** (rope frame & brail lines)	
Wooden Brail		**Metal Brail**	
Float Type*		**Float Spacing on Leader*** (centers)	
Weight Type* (irons, leads, chains, etc.)		**Weight Spacing*** (centers)	
Cost At Date Of Purchase		**Date Of Purchase**	
Inventory Completed By		**Date Inventoried**	
Net Builder (name, address, phone number)			

Construction Specifications (To ensure a well built and durable spring-haul trap net):

1. <u>Double salvage lines of black polypropylene twine</u> should be attached around the entire perimeter of the mesh netting before attachment to the black 0.95 cm (3/8 in.) polypropylene lines.

2. Double salvage lines are to be attached to the black 0.95 cm (3/8 in.) polypropylene lines <u>with a minimum of 3 hitches per mesh</u> using no less than #15 black treated nylon twine or equivalent.

3. <u>Black 0.95 cm (3/8 in.) polypropylene chafing lines</u> are to be attached across the entire bottom of the leader and head. The chafing lines are to be attached to the 0.95 cm (3/8 in.) polypropylene lines, that the mesh was attached to in #2 above, <u>with a minimum of 3 half hitches at every third mesh</u>, using no less than #15 black treated nylon twine or equivalent. NOTE: The chafing line may be omitted on the leader of the lightweight net at the purchaser's discretion.

4. Wing and leader bridles, brails, brail lines, lift line and marker, toggle ring (brail ring), and anchor lines are to be attached, and a zipper installed at the house end of the crib, such that the net is "<u>ready to fish</u>."

* Features identified by asterisks are at the net builder's discretion and may be substituted with products that provide equivalent results. Float ropes or metal float cans are <u>not</u> recommended as substitutes for plastic floats. Steel chain is a common and acceptable substitution for weights along the leader - but may increase the total weight of the net.

NOTE: For ESTN - <u>Mesh size and colour should match the ESTN standards & net dimensions should be within at least 10% of the ESTN standards. Record net dimensions on ESTN Trap Net Description - Form 2</u>

ESTN TRAP NET DESCRIPTION - FORM 2

TOP VIEW OF TRAP NET HEAD:

Leader
(attached to
head at gap)

Wing

Wing

Heart

Gap

Heart

House

Tunnel Opening

_____ x _____

Tunnel

Crib
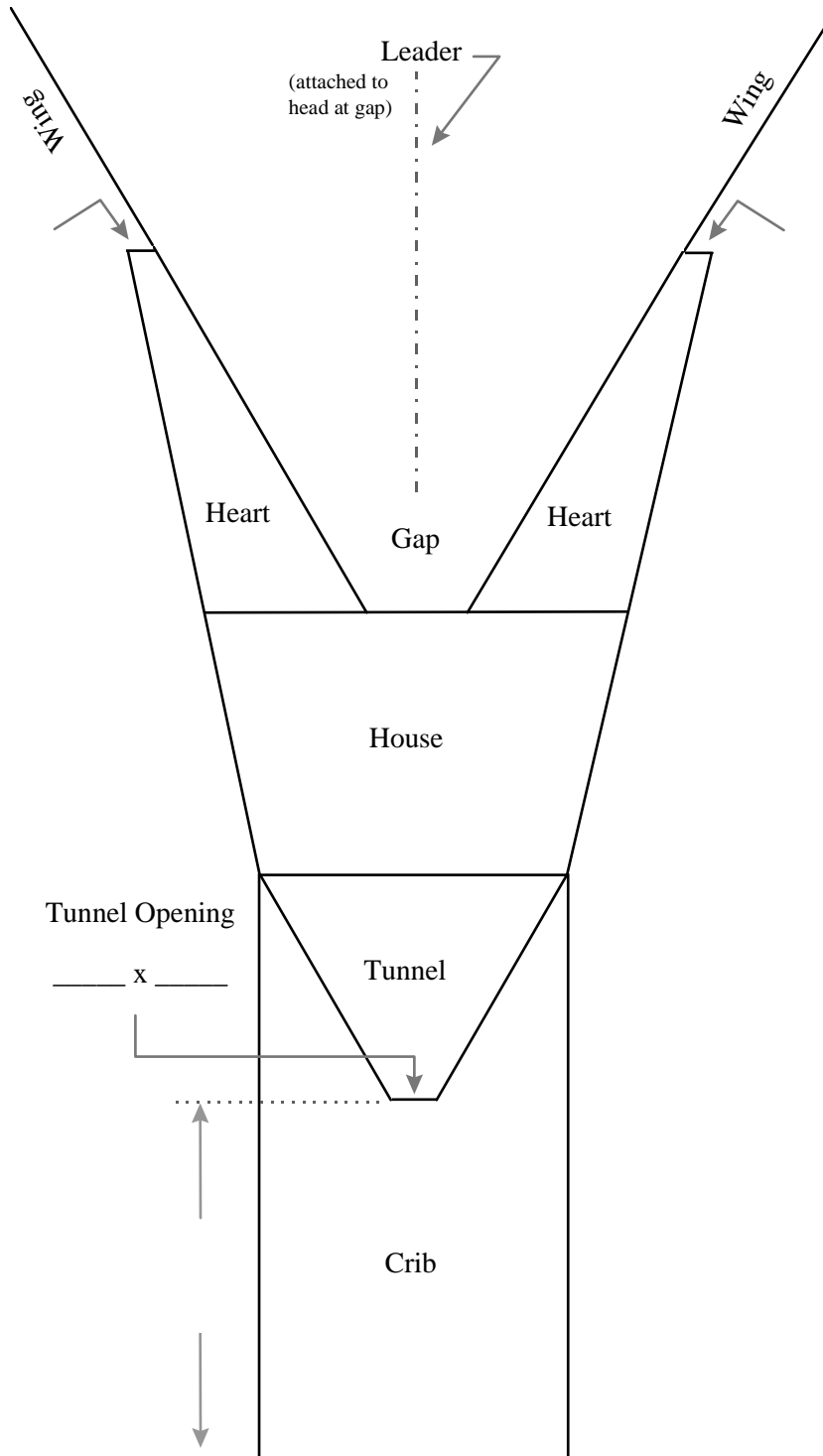
Head ID: _____

Leader ID: _____

Head Height:

_____

Number & Location of Brails:

_____

_____

SIDE VIEW OF TRAP NET LEADER:

Bridle

Rope Extensions for attachment to the head
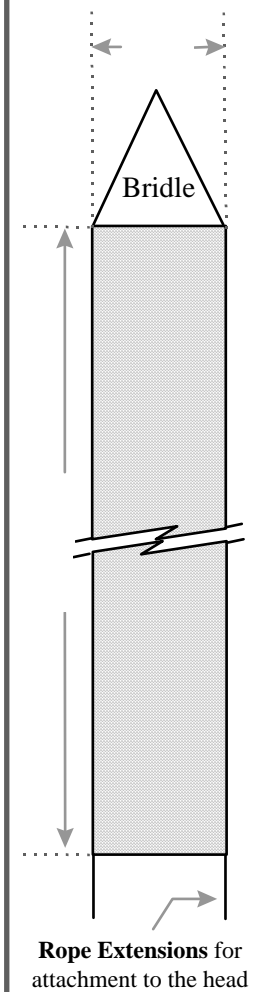
Diagrams Not Drawn To Scale   *(For ESTN - Net dimensions should be within at least 10% of the ESTN standards)*

ESTN - Effort/Catch Form

SITE DESCRIPTION

Project Code	Waterbody Name	UTM or Lat/Long Coordinates		TN Head Tag id #	TN Leader Tag id #	Sample #

Area #	Grid #	Site #	Site Type (substrate)[1]	(fish cover)[2]	Bottom Type[3] (all types 100 m each side of net)	Fish Cover Type[4] (all types 100 m each side of net)

SET DESCRIPTION (recorded at time of set)

Net Set Crew	Set Date (yy.mm.dd)	Set Time (24hh:mm)	Leader Length (30 - 46 m)	Dist. Off Shore (0 - 20 m)	Angle to Shore (70° - 90°)	Start Depth (m)	Mid Depth (m)	Gap Depth (1.7 - 3.5 m)

LIFT DESCRIPTION (recorded at time of lift)

Net Lift Crew	Lift Date (yy.mm.dd)	Lift Time (24hh:mm)	Effort Status[5]	Duration (fishing hours)	Water Temp. (°C)	Secchi Depth (m)	Cloud Cover (in eighths)	Precip. Type[6] (codes 00-95)	Wind Direction (1-360°)	Speed (in knots)

General Weather Through Set

Precipitation[7]	Surface Conditions[8]

FISH CATCH SUMMARY

Species/ Group	Total Catch	# Counted Only	# Length Tallied	# Biosampled	# Marks/Tags Applied	# Marks/Tags Recaptured

COMMENTS

_____

_____

_____

_____

_____

Fish sampling data: Form(s) _____ Scale envelope(s): _____ Length Tallies: _____

[1]Site Type – General Substrate codes:
1=gravel/pebble/sand mix (GP+SA >75%);
2=boulder/rubble/cobble mix (BO+RC >75%);
3= sand (SA >75%);
4=soft mix (SI+MU+DE+ soft CL>75%);
5= bedrock (BE >75%);
6 =other

[2]Site Type – Fish Cover Level codes:
1=no cover; 2=low (1-25%);
3=moderate (25-75%); 4=high (>75%);

[3]Bottom Type codes:
BR = bedrock; BO=boulder;
RC=rubble/cobble; GP=gravel/pebble;
SA=sand; SI=silt; CL=clay; MU=muck;
DE=detritus; MA=marl

[4]Fish Cover Type codes:
BO=boulders; MA=macrophytes;
LT=log/tree;   UB=undercut bank;
OD=organic debris; OT=other;
NC=no cover

[5]Effort Status codes:
1=no problem; 2= minor problem;
3=major problem

[6]Precip. Type codes:
00=no precipitation at lift time; 10=mist;
40=fog; 61=light rain; 65=heavy rain;
71=light snow; 75=heavy snow;
95=thunderstorm

[7]Precipitation Through Set codes:
1=no precip. during set;
2= <4 hrs. of precip.;
3= >4 hrs. of precip.;
4= constant precip.
9= unknown

[8]Surface Conditions Through Set codes:
1=calm waters for entire set duration;
2=mostly calm waters & some rough;
3=mostly rough waters & some calm;
4= rough waters for entire set duration;
9=unknown

ESTN - Fish Sampling Form

Waterbody:_____ Lift Date:_____ Net Location:_____ Sample #:_____

Species/ Group	Fish #	Fork Length (mm)	Total Length (mm)	Round Weight (g)	Age Structures Sampled[1]	Clips Observed[2]	Clips Applied[2]	Tag Ident.	Tag Status[3]	Selection Type[4]

[1]**Age Structures Sampled:** blank=no data, 0=no structure sampled, 1=scales any   side, 2=scales left side, 3=scales right side, 4=pectoral ray   ; 5=pectoral spine, 6=pelvic ray, 7=dorsal spine, A=otolith, B=operculum, C=sub-operculum, D=cleithrum, E=centrum, F=branchiostegal, G=other
[2]**Clips Observed/Applied:** blank=no data; 0=no clip; 1=right pectoral; 2=left pectoral; 3=right pelvic; 4=left pelvic; 5=adipose; 6=anal; 7=anterior dorsal; 8=posterior dorsal, A=lower caudal, B=mid-caudal, C=right opercular, D=left opercular, E=right maxillary, F=left maxillary.
[3]**Tag Status:** Record up to 4 characters as follow s: **First Character** is the tag status code, C=existed on Capture, A=Applied; **Second Character** is the tag disposition code, 0=no change, 1= retied same tag, 2=replaced lost tag, 3=removed, 4=not know n; **Third Character** is the tag condition code,   1= securely tied, 2=some slack, 3=loose, 4=unknow   n; **Fourth Character** is the fish condition code, 1=healed, 2=   bit raw , 3=festering, 4=w ear on fin, 9=unknown
[4] **Selection Type:** 0=not defined in survey, 1=defined in survey

ESTN LENGTH CLASS TALLY FORM – Small Fish (< 400 mm)

Waterbody: _____   **Lift Date:** _____   **Net location:** _____   **Sample #:** _____

Fork Length Class (mm)	Species: _____		Species: _____		Species: _____		Species: _____		Fork Length Class (mm)
	Dot Tally	**Total**	**Dot Tally**	**Total**	**Dot Tally**	**Total**	**Dot Tally**	**Total**	
90 - 99									90 - 99
100 - 109									100 - 109
110 - 119									110 - 119
120 - 129									120 - 129
130 - 139									130 - 139
140 - 149									140 - 149
150 - 159									150 - 159
160 - 169									160 - 169
170 - 179									170 - 179
180 - 189									180 - 189
190 - 199									190 - 199
200 - 209									200 - 209
210 - 219									210 - 219
220 - 229									220 - 229
230 - 239									230 - 239
240 - 249									240 - 249
250 - 259									250 - 259
260 - 269									260 - 269
270 - 279									270 - 279
280 - 289									280 - 289
290 - 299									290 - 299
300 - 309									300 - 309
310 - 319									310 - 319
320 - 329									320 - 329
330 - 339									330 - 339
340 - 349									340 - 349
350 - 359									350 - 359
360 - 369									360 - 369
370 - 379									370 - 379
380 - 389									380 - 389
390 - 399									390 - 399
TOTAL									TOTAL

ESTN LENGTH CLASS TALLY FORM – Large Fish (> 399 mm)

Waterbody: _____ **Lift Date:** _____ **Net location:** _____ **Sample #:** _____

Fork Length Class (mm)	Species: _____		Species: _____		Species: _____		Species: _____		Fork Length Class (mm)
	Dot Tally	Total	Dot Tally	Total	Dot Tally	Total	Dot Tally	Total	
400 - 409									400 - 409
410 - 419									410 - 419
420 - 429									420 - 429
430 - 439									430 - 439
440 - 449									440 - 449
450 - 459									450 - 459
460 - 469									460 - 469
470 - 479									470 - 479
480 - 489									480 - 489
490 - 499									490 - 499
500 - 509									500 - 509
510 - 519									510 - 519
520 - 529									520 - 529
530 - 539									530 - 539
540 - 549									540 - 549
550 - 559									550 - 559
560 - 569									560 - 569
570 - 579									570 - 579
580 - 589									580 - 589
590 - 599									590 - 599
600 - 609									600 - 609
610 - 619									610 - 619
620 - 629									620 - 629
630 - 639									630 - 639
640 - 649									640 - 649
650 - 659									650 - 659
660 - 669									660 - 669
670 - 679									670 - 679
680 - 689									680 - 689
690 - 699									690 - 699
TOTAL									TOTAL