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Manual of instructions for broad-scale fish community monitoring using North American (NA1) and Ontario small mesh (ON2) gillnets

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1.0 PROGRAM OVERVIEW

In 2004, a new Ecological Framework for Fisheries Management (EFFM) was announced in Ontario by the Minister of Natural Resources. The EFFM provides the building blocks for improving the way recreational fisheries are managed by moving away from individual lake management to a landscape approach, where active management of lakes will occur on a zone basis. The main components of the EFFM include regulatory streamlining, enhanced public involvement, and a broad-scale fish community monitoring program which the following methodology has been developed to provide.

The Broad-scale method uses a combination of two types of gillnets:

- "Large mesh" gillnet that target fish larger than 20 cm in length, the size range of interest to anglers;
- "Small mesh" gillnet that target smaller fish (*size range of interest to large fish*)

The Large mesh gillnet (aka North American; NA1) has been proposed by the American Fisheries Society as a standard for sampling angler harvested freshwater species in North America.[1] The Small mesh gillnet (aka Ontario Small mesh; ON2) is a new standard, developed in Ontario. Jointly, the Large and Small mesh gillnets span a mesh size range that is similar to the Nordic gang, a standard that has been adopted in Europe.[2] This combination of gear was proposed as an optimum compromise between North American and European standards. The Large mesh gillnet will supply data that are directly comparable to North American data and the combined use of nets will supply data that are potentially comparable to European data. The separation of the small and large mesh segments into two separate gears offers the advantage of a more flexible design that can be optimized to meet survey objectives.

[1] Bonar, S. A., W.A. Hubert, D. W. Willies. 2009. Standard Methods for Sampling North American Freshwater Fishes. American Fisheries Society, Bethesda, Maryland. 459 pp.

[2] Appelberg, M. 2000. Swedish standard methods for sampling freshwater fish with multi-mesh gillnets. Fiskeriverket Information 2000:1. 29pp.

2.0 FIELD METHODOLOGY

2.1 PROGRAM DESIGN SUMMARY

Table 1. Basic details of the North American / Large mesh (NA1) and Small mesh (ON2) methodology

Sampling Season	Surface water temperature greater than 18°C
Set Duration	Large Mesh: min sixteen hours; max twenty two hours Small Mesh: min twelve hours; max twenty two hours
Gear Length	Large Mesh: 49.6m (8 mesh sizes per gang x 3.1m panels x 2 gangs) Small Mesh: 25.0m (5 mesh sizes per gang x 2.5m panels x 2 gangs) *with option for use of single gang net*
Gear Height	Large Mesh: 1.8m (option of 0.9m for 1-3m stratum) Small Mesh: 1.8m (option of 0.9m for 1-3m stratum)
Mesh Series	Large Mesh: 38, 51, 64, 76, 89, 102, 114, 127 (stretch mm) Small Mesh: 13, 19, 25, 32, 38 (stretch mm)
Mesh Order	Non sequential single series
Set Orientation	Perpendicular or oblique to contours
Depth Stratification	1-3m, 3-6m, 6-12m, 12-20m, 20-35m, 35-50m, 50-75m, >75m
Spatial Stratification	Effort equally distributed over entire lake
No. Samples per Lake	Varies with lake size and maximum depth
No. Sets per Day	Large Mesh: 4 or 6 double strap sets Small Mesh: 2 or 4 double strap sets

2.2 PROJECT TIMING

Surveys should be conducted when surface water temperature is greater than 18 degrees Celsius, and concluded when temperature drops below 18 degrees Celsius. Ideally, it is recommended that sampling take place during the four to six week period of maximum summer water temperature.

2.3 GEAR TYPE

2.3.1 Gear Description

Table 2. Summary of the North American (A) and Ontario Small mesh (B) gillnet construction.

A

North American / Large Mesh Gillnet								
Stretch measure (in)	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
Stretch measure (mm)	38	51	64	76	89	102	114	127
Mono diameter (mm)	0.28	0.28	0.28	0.33	0.33	0.33	0.40	0.40
Series Order	5	3	7	1	4	8	2	6
Panel length (m)	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Panel length (ft)	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2
Panel height (m)	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Panel height (ft)	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
Mono color	clear							
Float line	13 mm (1/2 in)							
Lead line	no. 27 (27lbs/300 ft)							
Mesh labels	yes (mm)							

B

Small Mesh Gillnet					
Stretch measure (in)	0.50	0.75	1.00	1.25	1.50
Stretch measure (mm)	13	19	25	32	38
Mono diameter (mm)	0.10	0.13	0.13	0.15	0.15
Series Order	4	2	5	1	3
Panel length (m)	2.5	2.5	2.5	2.5	2.5
Panel length (ft)	8.2	8.2	8.2	8.2	8.2
Panel height (m)	1.8	1.8	1.8	1.8	1.8
Panel height (ft)	5.9	5.9	5.9	5.9	5.9
Mono color	clear				
Float line	10 mm (3/8 in)				
Lead line	no. 30 (15lbs/300 ft)				
Mesh labels	yes (mm)				

2.3.1.1 North American / Large Mesh (Gear Code 1)

Throughout this manual the following standard terms will be used to identify the various components of the index gear:

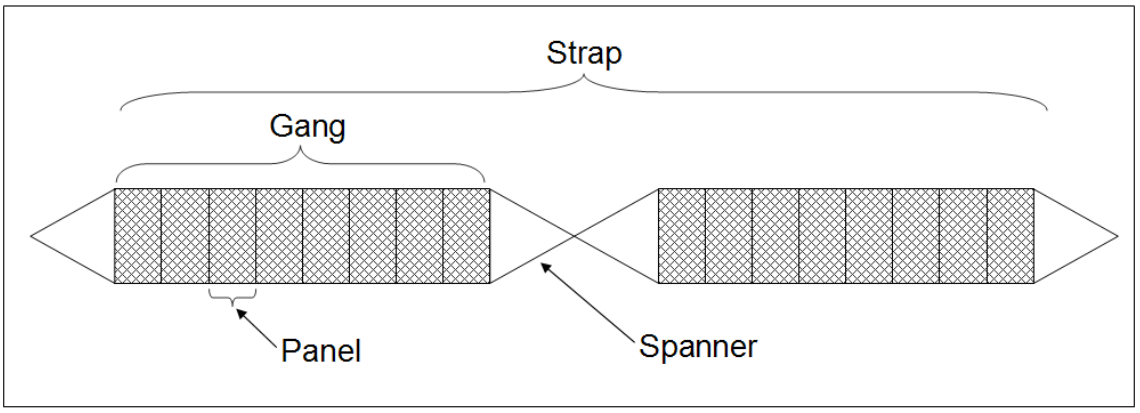


Figure 1. Terminology used in the manual to describe the fishing gear components

Large mesh gangs are 24.8 m long (8 mesh sizes x 3.1 m panels) by 1.8 m high and have the following stretch mesh sizes; 38mm (1.50”), 51mm (2.00”), 64mm (2.50”), 76mm (3.00”), 89mm (3.50”), 102mm (4.00”), 114mm (4.50”) and 127mm (5.00”). All panels in the gang are sewn together and hung on the half (two metres of mesh to one metre of lead line). All mesh sizes use double knotted construction. Mesh panels are non-sequentially arranged in a single series.

The recommend configuration, for all lake sizes, is a double gang strapped (joined) at the ends of the spanners (Figure 1). Gangs should be separated by a combined spanner length of between two to three meters. Panels on either side of the join should not be the same. There is also an option to fish single straps (one gang) in very small lakes with narrow strata, or where situations warrant (e.g., sensitive lakes, overwhelmingly large catches).

It is important that on receiving a new order of gangs from the manufacturer that several of these are randomly chosen and closely inspected to ensure they generally meet the specifications outlined in the Table 2. A list of potential suppliers is provided in Appendix III.

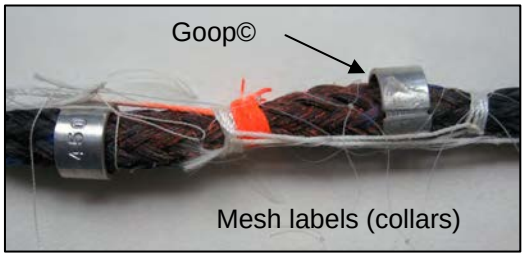
2.3.1.2 Ontario Small Mesh (Gear Code 2)

Small mesh gangs are 12.5m long (5 mesh sizes x 2.5m panels) by 1.8 m high with the following mesh sizes; 13mm (0.50”), 19mm (0.75”), 25mm (1.00”), 32mm (1.25”) and 38mm (1.50”). Similar to the Large mesh gang, the panels in the gang are sewn together and hung on the half (5m of mesh to 2.5m of lead line). All mesh sizes use double knotted construction, except for the 13-25 mm panels which are single knot (diameter is too fine for double knot), panels are non-sequentially arranged in a single series.

The recommended configuration, for all lake sizes, is a double gang strapped (joined) at the ends of the spanners. Gangs should be separated by a combined spanner length of between two to three meters. Panels on either side of the join should not be the same. There is also an option to fish single straps (one gang) in very small lakes with narrow strata, or where situations warrant (e.g., sensitive lakes, overwhelmingly large catches).

2.3.2 Float and Lead Line

Large mesh gangs are constructed using 13mm (0.5 inch) braided float line and the Small mesh with 10mm (.38 inch) braided float line. The Large mesh gang uses a Number 27 lead line (27lbs/300ft or 12.3 kg/91 m) and the Small mesh a Number 30 lead line (15lbs/300ft or 6.8 kg/91m).



The end of each panel is clearly labeled with a corresponding mesh size (mm) on a metal band and the division identified with a distinctive colour mark. To prevent the band from snagging in the gang, the seam is sealed by the manufacturer using a waterproof adhesive such as marine Goop©.

2.4 SET ORIENTATION

Both gear types are set on bottom (benthic) and orientation is perpendicular or oblique to the contours and should not be set parallel unless this is the only option available. The end of the gang (e.g., either the 76 mm or the 102 mm panel) that is set closest to shore should be randomly assigned. For both gear types, the gang closest to shore will be assigned as Gang 1 when recording data.

2.5 DEPTH STRATA

Individual sets should not be allowed to span more than one depth stratum. Strata representing less than 5% of surface area should be combined and sampled with the adjacent shallower stratum. Minimum set depth for both the Large and Small gangs is one metre. In situations where the dissolved oxygen profile indicates regions of anoxia (< 2 ppm), these strata (um) should receive a minimum of two sets of each gear type. If the absence of fish is confirmed, then remaining effort can be reallocated equally to remaining strata, or omitted completely if there is a need to minimize sampling time or mortality.

Table 3. Depth strata sampled by each gear

Strata ID	Strata Depth(m)	Large Mesh	Small Mesh
1	1-3 m	✓	✓
2	3-6 m	✓	✓
3	6-12 m	✓	✓
4	12-20 m	✓	✓
5	20-35 m	✓	✓
6	35-50 m	✓	✓
7	50-75 m	✓	✓
8	> 75 m	✓	✓

2.6 DURATION OF SET

The period of sampling for both Large and Small Mesh effort spans the hours of 13:00-17:00 (set) and 8:00-11:00 (lift), in such a way that soak time is a minimum of 16 hours up to a maximum of 22 hours (target duration is 18hrs). There is an option for a minimum set time of 12 hours for Small mesh only in situations where late arrival at a lake may not permit setting before 17:00. However, all Small mesh sets must fish overnight and include both crepuscular periods (i.e., set no later than one hour before sunset and lifted no earlier than one hour after sunrise).

2.7 ALLOCATION OF EFFORT

2.7.1 Allocation to Area Stratum

Both Large and Small mesh sets should be allocated equally as possible to all regions of the lake. Dividing lakes up into a number of approximately equal-sized Area (sectors) strata and allocating the required samples similarly among these is the best approach to spatially allocate the sample. Although not required for smaller lakes, for large lakes that are sub-divided into Sample Areas for logistical reasons, each should be assigned a value of 1-10 (see 2.15.3 for discussion on recording effort and catch by Area). Typically, this is necessary for lakes >3000 hectares. In large lakes where travel time may prevent the full spatial extent of the lake, or sample area, to be sampled each day, sites may be grouped into manageable clusters as an acceptable compromise; however, gangs should not be set simultaneously within 250 m of each other. In very small lakes, where this interval may be difficult to achieve, neighboring sets should be set at right angles to one another. The sample sites assigned to a lake should only be fished once (not re-used) during the course of the project.

2.7.2 Allocation to Depth Stratum

Allocation of Large Mesh effort must cover all depth strata present in a lake and each stratum should receive at least two sets to permit calculation of stratum variance. The minimum strata sampling requirements by lake size, intended target species and maximum stratum depth (i.e. deepest stratum with >5% surface area) for Large and Small mesh are presented in Tables 4 and 5 for lakes up to 10K hectares. For lakes greater than 10K hectares, a formula is provided at the bottom of the Large mesh table (Table 4) to calculate appropriate sample size. These sets should be allocated to the strata in similar proportions as for 5-10K lakes of comparable maximum depth. A sample size of 30 Small mesh sets should be used for lakes greater than 10K hectares and these distributed representatively around the lake. Additional sets in core walleye, brook trout and lake trout strata (as revealed by sampling) can be done if a more detailed assessment of these species is a project requirement. However, this additional effort should only be done once the minimum sampling requirement has been met for all strata.

It is very important that the stratum's effort be allocated 'across' each stratum, particularly for the 6-12m stratum where the thermocline typically resides. To accomplish this, half of the allocation should target the shallower half and the remainder the deeper half of a stratum by varying the start depth (e.g., shallow = 20-27m & deeper = 27-35m). Gangs are allowed to span the two sub-strata; however, the exception is for the 6-12m stratum, if this includes the thermocline. For this stratum, attempt should be made to allocate an equal number of sets above and below the top of the thermocline, but these sets should not be allowed to cross the top of the thermocline. Hence, it is very important to complete an accurate temperature profile before any sets are made in depths greater than six metres.

Sets in the 1-3 m stratum should alternate being set at 1m start depth and proceeding deeper and setting at 3m and proceeding shallower. This will help to remove potential bias of the 1-2m portion being sampled disproportionately more than the 2-3m portion, or visa versa.

Assignment of both the Large mesh and Small mesh effort to the 1-3 m stratum can be done prior to the start of a project. This will be particularly useful for lakes with no bathymetry as these sites can be fished initially while the bathymetry is collected for creation of the sampling map. To standardize between lakes with numerous islands and others with few or none, this allocation should be confined to just the lake perimeter shoreline.

Occasionally, it may not be possible to keep the strap fully within the intended stratum (e.g., lake has very small narrow stratum). Where relocation to a more suitable area is not possible, then the strap may be permitted to enter the adjoining stratum. In these situations, it is imperative that the start, mid and end depths are recorded for the effort so that the most representative stratum (i.e., one containing the mean depth) can be assigned.

For each of the sample days, gangs should be set in all of the available strata as equally as possible (i.e., do not set all gangs in one stratum, unless there is only one). For lakes where catch rates are suspected to be high, it is good practice to set one or two sets in each available stratum first (i.e., don't concentrate the first round of samples in any particular stratum).

Small Mesh straps/gangs should not be fished in association (joined or < 250m from) with Large Mesh straps/gangs to minimize the possibility that small fish caught in these gangs could attract predatory fish into the area, increasing the catchability of the Large Mesh gear.

Table 4. Recommended North American (Large mesh) minimum strata sample size by lake area (hectare), maximum depth stratum with >5% area in lake and the intended target species. **The variable allocation should be used for lakes selected for both walleye and lake trout.** Use maximum lake depth if stratum areas are unknown

		Walleye and Brook Trout							Lake Trout							Variable						
		Maximum Stratum with >5% of Surface Area							Maximum Stratum with >5% of Surface Area							Maximum Stratum with >5% of Surface Area						
	Stratum	3-6	6-12	12-20	20-35	35-50	50-75	>75	3-6	6-12	12-20	20-35	35-50	50-75	>75	3-6	6-12	12-20	20-35	35-50	50-75	>75
5-50 ha	1-3 m	4	3	2	2	2	2															
	3-6 m	4	3	2	2	2	2															
	6-12 m		2	2	2	2	2															
	12-20 m			2	2	2	2															
	20-35 m				2	2	2															
	35-50 m					2	2															
	50-75 m						2															
	> 75 m																					
	Total	8	8	8	10	12	14															
50-500 ha	1-3 m	7	5	4	3	3	3	3	4	2	2	2	2	2	2	6	4	3	2	2	2	2
	3-6 m	4	4	3	3	3	3	3	7	2	2	2	2	2	2	5	4	3	3	3	3	3
	6-12 m		2	2	2	2	2	2		7	4	4	3	3	3		3	3	3	3	3	3
	12-20 m			2	2	2	2	2			3	2	3	3	3			2	2	2	2	2
	20-35 m				2	2	2	2				2	2	2	2				2	2	2	2
	35-50 m					2	2	2					2	2	2					2	2	2
	50-75 m						2	2						2	2						2	2
	> 75 m							2							2							2
	Total	11	11	11	12	14	16	18	11	11	11	12	14	16	18	11	11	11	12	14	16	18
500-1500 ha	1-3 m	7	6	5	5	5	5	4	4	2	2	2	2	2	2	6	4	3	2	2	2	2
	3-6 m	5	5	4	4	4	4	4	8	2	2	2	2	2	2	6	5	4	4	4	4	4
	6-12 m		3	3	3	3	3	4		10	6	4	3	2	3		5	4	4	4	4	4
	12-20 m			2	2	2	2	2			4	5	4	4	4			3	3	3	3	3
	20-35 m				2	2	2	2				3	4	5	3				3	3	3	3
	35-50 m					2	2	2					3	3	3					2	2	2
	50-75 m						2	2						2	3						2	2
	> 75 m							2							2							2
	Total	12	14	14	16	18	20	22	12	14	14	16	18	20	22	12	14	14	16	18	20	22
1500-5000 ha	1-3 m	9	7	7	7	7	5	5	8	2	2	2	2	2	2	7	5	4	3	3	3	3
	3-6 m	5	6	5	5	6	6	5	6	2	2	2	2	2	2	7	6	5	5	5	5	5
	6-12 m		4	4	4	4	6	5		13	8	4	3	2	2		6	5	5	5	5	5
	12-20 m			2	3	3	3	5			6	8	5	4	4			4	4	4	4	4
	20-35 m				2	2	2	2				5	8	7	6				4	4	4	4
	35-50 m					2	2	2					4	5	6					3	3	3
	50-75 m						2	2						4	4						2	2
	> 75 m							2							2							2
	Total	14	17	18	21	24	26	28	14	17	18	21	24	26	28	14	17	18	21	24	26	28
5000-10000 ha *	1-3 m	10	11	9	9	7	8	9	2	2	2	2	2	2	2	8	6	5	4	4	4	4
	3-6 m	7	8	8	7	7	7	8	15	6	2	2	2	2	2	9	8	7	7	7	7	7
	6-12 m		3	5	8	10	9	7		14	9	5	2	2	2		8	7	7	7	7	7
	12-20 m			2	2	4	4	4			11	9	7	6	5			5	5	5	5	5
	20-35 m				2	2	2	2				10	12	10	7				5	5	5	5
	35-50 m					2	2	2					7	7	9					4	4	4
	50-75 m						2	2						5	6						2	2
	> 75 m							2							3							2
	Total	17	22	24	28	32	34	36	17	22	24	28	32	34	36	17	22	24	28	32	34	36

* **>10 K(ha)** $= 0.0987(Lake\_Area)^{0.2581}$ × Allocation for a 5-10K hectare lake of similar depth

Table 5. Recommended minimum Ontario Small mesh strata sample size by lake area (hectare) and maximum depth stratum with >5% area. **Important:** Additional sets can be done if a more detailed assessment of species composition is a project requirement. However, this additional effort should only be done once the minimum sampling requirement has been met for all strata.

Small Mesh

		Maximum Stratum with >5% of Surface Area						
	Stratum	**3-6**	**6-12**	**12-20**	**20-35**	**35-50**	**50-75**	**>75**
5-50 ha	**1-3 m**	2	2	2	2	2	2	
	3-6 m	2	2	2	2	2	2	
	6-12 m		2	2	2	2	2	
	12-20 m			2	2	2	2	
	20-35 m				2	2	2	
	35-50 m					2	2	
	50-75 m						2	
	> 75 m							
	Total	**4**	**6**	**8**	**10**	**12**	**14**	
50-500 ha	**1-3 m**	3	3	3	3	3	2	2
	3-6 m	3	3	3	3	2	2	2
	6-12 m		2	2	2	2	2	2
	12-20 m			2	2	2	2	2
	20-35 m				2	2	2	2
	35-50 m					2	2	2
	50-75 m						2	2
	> 75 m							2
	Total	**6**	**8**	**10**	**12**	**13**	**14**	**16**
500-1500 ha	**1-3 m**	4	4	4	4	3	3	3
	3-6 m	4	4	4	3	3	3	3
	6-12 m		3	3	3	3	2	2
	12-20 m			2	2	2	2	2
	20-35 m				2	2	2	2
	35-50 m					2	2	2
	50-75 m						2	2
	> 75 m							2
	Total	**8**	**11**	**13**	**14**	**15**	**16**	**18**
1500-5000 ha	**1-3 m**	5	5	5	5	5	4	4
	3-6 m	5	5	5	4	4	4	4
	6-12 m		4	4	4	3	3	3
	12-20 m			3	3	3	3	3
	20-35 m				2	2	2	2
	35-50 m					2	2	2
	50-75 m						2	2
	> 75 m							2
	Total	**10**	**14**	**17**	**18**	**19**	**20**	**22**
5000-10000 ha *	**1-3 m**	6	6	6	6	6	5	5
	3-6 m	6	6	6	5	4	4	4
	6-12 m		5	5	4	4	4	4
	12-20 m			4	4	4	4	4
	20-35 m				3	3	3	3
	35-50 m					2	2	2
	50-75 m						2	2
	> 75 m							2
	Total	**12**	**17**	**21**	**22**	**23**	**24**	**26**

*** >10K = 30 sets**

2.8 PRE-SURVEY PREPARATION

Established procedures should be followed for attaining permission to conduct a survey on the intended lake and relevant management agencies/cottage groups/ should be notified well in advance of fieldwork.

Safety and operation protocols must follow MNR **Marine Safety Program Policy** and should be carefully reviewed by the crew and manager prior to the field work and revisited periodically during the program. Working in boats during the height of summer can expose crews to heat related injuries. Sunscreen, sunglasses, hat, life jacket, long sleeve shirt and water bottle should be part of every crew member's personal onboard equipment.

Gangs should be neatly packed/loaded into tubs (with holes for drainage) prior to heading out onto the water, or before setting a gang. This is most easily accomplished by two people feeding the gang into the bin/tub, keeping the lead line on one side and float line on the other. If gangs will be fished as a strap, these should be joined prior to setting and loaded into the tubs as such. Tubs and the bow of boats should be checked for snags/burrs ahead of time and these removed so that gangs flow smoothly out and aren't inadvertently damaged during setting and pulling. A flat file should be included in the sampling kit for grinding down burrs that may occur from time to time from anchors knocking against the gunnels. Covering exposed rivets with a small flat spot of clear marine Goop © (available at Canadian Tire) in areas where the gang may contact the boat as it is set or retrieved will be helpful. Use of duct or other types of tape is not advised (other than as a quick fix) as tape will often begin to detach over time and the lifted edges will themselves become a source of snagging.

Assembling a selection of rope of varying lengths, labelled at each end with dimensions, and assigned to appropriately labelled tubs/pails, make sorting and setting much easier. Sinking rope will reduce the possibility of any excess floating at the surface becoming a navigational hazard. Braided 3/8" nylon "yacht" rope has been found to work extremely well: it sinks, does not tangle unduly, lies nicely in pails and the larger diameter provides for better grip when pulling.

All floats should be clearly marked with agency name and contact number and should include a caution that it is attached to scientific equipment and lifting and/or removal is prohibited. Appendix XII contains English and French versions of a label that could be used. Floats should be yellow in colour, if possible, as this is a universal navigation colour indicating caution. Gangs set in shallow water where there is less than two metres of water above the float line should use floats that have yellow reflector tape attached. It is also advised to add/clip several smaller floats, also with reflector tape, along the float line between the two primary floats. A flashing amber light(s) attached to the primary floats can also be used if risk to navigation is high. However, it is strongly advised that no nets be placed in high nighttime traffic areas in water < 4m. Effort should be made to advise the public, who are in the general area where work is being conducted. This especially pertains to anglers who may snag on the gear if they unknowingly fish near the marker float(s).

An important consideration in setting the gangs correctly is anchor weight. Using too heavy an anchor will adversely affect the way the gang is set and may unnecessarily fatigue the crew. In addition, heavy anchors can place excessive tension on the gang which could negatively affect catchability of the gear. It is advised that anchors not exceed two kilograms in mass for the Large mesh gangs, often only half this will be sufficient (e.g., 5 or 6 links of 10mm grade 70 chain). Additional anchor weight is likely not needed for strapped effort.

Forms should be photocopied onto write-in-the-rain paper and placed in a coverable clipboard. A knife sharpened HB pencil is recommended for recording. Appendix VI contains code strips which can be printed, laminated and affixed to clipboard as a reference aid for data entry.

All crew members should receive training on species identification prior to the start of a project. Development of a reference collection during earlier projects should be undertaken by any office/agency who might regularly be conducting this type of survey. Crews should be acutely familiar with the possible Species at Risk (SAR) they may encounter and be able to readily identify these. Whenever possible, capture of these should be minimized (i.e., re-distributing stratum effort or site location) and live individuals should be released once relevant information is recorded. If the species at risk is not known from the lake then there is need to preserve a sample. The new record is invalid without a confirmed voucher.

Identification of cyprinids will be the most challenging aspect to sorting the catch, and crews will need the ability to preserve unknown samples for later examination (preservative and unbreakable containers) (see Section 2.14.3.3 for more information).

Ontario species codes are provided in Appendix IV (organized by code with Latin name) and Appendix VII (field sheet; organized by common name). A laminated copy of this should be part of the field sampling kit.

2.9 SECCHI DEPTH

Secchi depth provides a measure of water transparency. It is collected as a simple and inexpensive way to gather long-term comparative data that reflects the trophic status of a water body. The Secchi depth is determined as the depth mid-way between where the disc first disappears on descent and then reappears with recovery (Hutchinson 1957 in Clark 1996).

A secchi depth reading should be collected at the deepest location of the lake using the following procedure:

1. When possible, take reading during the time period of 11:30-14:00
2. Lower the Secchi disk until it disappears. Note the depth.
3. Raise the disk until it reappears and note this depth.
4. The Secchi depth is midway between these two depths.
5. Record to nearest 1/10th metre (e.g. 4.1m).
6. Make observations on the shady side of the boat and **do not wear sunglasses**.
7. There is no need to anchor the boat or plane. If you have trouble with drifting, the Secchi depth can be an approximation. Simply use an estimated depth based upon the angle of the Secchi line and record that Secchi depth was an approximation.

In lakes with multiple distinct basins, Secchi reading should be completed as described above in each of these. The Temperature and Dissolved Oxygen Profile Form should be used to record this for each basin.

2.10 TEMPERATURE and OXYGEN PROFILES

Oxygen and temperature profiles are recorded in-situ using a digital YSI oxygen/temperature meter at the deepest location of the lake. Measurements should be observed and recorded at 0.5 m (surface), at 1.0 m intervals from 1.0 m to 16 m and at 2.0 m intervals to 35 m. Where lake depth exceeds 35 m, one measurement should be taken approximately halfway between 35 m and bottom and 1 m off bottom, or to the maximum extent of cable.

Operation of oxygen/temperature meters should follow instructions laid out in the owner's manual. Several universal cautions should, however, be observed. Oxygen/temperature probes must be left

at the desired depth long enough to equilibrate. This process may take several minutes at very low oxygen concentrations although newer meters equilibrate much faster than older models. Probes without stirrers will have to be gently “jigged' to ensure a movement of water across membrane surfaces. Anoxic conditions can ruin the probe membranes, thus, the probe should be left for minimal time where these conditions exist. It is not necessary to verify anoxic conditions between where they are first encountered and the bottom since anoxic water will not overlay more oxygenated water. The probe will still have to be lowered through anoxic layers if temperature data is required, but this can be done more quickly if only the temperature data is recorded. Temperature and dissolved oxygen data is recorded on the Temperature and Dissolved Oxygen Profile Form.

In lakes with multiple distinct basins, temperature and oxygen profiles should be completed, as described above, in each of these. A separate Temperature and Dissolved Oxygen Profile Form should be used to record this for each basin.

Oxygen Meter Calibration

Oxygen meter membranes should generally be changed monthly. The need to change the membrane will be evident by difficulties encountered during the calibration procedure. Membranes should be changed when meters cannot hold calibration. Meter calibration for most models is by air saturation. Care should be taken to complete the air calibration at a time when the temperature of the sensor is constant. This is best done in the lab prior to each use when the meter and probes have been at room temperatures overnight.

For further information on secchi and temperature and oxygen measurements see Clark B. 1996. **Limnological Sample and Data Collection Methods Used by The Muskoka Lakes Aquatic Assessment Unit.** Ontario Ministry of Environment and Energy: 30 pp.

2.11 SETTING GANGS

It is important that the gang remain fully within the stratum. Before setting the gang, it is a good practice to make an initial pass of the intended location while viewing the area on the depth sounder, to ensure the gang will fit fully within the depth stratum. The gang is deployed by first throwing out a float along with the rope making sure that there is enough line to reach bottom with some to spare; this will prevent the gang from being lifted off the bottom by wave action. Clip or tie the end of this rope to the anchor and then to the first spanner, drop overboard and start paying out the gang as the boat begins to back up very slowly. Periodically spread the float and lead line apart to check that they aren’t twisted. Setter(s) should indicate to the driver (or recorder) when the middle of the gang is reached so that UTM coordinates can be recorded or marked. The driver should provide a depth to the setter(s) as the end of the gang is reached so the appropriate amount of rope is used for the second float. Clip or tie the end spanner to the anchor and fasten the rope to this and drop overboard. Pay out all the rope quickly while the boat is maintained in position. Once all the rope is out, the boat should continue reversing in a straight line. Holding onto the rope near the float, pull the gangs until snug, not tight. Ensure that both floats are bobbing loosely on the surface. It is highly advised that two floats be used on each set, one per end, as it is inevitable that during the course of a project a float line will become detached or a float sunk by accidental use of insufficient line. A dry gang may take a few minutes to sink while the braided float line fills with water for the first time, the crew should remain until the gang has submerged enough not to be a hazard to navigation.

The gang should be set in as straight a line as possible, as it is exceedingly difficult to straighten a gang once more than 50% of it is deployed. An overly arced gang will likely have to be retrieved into the boat before being reset straight. The primary cause of a ‘bent’ set is an incorrectly packed gang, pausing during setting to untangle a gang on a windy day will often have this result.

2.12 RETREIVING GANGS

Double check depths and coordinates before lifting the first anchor to make sure you are pulling the right gang. Approach the downwind float and retrieve into the boat. A boat hook is a useful item to include in the list of onboard equipment. Pull in the rope, depositing it directly into the appropriately labelled pail or tub. This will ensure that it goes back out tangle-free on the next set and doesn't interfere with current retrieval. Pulling in the net should be done by two people, one pulling in the lead line while the other pulls the float line.

From time to time nets will suffer some amount of damage and an attempt should be made to close holes as they appear. Simply crudely cinching the hole closed with a piece of monofilament is all that is usually needed. Sometimes hole(s) are too big or numerous to be fixed in the field and require the whole panel to be replaced, the following are general rules of thumb for when a gang should be decommissioned and sent out for repair:

a) Large mesh – the equivalent of four basketball or 12 softball sized holes in any one panel
b) Small mesh – the equivalent of two basketball or six softball sized holes in any one panel

Crews should routinely record notes on the general condition of a net after each set in the comment field of the appropriate Set and Effort Form (number of softball/basketball holes in strap). Damaged nets should be dried and placed in a bag suitable for shipping. If possible, a description of damage (which mesh panel(s) and extent in units of softball or basketball) should be included on the bag's label.

2.13 PROCESSING CATCH

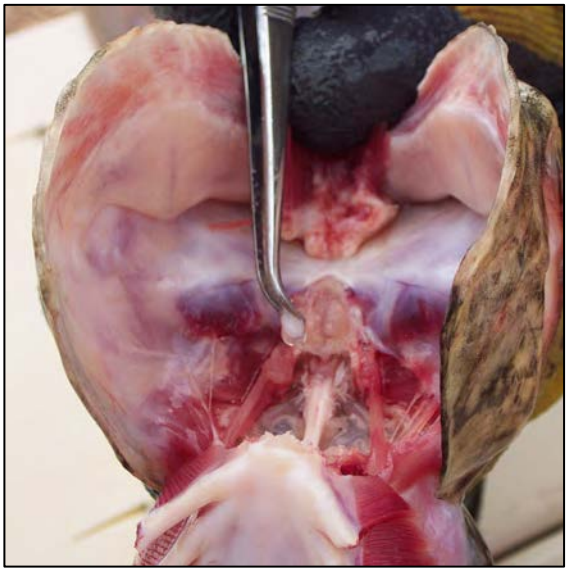
The **MNR Fisheries Animal Care Class Protocols** developed for this program should be consulted for information on the proper protocol for handling live fish samples (Appendix XI).

Fish sampling requirements differ between Large mesh and Small mesh sets, the important distinction being, Small mesh catch will be recorded by gang (which net in the strap) but this level of information is not required for Large mesh effort. Thus, once the set is onboard, catch from both Large mesh gangs in a particular strap can be removed and combined into a single holding tub prior to any processing. In contrast, the catch from each gang in a Small mesh strap will need to be kept separate in two pails/tubs and these must be labeled as to which was the gang closest to shore (*Gang* = [1]; see below). For both Large and Small mesh effort, panel (mesh size) information is optional. Sets may be picked up collectively then processed, or lifted and processed in turn, whatever is easiest and most efficient.

Fish that fall out of net before reaching the boat, alive or dead and cannot be retrieved for processing, should be ignored (i.e., omitted from catch records).

All fish from Small mesh are measured for fork length (mm), as they are for Large mesh, but do not require any other biological sampling as part of the general program, including larger(>200 mm) fish that may be captured incidentally. If there is a specific project requirement to collect detailed information from any or all of the Small mesh catch then this is to be entered on the Detailed Fish Form. If both forms (i.e., Detail and Length Sample) are used within a particular Effort, then the information should not be duplicated.

Table 6 provides a summary of the **minimum** data requirement of the general program, and a copy of this should be included in the field sample kit. A key sampling requirement of the Large mesh effort is the mandatory detailed dead sampling of the first 50 Primary Species (plus, all remaining individuals of these species in the effort containing the 50th fish) and first 20 Secondary Species (plus remainder in the effort containing the 20th fish) caught in each lake survey. These fish receive a Sel (select) code of 1. The purpose of this is to ensure that this initial partial sample of weights and ages across all projects within a zone approximates a random sample. Additional detailed bio-sample collection beyond the above stated minimum is up to the discretion of the project lead(s**). However; any dead key species (walleye, lake trout and brook trout) should be sampled fully (lth, wt, ageing structures, etc.) whenever possible.** If sampling catch above the stated mimimums, effort should be made to sample a wide selection of sizes caught. Once the mandatory dead sample is collected, and there is a need to do so, any live fish can be released after being measured, if it is believed the fish has a good chance of surviving. Note: Partial, highly desiccated, or fish <100mm should not have round weights taken.



After fish have been biologically processed, catch by species (and gang if required) should be totaled from the biological form(s) and this information recorded in the appropriate spot on the Effort Catch Form (see Section 2.15.3) to ensure counts on these two forms match.

Contaminant samples should be collected following guidelines provided in Appendix II. These can, but don't necessarily have to, include fish from the initial mandatory dead sample. Care should be taken to collect a representative sample spanning the range of fish sizes observed. The first twenty fish caught may not necessarily provide a suitable selection, so some opportunistic sampling of fish over the duration of the project may be necessary.

Minimum requirements for contaminant sampling are:

1. Fish must be >150mm total length; wide range of sizes preferred
2. Sample size: target = 10, maximum = 20, minimum = 3
3. BsM code, effort and fish number and species code must be recorded on sample label in indelible ink or pencil and placed inside the plastic whirl pack. The BsM code should then also be written in indelible ink on the outside of the bag.
4. Samples collected over the range of fish sizes observed
5. Individual fish samples must be packaged separately and grouped by lake.

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 (refer to Appendix VIII). 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 ten scales from below the lateral line and posterior to the insertion of the pectoral fin. For soft rayed fish (northern pike, salmonids, coregonids, etc.) remove at least twenty scales from above the lateral line and anterior to the dorsal fin. The scale sample being requested from the key species is to provide future opportunity for DNA analysis; hence,

properly cleaning the sampling knife between fish is very important. Where time permits, the collection of scales samples from other non-key species for DNA analysis is encouraged (n=10-25 per species). For a detailed description of collection methods for fish calcified ageing structures refer to: Mann, S.E. 1992. **Collection techniques for fish ageing structures (northwest region).** Technical Report #73. Ontario Ministry of Natural Resources, Northwest Region Science and Technology Unit, Regional Ageing Laboratory, Dryden, Ontario. 20p.

A common problem that crews will experience with clearing overnight sets will be that fish are often in advanced stages of decay due to the long retention time in warm water and will be difficult to remove intact and measure. In these situations, an approximate fork length will suffice. Species too decomposed to be identified should be recorded using the family code (e.g., Cyprinidae = 180; see Appendix IV), if discernable, otherwise unidentifiable species should be recorded as SPC = 900. Unknown species should be recorded as 000 (see section 2.14.3.4 for more information on preserving and recording information on unknowns).

Table 6. **Minimum** sampling requirement from Large mesh effort. The "Min Sam" refers to the first n (50 or 20) individuals captured in the survey, along with all remaining fish of this species caught in the effort containing the n^{th} fish. These must be sacrificed and sampled for measurements and structures indicated (i.e., check marks) and identified with a Sel=1 code. Applying more specific gonad coding (Appendix I), than the mimimum level identified below table, is permited if this classification is certain.

All fish caught must be measured for fork length and detailed biological samples collected as follows:

	Fish Species	Spc Code	Min Sam (first n)	RWT	Sex	Gonad Cond.	Aging Structures				Genetic
							OT	Scales	Rays	Cleithra	
Primary Species	Brook Trout	080	50	✓	✓	✓	✓	✓			✓ (max 50)
	Lake Trout	081	50	✓	✓	✓	✓	✓			✓ (max 50)
	Lake Whitefish	091	50	✓	✓	✓	✓	✓			
	Northern Pike	131	50	✓	✓			✓		✓	
	Smallmouth Bass	316	50	✓	✓		✓	✓			✓ (max 50)
	Walleye	334	50	✓	✓		✓	✓			✓ (max 50)
Secondary Species	Black Crappie	319	20	✓	✓		✓	✓			
	Bluegill	314	20	✓	✓		✓	✓			
	Largemouth Bass	317	20	✓	✓		✓	✓			
	Sauger	332	20	✓	✓		✓	✓			
	White Sucker	163	20	✓	✓				✓		
	Yellow Perch	331	20	✓	✓		✓	✓			
Exception	Lake Sturgeon	031	All	✓	DEAD	DEAD			✓		✓
	Musky	132	DEAD	✓	✓	✓		✓		✓	

* Fish sampled above these minimums should be chosen selectively to represent the size range of fish caught *

Gonad Condition: 10 undeveloped; 20 prespawning (inc. dormant, developing and fully developed); 99 unknown

Contaminant Samples: if requested (3 fish minimum per species required; wide selection of sizes)

OT: Otoliths

Scales: Appendix VIII for location by species type

Rays: First four pectoral rays

Cleithra: One required if undamaged

A total count of crayfish (or carapaces) from each set should be recorded in the comment field on the Set and Catch Form. In addition, the crayfish sample should be inspected for the presence of *Orconectes rusticus* (rusty crayfish) and noted in the appropriate spot on the Tracking form (see 2.15.1). For help in properly identifying, consult the **Field Guide to Aquatic Invasive Species: Identification, collection and reporting of aquatic invasive species in Ontario waters**. Lui, K., M. Butler, M. Allen, J. Da Silva and Beth Brownson. 2008. Ontario Ministry of Natural Resources. Ontario, Canada.
Fish Disposal Guidelines developed for this program are provided in Appendix X and should be consulted for instruction on the proper procedure for disposing of dead fish.

2.14 FISH IDENTIFICATION PROTOCOL

2.14.1 Introduction

The need for accurate fish identification can not be overemphasized. It is critical to both the current and future use of the data collected in the Broad-scale Monitoring Program. The accurate identification of fishes is not easy and is a skill that requires countless hours examining specimens in the lab and/or field. An overconfident field worker will often miss rare species, or misidentify species, because of over-reliance on one or two key identification species. Also, specialized tools such as microscopes and dissecting tools often required to help count meristic features, or to detect distinguishing morphometric features, are typically not available when in the field.

2.14.2 Training

There is a wide range in ability to identify fishes and crew members hired for netting and sampling fish may not have had adequate, or recent, training and experience in species identification. It is important that crews are provided with information and training to identify species they may expect to encounter, including potential invasive species and species at risk, and where possible be able to identify them in the field. Crew members should be trained and tested to identify Level 1 species, which include adult sport fish (walleye, muskellunge, northern pike, bass, lake trout, brook trout); common whitefish species; common sucker species and a few minnow species such as longnose dace, creek chub, blacknose dace.

The essential field guide for small fish identification that all crews should have on hand is the **The ROM Field Guide to Freshwater Fishes of Ontario**, by Erling Holm, Nick Mandrak and Mary Burridge. Mass Market Paperback. 2009. ISBN-10: 0888544596; ISBN-13: 978-0888544599 and is available from Amazon.ca.

2.14.3 Voucher Specimen

A voucher specimen is a representative sample of a species captured in a survey that is preserved or photographed to verify the species identity. Even in cases where a competent biologist identifies the fish, properly collected voucher specimens allow for re-verification if this is later called into question.

2.14.3.1 When is a voucher specimen required?

Voucher specimens are not required for all species captured in a lake survey for the broad-scale monitoring program. The factors affecting the collection of a voucher include whether it is a first record from a lake, the level of difficulty in identifying the fish species and the ability and confidence of the crew members in species identification.

Scenario	Voucher Specimen Required
Crew cannot readily identify the species captured in a waterbody with a high level of confidence	yes
Species is known from the waterbody and crew members can readily identify the species with a high level of confidence (e.g. Level 1 species)	no
No record of species from the waterbody but crew members can readily identify the species with a high level of confidence.	no if a level 1 sport fish, or common whitefish and common sucker species – but photo record is mandatory yes for all other non-sport fish species including invasive species* and species at risk.

* invasive species found in waters where they have not previously been detected should be collected and reported: round and tubenose goby, rudd, ruffe, 3 spine and 4 spine sticklebacks, white perch, goldfish, Asian carp (black, grass, silver and bighead), rusty crayfish, and spiny waterflea. Also anything that is out of the ordinary that the crew cannot identify or that is suspected to be new to the waterbody or watershed (e.g. black crappie, rainbow smelt etc.). These occurances should be reported to project lead as soon as possible. Refer to section 2.1.4.4 for more information on follow-up reporting.

2.14.3.2 Collecting Voucher Specimens

Voucher specimens should be in the best possible condition and larger specimens of small fish should be selected to facilitate easier identification. When taking a voucher specimen, this should be kept whole – do not gut, dissect, collect tissues, or otherwise cut the fish to ensure key morphological features needed for identification remain intact. Where a voucher specimen is required and the sample(s) are dead, preserve up to three specimens. Where a voucher specimen is required and the sample(s) are alive, one voucher specimen is adequate.

Most fish captured in nets in the broad-scale monitoring program will be dead. However, where a live fish is captured and is required as a voucher specimen, the individual must be euthanized in accordance with the **Animal Care Class Protocols** developed by the OMNR Fisheries Animal Care Committee (Appendix XI). Once the opercular movements cease, the fish can be considered dead and ensures ethical and humane treatment during preservation.

Recommended methods for euthanizing fish in the broad-scale monitoring program include:

- Chemical (euthanasia by anesthesia)
  Tricaine Methane Sulfonate (TMS/MS222)
- Physical Blow to Head

Field crews must be trained in the euthanasia method to be used. If Tricaine Methane Sulfonate (TMS/MS222) is to be used, crews need to be trained and provided with the necessary safety equipment to ensure safe transport, handling and use of the chemical as outlined in the Material Safety Data Sheets (MSDS) (Appendix IX)

2.14.3.3 "Fixing" Voucher Specimens in the Field

Careful and correct preservation procedures in both the field and laboratory are important for ensuring the quality of the collected specimens or tissues. The fish must be preserved in as natural a state as possible. Where possible, the specimen should float freely in a sealable jar or triangular whirl-pack to avoid curling, laying the jar/bag on its side can help. Before immersing large specimens, fixative should be injected directly into the body cavity to facilitate penetration and preservation of the internal organs. If syringes are not available, an incision can be made to the right of the ventral line to allow penetration of the fixative into the body cavity. The stomach should also be incised for internal fixation in order to negate digestive enzymes and better preserve contents. Care should be taken when making the incision to avoid damaging the internal organs.

Fixatives of the correct concentration, appropriate containers, clean and sharp dissecting tools, waterproof data form/labels, and complete observation records will all affect the quality and value of the sampling. Fish **must** be fixed immediately after death in **10% formalin** to prevent tissue decomposition. However, this should only be done once back onshore/in lab. While on the water these samples should be placed temporarily in a small cooler on ice. Formalin is commonly used to fix collected specimens and it is available in liquid or powder forms (formalin is 37% formaldehyde dissolved in water). Formalin is slightly acidic and will de-calcify and soften bony structures; the addition of a buffering agent will help to impede this process. To make a 10% solution of buffered formalin, combine, by volume, one part full strength formalin with nine parts distilled water and add approximately three millilitres of borax (buffering agent) per litre of solution. Crews should be aware of safety concerns and use the necessary safety equipment for ensuring safe transport and handling. These are provided in the Material Safety Data Sheets (MSDS) provided at the back of this manual (Appendix IX).

For proper fixation and preservation, the animal should be immersed in the fixative for a minimum of three days. Optimum fixation times for fish less than six inches in length is one to two weeks. For fish over six inches in length fixation time ranges from two to four weeks.

After fixation in formalin, the specimens must be thoroughly rinsed before placing in 38 - 40% isopropyl alcohol for longer-term storage. To do this, fill the jar with water, allow to soak for several hours before decanting. Repeat this procedure a number of times over several days until no strong formalin odour can be detected. The label on the storage jar should clearly indicate what preservative and concentration is in the jar.

2.14.3.4 Recording Information

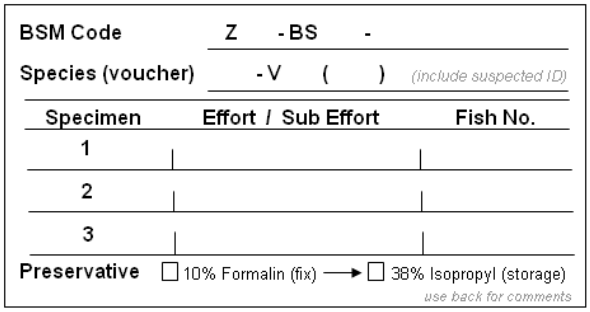
If a voucher specimen is being preserved (or photographed) the biological information for the sample should be recorded on the Detailed Fish Form (see Section 2.15.3) with *TIS* field = A (i.e., whole fish retained) and a note placed in the *COMMENTS* field as to the suspected species ID (see Figure 12 for example).

FISH field on the Detailed Fish Form for an unknown voucher specimen should follow the following convention: 000_V*x* where x is a numeric assigned to that particular unknown. For example, the first unknown (shiny minnow, big eye, with black line along side) should be identified as species 000_V1, the next unknown (black minnow with sub-terminal mouth) becomes species 000_V2. For the

remainder of the project any additional samples of the shiny minnow with the big eye and black line along side would be coded as 000_V1.

A waterproof specimen label must be placed inside each jar or whirl-pack. A sheet of labels for unknowns (should be used for reference specimens as well) can be found at the back of this manual. This can be photocopied onto waterproof paper, divided up into individual labels and placed into the sampling kit. In a pinch, a Broad-scale scale envelope can also double as a preserved specimen label. The label information should be filled out in pencil as preservative may cause some inks to run and smear.

Figure 2. Unknown and Reference species voucher label.



Unknowns should be fixed and stored in separate containers for each species type (only spc 000_V2 stored together; i.e., samples of 000_V2 from different efforts can be combined), but care must be taken not to load too many fish in one jar or container as this may prevent proper preservation.

2.14.3.5 Sealing Voucher Samples

Once the formalin and label have been added, jars should be

- sealed with Parafilm® and secured with a plastic screw-type lids or
- polypropylene lids with polyfoam liners must be used.

Jars should then be placed on their sides and placed in a secure container for transport. If triangular whirl-packs are used they should be placed upright in a water tight container/pail that can be fashioned shut to prevent spilling of contents.

2.14.3.6 Disposal of Formalin

Formalin must be oxidized to formic acid before disposal in the sanitary sewer as an aqueous waste. Protective gloves, clothes, and eye protection are mandatory when working with formalin. Slowly, while stirring, add the diluted formalin (1 ml of formalin to 10 mls of water) to an excess of household bleach (25 mls of household bleach for each ml of formalin). Stir for 20 minutes and then wash the solution into the drain with at least 50 times its volume of water. (procedure is from Armour, Browne and Weir in “Hazardous Chemical Information and Disposal Guide," Dept. of Chemistry, University of Alberta.)

Alternatively:

Mix waste 10% formalin with Formalex in a 4:1 ratio and allow it to sit for one hour while pink flocculate forms, after which it can be flush down toilet or drain according to municipal and provincial guidelines.

2.14.3.7 Taking a Photographic Record

Photographs can be a useful way to record unknowns in the field as the natural colour can be captured as well as form, allowing for easier identification. The best approach for obtaining photographic record of a specimen is:

- use a macro-lens or setting on the camera for taking photo
- place the specimen on a light grey background
- take the photo in the shade without a flash
- place a ruler or object of fixed size (e.g., loonie) in the photo to provide scale
- add a label in the photo that has the BsM code identifier, Effort/Sub-Effort and Fish Number
- take several photos and check to ensure the specimen has been captured adequately

Crews should take a reference photo of each species caught in a lake to help in evaluating possible misidentification if, on subsequent review of the data, this is called into question.

2.14.3.8 Identification of a Voucher Specimen

Initial identification of voucher specimens and photographic records should be conducted in-house by a qualified individual who has formal training and experience in fish identification. Qualified individuals should have the Royal Ontario Museum, or equivalent, training to at least Level 3 identification difficulty and practice fish identification on an ongoing basis. Any samples that cannot be identified with a high degree of confidence should be sent to a fish taxonomist/expert for identification at another MNR office, external agency, university, museum or consulting company. A copy of the Tracking sheet must accompany all samples that are sent out for identification. Any occurrence of species new to Ontario, or an invasive species or species at risk that is a new record for a waterbody should be sent to Erling Holm at the Royal Ontario Museum for confirmation and retained as a voucher specimen.

2.14.4 Reporting Invasive Species

Any occurrence of species new to Ontario or an invasive species that is a new record for a waterbody should be reported to the

Invading Species Hotline (1-800-563-7711), or:

Website: www.invadingspecies.com

Once you submit information on the sighting via the hotline or website, program staff will contact you to clarify any details.

2.14.5 Reporting Species at Risk

Any new occurrence of a species at risk in a waterbody should be reported to the Natureal Heritage Information Centre by completing the form found at:

http://nhic.mnr.gov.on.ca/MNR/nhic/species/species_report.cfm

The reporting form is to be used to submit records of provincially rare species (i.e. those tracked by the NHIC) from within Ontario. To determine if a species is tracked by the NHIC, refer to the species lists provided. A "Y" in the "Track" column indicates that a species is considered rare in Ontario and is tracked by NHIC.

1. Please read the Species Report Guide before entering information.
2. Fields with ***** are required. Other fields should be filled out if known.

Complete one form per species per waterbody per date.

2.15 DATA RECORDING

Data forms that will be used to record information include:

a) Tracking Form
b) Temperature and Dissolved Oxygen Profile Form
c) Effort and Catch Form
d) Detailed Fish Form
e) Length Tally Form

An explanation of the data fields and the required data format can be found in the Data Dictionary (Appendix I). This should receive thorough review before commencing any field work. Code strips are provided in Appendix VI which can be printed, laminated, attached to clipboard to serve as a quick reference to the various input codes. Blank copies of the standard page size form are provided at the back of this manual.

All data fields on the scale envelopes are mandatory (Figure 3). Scale envelopes for each lake/project should be stored in separate scale/sock boxes at the conclusion of the project. The box must be labeled with the appropriate BsM code plus Waterbody_LID on the outside. Boxes should be uniquely numbered and each individual scale envelope stamped with this box number before archiving. Additional 'special' catch sampling (e.g. fecundity counts) that cannot be accommodated using the provided forms should be recorded in a separate write-in-the-rain book/pages and formatted as preferred. The presence of this additional information should be noted in the appropriate spots on the tracking form which must be completed for every project.

Forms should be checked for completeness and accuracy before the end of the day, during the trip home in the truck or once back at base camp is recommended. Omitted details can often still be recalled when this check is done the day of sampling.

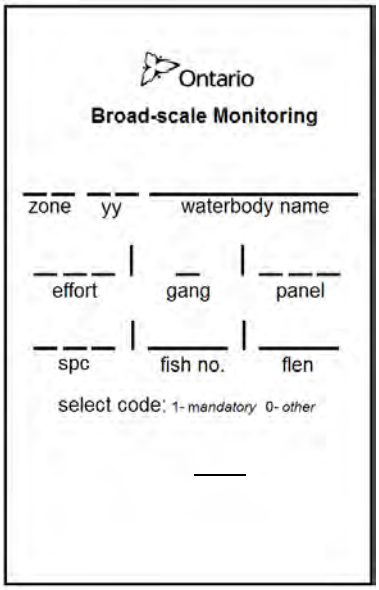


Figure 3. Scale envelope

2.15.1 Tracking Form

The Tracking Form is used to capture descriptive information about each project that cannot be entered with the data into FISHNETV3, but is required for proper interpretation of results. Figure 4 provides an example of the type of information to be captured on this form. This need only be filled in once at the end of a project and must accompany the biological data forms when submitted for entry into FISHNETV3. This data will be entered into a separate online database but will be linkable to the catch and biological data using the *Waterbody_LID* (Waterbody Location ID). Hence, it is imperative that this information is included on the form.

Project lead should be the name of a full time employee involved with the project.

BsM SURVEY TRACKING FORM

Waterbody Name: Trout Lake — Project Lead: J. Taylor

Waterbody_LID: 17 - 6112 - 50030 — Crew Names: M. Johnson, C. Peters

Broad-scale Monitoring Code: Z 17 - BS 08 - Trout00

Survey Start Date: 2008 (yyyy) / 08 (mm) / 11 (dd)

Genetic Samples Taken: Y / (N) Spc:

Bathymetric Survey Conducted: Y / (N)

Unknown Fish SPC Collected: (Y) / N Spc: 000_V1 000_V2

Known SPC Vouchers: (Y) / N Spc: 93

Contaminant Samples Taken: (Y) / N Spc: 81 91

SAR Species Detected: (Y) / N Spc: 238 — AIS Species Detected: Y / (N) Spc:

Nesting Cormorants Observed: Y / (N) — Secchi Data Collected: (Y) / N

AIS Zooplankton Conducted: (Y) / N — No. of Temp / DO Profiles Collected: 2

Angler Count Info Recorded: Y / (N)

Comments / Additional Sampling / Observations:

Water levels very low, lots of pollen on the water surface; good launch at UTM 17 634578 5027861

Good weather during project, sunny and not much wind, big rainstorm the first night

Figure 4. Example of a completed Tracking Form. This is filled out once for each of the projects and must accompany the data forms when submitted for entry into FISHNETV3. This data will be captured in a separate online Access database as it cannot be accommodated by the FISHNETV3 data structure, but is required for proper results interpretation. Project Lead is the name of a full time MNR employee involved with the project. Broad-scale Monitoring Code: Z= Fisheries Management Zone; BS= year (yy).

2.15.2 Temperature and Dissolved Oxygen Profile Form

Directions on taking water profile measurements are provided in section 2.10. Temperature and oxygen profiles need not be at one metre intervals, if this level of resolution does not provide any measurable gain; however, one metre intervals are recommended in the region of the thermocline. All UTM data collected by the project must be in the MNR standard datum of NAD83.

BsM TEMPERATURE & OXYGEN PROFILES

Broad-scale Monitoring Code Z 17 · BS 08 · Trout01

Survey Area	1 (west basin)		**Survey Area**	2 (east basin)		**Survey Area**		
Date (yyyy-mm-dd)	2008 - 08 - 12		**Date** (yyyy-mm-dd)	2008 - 08 - 14		**Date** (yyyy-mm-dd)	- -	
Easting	611898		**Easting**	612076		**Easting**		
Northing	4999461		**Northing**	4993070		**Northing**		
Secchi	5.4 m		**Secchi**	4.9 m		**Secchi**	m	

Depth (m)	Temp (°C)	DO (mg/l)	Depth (m)	Temp (°C)	DO (mg/l)	Depth (m)	Temp (°C)	DO (mg/l)
0.5	19.2	9.52	0.5	21.5	8.64			
1	19.1	9.5	1	21.5	8.59			
2	19	9.49	2	20.9	8.45			
3	18.9	9.46	3	20.8	8.43			
4	18.8	9.45	4	20.8	8.41			
5	18.6	9.37	5	20.0	8.41			
6	18.6	9.18	6	19.5	8.35			
7	17.9	8.88	7	18.0	8.30			
8	15.7	9.43	8	17.9	8.24			
9	13.5	9.52	9	14.5	8.75			
10	11.8	9.58	10	12.5	8.75			
11	10.8	9.79	11	11.3	8.76			
12	9.7	9.77	12	10.5	9.11			
14	9.6	10.02	14	9.6	9.51			
16	8.4	10.01	16	8.6	9.53			
18	8.2	10.02	18	8.4	9.53			
20	7.9	10.09	20	8.1	9.87			
22	7.8	10.05	22	7.5	9.88			
24	7.1	10.05	24	7.3	9.88			
26	6.9	10.11						
28	6.5	10.10						
30	6.4	10.11						
32	6.4	10.11						
34	6.4	10.12						
36	6.3	10.12						
46	6.0	10.12						
54	5.9	9.89						

Max Depth	55 m		**Max Depth**	25 m		**Max Depth** m

Comments:

meter appears to be functioning correctly

Figure 5. Example of a completed Profile Form. This is filled out at least once for each project and must accompany the data forms when submitted for entry into FISHNETV3. The total number of profiles completed on the lake must be recorded in the appropriate spot on the BsM Survey Tracking Form (see Figure 4). Measurements should be observed and recorded at 0.5 m (surface), at 1.0 m intervals from 1.0 m to 16 m and at 2.0 m intervals to 36 m. Where lake depth exceeds 36 m, one measurement should be taken approximtely halfway between 36m and bottom and 1 m off.

2.15.3 Effort and Catch Form

The Data Dictionary provides the necessary detail on how each of the fields on this form should be filled in and this is used for both Large and Small mesh gear.
Effort is the unique number given to each set and is in ascending order starting with one, without duplication and regardless of type of gear.

Site number is three characters and will include identification of Sample Area if the lake is spatially divided for sampling (Figure 6). The first character of the *Site number* will denote the Area sampled. with [0] used if the lake is not spatially segregated for sampling (see section 2.7.1 for discussion on spatially stratifying).

The level of sub-effort detail recorded for the *Effort* is to be identified in the *Process Code* box (i.e. strap only, strap and gang, strap, gang and panel, or some combination) (Figure 7). This will be used to select the appropriate FISHNETV3 template for entry.
It is important that three fields are filled in correctly for each effort because these are required to match the sample effort to a gear type during data entry process.

1. *Gear*: circle either [1] - large mesh or [2] - small mesh
2. *Number of gangs in strap*: circle either [1] gang or [2] gangs
3. *Net Height used*: circle either [1] m or [2] m

Gear Use [0] = standard and *Gear Use* [7] = non-standard is used to identify whether the *Effort* is conducted as prescribed in this manual or its application altered in some way to address some other objective. Primarily this will be to differentiate whether the *Effort* (and location) was randomly selected (i.e., standard) or targeted (non-standard). The need for this distinction is to permit, (particularly for Small mesh effort) some effort to be intentionally or opportunistically allocated to a particular, perhaps unique, habitat to increase chance of detecting certain low density species (e.g., species at risk monitoring). Subsequent analysis will need the ability to separate these targeted efforts from random to properly interpret lake-wide species complexity measures. These targeted sets would be in addition to the minimum random sets prescribed by this methodology.

For Large mesh effort, species *Catch* (total fish of this species caught in the *Effort*) should be recorded without gang information (*Gang* = [0]) (i.e., catch from both gangs can be combined prior to sampling). For ease of recording, this information can be completed for the first record and then for subsequent records by use of an arrow (if information is the same). For Small mesh gangs, species *Catch* will be recorded by gang (*Gang* = [1] or [2]) (i.e., catch from each gang needs to be kept separate prior to sampling) (see Figure 6).

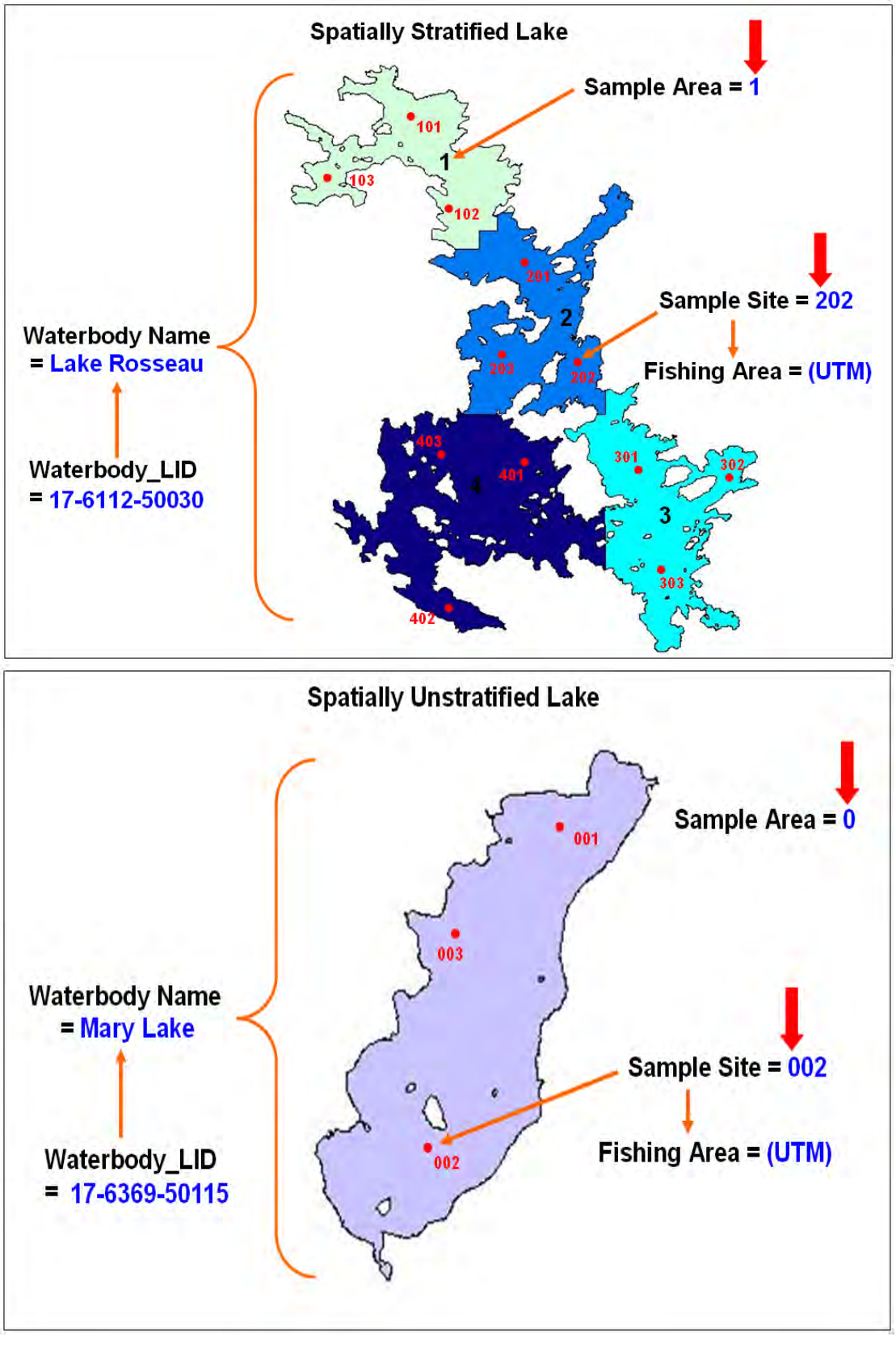


Figure 6. Top panel demonstrates the required format of the FISHNETV3 spatial descriptors for a spatially stratified lake vs. the bottom panel which displays this same information for a lake which is not spatially stratified for sampling. Areas assigned to the various regions of the lake must be given a number (1-10) and 0 used to denote that the lake was not spatially stratified for sampling (see red arrows).

EFFORT & CATCH FORM

Waterbody Name - Survey Area		Process Type	Effort
Rosseau	1	☑ strap ☐ gang ☐ panel	6
Site	**UTM Zone**	**UTM Easting**	**UTM Northing**
112	17	606628	5010887
Set Date: (yyyy-mm-dd)		**Set Time (hh:mm)**	
2008-08-15		14:15	
Gear	**# Gangs/ strap**	**Net Height (m)**	**Gear_Use**
1- Lg : 2- Sm	1 - 2	1 - 2	0 - ST 7 - NST
Stratum Depth	**Start Depth (m)**	**Mid Depth (m)**	**End Depth (m)**
12	14	16	18
Lift Date: (yyyy-mm-dd)		**Lift Time (hh:mm)**	**EFFST**
2008-08-16		10:30	1
Substrate:	**Type(s):**		
Fish Cover:	**Type(s):**		
Recorder's Initials:	J D		
Comments:			

Gang	Panel	SPC	Catch	Gang	Panel	SPC	Catch
0	000	81	2				
		93	7				
		91	1				
		271	1				

Figure 7. Example Effort & Catch Form from a Large mesh effort. The particular gang that species catch (count) came from is not required for this gear type; Gang is recorded as 0 (red arrow). See Figure 10 for the associated Detail sample information.

Gang number relates to the sequence of nets relative to the *Start Depth* and *End Depth*.

- Gang [0] = catch from both gangs combined (i.e., gang not identified)
- *Gang* [1] = gang that began at the Start Depth
- *Gang* [2] = gang that ended at the End Depth

If it is believed that the fishing efficiency of a set has been significantly impaired (e.g., net tampered with, very large holes (i.e., could step through), large amounts of debris in net) then the Effort & Catch Form should be retained but voided by placing a large strike across the face of the form (Figure 8), and the *Effort* redone (set again). Moving to another comparable area is a possibility if it will mitigate the circumstance that negated the previous set. Reasons for the re-set should be described in the comments section of the relevant form. If there is a requirement to biologically sample any of the catch from a 'voided' effort then the *EFFST* (Effort Status) should be recorded as [3; sample effort compromised], in this case the Effort & Catch form should not be voided by a strike through. For both Large and Small mesh effort, *Panel* (mesh size) information is optional. Additional codes for *EFFST* are [1] sample effort good - no problems and [2] minor problems - catch probably not affected. When species catch is not recorded by mesh then the *Panel* field is entered as [000] (see Figure 9). If there is a project specific need for catch and size information by panel, then a three character code is used based on the metric measure of stretch mesh size found on each panel (e.g., 013, 019, 025, 032, 038, 051, 064, 076, 089, 102, 114, 127).

EFFORT & CATCH FORM

Waterbody Name - Survey Area		Process Type	Effort
Rosseau	1	☑ strap ☑ gang ☐ panel	7
Site	**UTM Zone**	**UTM Easting**	**UTM Northing**
160	17	606670	5010996
Set Date: (yyyy-mm-dd)		**Set Time (hh:mm)**	
2008-08-15		15:00	
Gear	**# Gangs/ strap**	**Net Height (m)**	**Gear_Use**
1- Lg 2- Sm	1 2	1 2	0 - ST 7 - NST
Stratum Depth	**Start Depth (m)**	**Mid Depth (m)**	**End Depth (m)**
1	2	2	2
Lift Date: (yyyy-mm-dd)		**Lift Time (hh:mm)**	**EFFST**
2008-08-16		10:50	3
Substrate: 1 Type(s): GP CL			
Fish Cover: 3 Type(s): MA			
Recorder's Initials: J D			
Comments:			
Storm blew net up on beach			

Gang	Panel	SPC	Catch	Gang	Panel	SPC	Catch

Figure 8. Example of a voided Effort & Catch Form . Effort status =3 (sample effort compromised) and explaination

Species codes will use those identified in FISHNETV3. Species code “900” should be used for fish that are unidentifiable (e.g., rotted or partial). Species code “000” should be used for unknown species that are being retained for later expert identification (see section 2.14.3.4 for additional information on properly labeling unknown species).

Depth information (recorded to the nearest metre is sufficient) and the Depth requirements are:

- *Stratum Depth*: depth stratum where the gangs are set (shallowest stratum limit; eg 20 for the 20-35m stratum).
- *Start Depth*: depth at the end of the gang closest to shore.
- *Mid Depth*: depth where the spanners are joined between the gangs.
- *End Depth*: depth at the end of the gang farthest from shore.

Habitat descriptions must be recorded for all sites in the 1-3 m depth stratum (Figure 9 and Appendix VI). Codes for *General_Substrate* and *Fish_Cover_Level* should be recorded in the respective data fields (not comments). The presence of specific habitat elements should be recorded using the codes for *Substrate_Type* and *Fish_Cover_Type*.

The *Comments* field on the Effort & Catch Form is where any information the crew thinks could be of some use during the analysis (no matter how immediately unimportant it may appear).
In the rare circumstances that nothing is caught in an *Effort* (set) then the words “No Catch” should be clearly written across the *Catch* count columns to indicated this.

EFFORT & CATCH FORM

Waterbody Name - Survey Area		Process Type	Effort
Rosseau	1	☑ strap ☑ gang ☐ panel	7
Site	**UTM Zone**	**UTM Easting**	**UTM Northing**
160	17	606670	5010996
Set Date: (yyyy-mm-dd)		**Set Time (hh:mm)**	
2008-08-15		15:00	
Gear	**# Gangs/ strap**	**Net Height (m)**	**Gear_Use**
1- Lg 2- Sm	1 2	1 2	0 - ST 7 - NST
Stratum Depth	**Start Depth (m)**	**Mid Depth (m)**	**End Depth (m)**
1	2	2	2
Lift Date: (yyyy-mm-dd)		**Lift Time (hh:mm)**	**EFFST**
2008-08-16		10:50	1
Substrate: 1 Type(s): GP CL			
Fish Cover: 3 Type(s): MA			
Recorder's Initials: J D			
Comments:			
Cottager - would like a copy of project results when			
available (Bob Brown 705 646-5534)			
Strong NW wind 10-15+knots			
3 Crayfish in strap			

Gang	Panel	SPC	Catch	Gang	Panel	SPC	Catch
1	000	331	24	2	000	331	31
		311	7			311	5
		316	3			316	2
		198	1			000_V1	1
		900	1				

Figure 9. Example Effort Catch Form from a Small mesh effort. The red arrow indicates where habitat information is recorded. This is only required for the Large and Small mesh effort set in the 1-3m stratum. Note: catch information is recorded by gang for Small mesh effort, unlike for Large mesh effort where this is optional (i.e., Gang= 0). Associated length information from this example can be found in Figure 11.

2.15.4 Detailed Fish Form

This form is used primarily to capture length information from Large mesh efforts; however, it can also be used to record any desired biological information, in addition to fork length, for fish caught in Small mesh efforts (e.g., juvenile key species or unknown species (*SPC* = 000)).

As mentioned earlier, *Gang* and *Panel* information is not a mandatory data requirement for Large mesh effort and is recorded as a 0 and 000, respectively. *Gang* identification is needed for Small mesh effort, and hence, the particular *Gang* the fish were caught in [i.e., 1 or 2] will need identifying. Again, *Gang* 1 is that gang that corresponds to the gang closest to shore.

The *SEL* (select) field is used to identify the mandatory dead samples (code [1]) from subsequent, perhaps less random, samples collected for supplemental interests or as a regular part of the sampling (code [0]) (Figure 10). If all fish, or all primary and/or secondary species, are sampled in the project, only the first 50 should be assigned as *SEL* = [1].

FISH (fish number) is assigned to each fish on the Detailed Fish Form, this can be a unique number for each project, or can start at one for each *Effort* (i.e., fish number series does not carry across *Efforts*).

Stomach Content Taxon (i.e., *TAX_1* & *TAX_2*) field is used to capture taxonomic data for items identified in the stomach. This only needs to be identified to a very general level using the following structure:

- Invertebrates: crustaceans (2000)
- Invertebrates: insects (3000)
- Fish: fish remains (900 unidentifiable or use actual species code)

A) Effort 6 DETAILED FISH FORM Waterbody Name Rosseau Year (yy) 08

GANG	PANEL	SEL	SPC	FISH	FATE	FLEN	TLEN	RWT	SEX	GON	CLIP_C	AST	TIS	STOM	TAX_1	TAX_2	COMMENT
0	000	1	81	1	K	490	539	1175	2	22		A	1	1	093	121	
		1	81	2	D	390	429	560	1	10		A	1	0			fish lice
		0	93	3	D	260											
		0		4	D	245											
		0		5	D	310											
		0		6	D	225											
		0		7	D	235											
		0		8	D	288											
		0		9	D	291											
		0	91	10	D	540											
		0	271	11	D		632										

B) Effort 6 DETAILED FISH FORM Waterbody Name Rosseau Year (yy) 08

GANG	PANEL	SEL	SPC	FISH	FATE	FLEN	TLEN	RWT	SEX	GON	CLIP_C	AST	TIS	STOM	TAX_1	TAX_2	COMMENT
0	000	1	81	1	K	490	539	1175	2	22		A	1	1	093	121	
															900	2000	
		1	81	2	D	390	429	560	1	10		A	1	0			fish lice
		0	93	3	D	260											
		0		4	D	245											

Figure 10. (a) Example of a Detailed Fish Form from a Large mesh effort (see Figure 7 for the associated Effort & Catch Form). The red arrow indicates where fish sampled as part of the mandatory dead sample are identified (e.g., 1 = mandatory; 0 = other). (b) same data, but demonstrating how more than two food items can be identified (green arrow).

Taxon codes are provided in Appendix V where actual non fish species are identifiable. For fish, just the SPC code (e.g., 331 = yellow perch; see Appendix IV and V) should be used. Two columns are provided on the Detailed Fish Form to capture this information. Additional lines on the form can be used to record more than two taxon (Figure 10b). Chyme/bile should be recorded as empty stomach.

For species that have rounded tails, the total length should be recorded in the fork length field. It is optional whether it is also recorded in the total length field.

Fish that are incomplete, or have become overly desiccated in transport and handling, should not have round weight recorded. Also, accurately weighing fish <100mm in the field is discouraged, as these measurements are often erroneous due to precision of measuring device and the influence of varying levels of wind and surface moisture.

The Data Dictionary (Appendix I) provides explanation of the various data fields on the Detailed Fish Form and should be consulted during data recording.

2.15.5 Length Tally Form

Although the Detailed Fish Form can be used for recording catch information from either Large or Small mesh, the Length Tally Form is to be used only to record length information from Small mesh effort. The Length Tally Form provides the option of capturing individual fork lengths by species and gang, or can capture this information for a few species by length tally if large catches are

encountered (e.g., yellow perch). The size interval that a fish is assigned to on the Length Tally Form should follow the following convention: SIZ_FL 140 for fish 140-149 mm fork length.

Effort 7 — BsM LENGTH TALLY FORM — Waterbody Name Rosseau — Year (yy) 08

	Gang = 1		Gang = 1		Gang = 2		Gang =		Gang =		Gang 1		Gang 2		Gang		Gang	
	SPC = 331		SPC = 311		SPC = 331		SPC =		SPC =									
SIZ_FL	Tally	Total	Tally	Total	Tally	Total	Tally	Total	Tally	Total	SPC	FLEN	SPC	FLEN	SPC	FLEN	SPC	FLEN
30											316	302	311	210				
40											316	240	311	233				
50											316	210	311	238				
60	▪	1			▪	1					198	115	311	200				
70	▪▪	2			▪▪	2					900	100	311	250				
80	▪▪	2			⁞▪	3							316	178				
90	⊠ ⁞▪	13			⊠ ⁞▪	15							316	222				
100	▪▪	2			▪▪	2												
110																		
120	▪	1			▪	1												
130	▪	1			▪▪	2												
140																		
150	▪	1			▪	1												
160																		
170	▪	1			▪	1												
180																		
190					⁞	2												
200			▪	1														
210			⁞▪	3														
220			▪	1														
230			▪	1														
240			▪	1	▪	1												

Figure 11. Example Length Tally Form from a Small mesh effort. See Figure 9 for the associated Effort and Catch information. Yellow perch (331) and one other species per gang can be captured by length tally. Multiple forms can be used if length tally is needed for more species. Bin size range is 140-149 etc. Also note the use of SPC (species) codes of 900 (unidentifiable). The unknown voucher specimen (000_V1) is recorded on a separate Detailed Fish Form as the sample requires a fish number and comment information (i.e., suspected ID).

BsM EFFORT & CATCH FORM

Waterbody Name - Survey Area		Process Type	Effort
Rosseau	1	☑ strap ☑ gang ☐ panel	7
Site	**UTM Zone**	**UTM Easting**	**UTM Northing**
108	17	606688	5010987
Set Date: (yyyy-mm-dd)		**Set Time (hh:mm)**	
2008-08-15		14:15	
Gear	**# Gangs/ strap**	**Net Height (m)**	**Gear_Use**

Gang	Panel	SPC	Catch	Gang	Panel	SPC	Catch
1	000	000_V1	18	2	000	000_V1	3
1	000	000_V2	1	2	000	000_V2	3
1	000	331	7	2	000	331	4
1	000	316	1	2	000	201	1

Effort 7 — **BsM LENGTH TALLY FORM** — Waterbody Name Rosseau — Year (yy) 08

	Gang = 1		Gang = 1		Gang =		Gang =		Gang =		Gang 1		Gang 2		Gang		Gang	
	SPC = 331		SPC = 000_V1		SPC =		SPC =		SPC =									
SIZ_FL	Tally	Total	Tally	Total	Tally	Total	Tally	Total	Tally	Total	SPC	FLEN	SPC	FLEN	SPC	FLEN	SPC	FLEN
30											316	265	331	132				
40													331	119				
50	▪	1											331	157				
60	▪▪ ▪	3	▪	1									331	101				
70	▪	1	▪▪ ▪▪ ▪	13									000_V1	65				
80	▪ ▪	2	▪▪	2									000_V1	71				
90													000_V2	65				

Effort 7 — **BsM DETAILED FISH FORM** — Waterbody Name Rosseau — Year (yy) 08

GANG	PANEL	SEL	SPC	FISH	FATE	FLEN	TLEN	RWT	SEX	GON	CLIP_C	AST	TIS	STOM	TAX_1	TAX_2	COMMENT
1	000	0	000_V1	56	K	72							A				ID? (199)
↓	↓	↓	000_V1	57	K	83							A				
↓	↓	↓	000_V2	58	K	65							A				ID? (183)
2			000_V1	59	K	62							A				
↓	↓	↓	000_V2	60	K	59							A				
↓	↓	↓	000_V2	61	K	44							A				
↓	↓	↓	201_V3	62	K	55							A				Ref Sample

Figure 12. Example of the data collection required for a Small mesh effort where multiple unknowns were captured (*i.e., as complicated as it gets*). This requires that all three data form types are used. Voucher specimens for the two unknown species in this example (labelled 000_V1 and 000_V2) are retained whole (i.e.,TIS= A), and their length information is captured on a Detailed Fish Form as the physical sample requires a Fish ID number(s). Samples of unknowns can be placed in one container as long as they remain separate for each voucher species (e.g., all 000_V2 can go in one bottle from two or more gangs, or efforts). Fork lengths from additional unknowns that are not retained can be recorded on the Length Tally Form (as shown above). Note: no individual fish information should be duplicated on both the Length Tally and the Detailed Fish Form. As additional representatives might be caught in later efforts within the same project/lake, the crew should make note of the description of each unknown when the 000_V*x* is first assigned so later examples can be properly coded. Note: suspected ID should be provided in the comment field of the first representative member and on the jar label.

2.15.6 Environmental Data

The collection of lake-specific daily ambient environmental data is optional as most of these measurements are available from Environment Canada for the majority of regions in the province. Daily and hourly climate data can be found online at the Environment Canada web site (climate.weatheroffice.ec.gc.ca), follow the links to the online data archive and use customize search to find data for a particular area. Results can be cut and pasted into Excel for summary and analysis. Alternatively, specific data requests can be made, on a cost recovery basis, by contacting the weather office at the email address, ontario.climate@ec.gc.ca. Note: the barometric pressure is the specific station pressure and will need to be converted to sea level pressure. A barometric conversion table for each station is available from Environment Canada. The use of the Environment Canada's hourly database would permit the calculation of average morning and afternoon climate values for each of the days netted. Site specific weather measurements should be taken at mid-day and can be collected using a hand-held devices such as the Kestrel 4000 by Neilson- Kellerman (http://www.nkhome.com/ww/4000/4000.html).

2.16 DATA ARCHIVING IN FISHNETV3

All projects following the guidelines set out in this manual should be entered in a timely fashion into the Corporate Data Archive (FISHNETV3) using the available Broad-scale Monitoring templates.

2.17 POST-SAMPLING CARE AND STORAGE OF GANGS

To prevent the possible spread of invasive species between lakes with no connecting waterways, it is very important that gangs be cleaned of any coarse debris and allowed to dry thoroughly between projects (minimum of 48 hrs). Boats, motors, fish tubs, etc, should be sprayed down inside and out with a diluted bleach solution (15%), using a garden sprayer and proper protective clothing, and then pressure washed. MSDS sheet in Appendix IX should be reviewed prior to working with bleach. Ropes, anchors and floats should also be washed in a dilute bleach solution and allowed to dry between lakes. Bleach should not be used on the gangs as this could damage and/or shorten the lifespan of the monofilament, and could perhaps affect the catchability of gear by introducing a scent to the gear. Using two sets of gear for programs indexing numerous lakes throughout the summer is recommended. Alternating the gear between lakes will minimize down time and ensure the next set of equipment is thoroughly dry before use.

The **Broad-scale Fish Community Monitoring Invasive Species Prevention Protocol** should be consulted for more detailed information on preventing transfer of invasive species between systems.

Acknowledgements

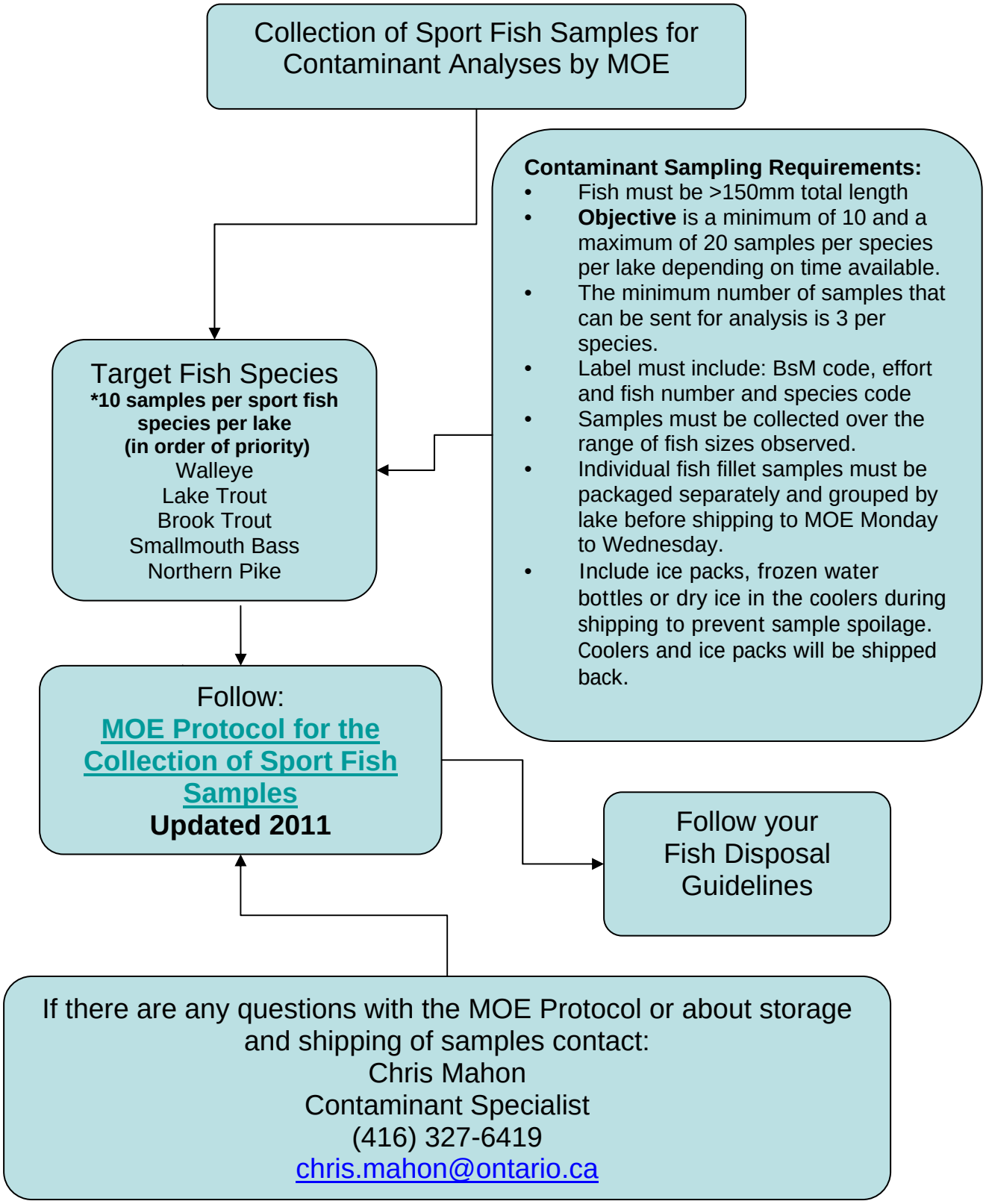
We would like to acknowledge the considerable contributions made to this protocol by Jeff Wiltshire, Helen Ball (Fisheries Section) and Tim Haxton (ASU). We also would like to thank Kim Armstrong (QMLFAU), George Morgan (Laurentian Co-op Unit), Brian Jackson (Atikokan District), Daniel Nadeau (PQ Government), Paul Giroux (BC Government), Lloyd Mohr (LHMU), Jenni McDermid (Wildlife Conservation Society), Don Hughes (HHFAU), Jake La Rose (LSFAU), Michelle Craigen (MLFAU) and their respective crews (including KLFAU) for rigorously field testing the method during the summer of 2007. The hard work and dedication of these individuals provided the data which not only further refined the methodology, but was instrumental in the realization of the Provincial Broad-scale Program in 2008. Finally, special thanks to Melissa Payne for her editioral comments which significantly improved the document.

FN3 Field Names	Form Abbr.	Description
Index Gear Family	*[# GANGS / STRAP]*	Indicate number of nets in strap by circling either 1 = 1 gang strap or 2 = 2 gang strap (std)
Ageing Structures Sampled	*[AST]*	The age structure(s) collected from a fish, options: 0 = no structure collected, 2 = scales (collected from the left side of the fish), 4 = pectoral ray, 7 = dorsal spine, A = otolith, B = operculum. Structures must be labeled using EFF/SAM and FISH numbers.
Caught Count	*[CATCH]*	Total number of fish caught in the net-gang-panel being sampled (referenced to *[SPC]*)
Clips Observed	*[CLIP_C]*	Any observed fin clips at capture, options: 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, 9 = upper caudal, A = lower caudal
Comment	*[COMMENT]*	Additional information observed relating to this fish
Effort Sample Number	*[EFFORT]*	Unique (and sequential) number given to each individual net set
Effort Status	*[EFFST]*	Describes the quality of the data. 1: sample effort good - no problems; 2: minor problems: catch probably not affected, 3: sample effort compromised - not representative (provide details in comment field)
Gear Depth End	*[END DEPTH]*	Depth of the net at the end of the set (to nearest metre)
Fish Fate	*[FATE]*	The fate of a fish that was caught; options D = dead on capture, K = killed (sacrificed), R = released
Fish Cover Type	*[FISH COVER TYPE]*	only for 1-3m stratum - record of all fish cover type observed: options LT- logs and trees; MA - macrophytes; OT - man made structure (provide details in comment field)
Fish Cover Level	*[FISH COVER]*	Describes the amount of cover at a sampling site, options: 1 = nocover, 2 = low (1-25%), 3 = moderate (25-75%), 4 = high (>75%)
Fish Number	*[FISH]*	A numeric assigned to every fish (continuous across species) which is measured. Can be unique across project or just within a [EFF]
Fork Length	*[FLEN]*	The length, measured to the nearest millimetre, 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).
Sub Effort Number	*[GANG]*	A particular gang in a strapped (multiple gang) effort; "1" is the gang at the start depth and "2" is the net at the end depth, "0" denotes that information was not recorded by gang.
Gear Use	*[GEAR USE]*	0 = standard random set; 7 = non-standard (ie. targeted)
Index Gear Family	*[GEAR]*	Identifying code for the gear (e.g., 1= Large Mesh LMG or 2= Small Mesh SMG)
Gonad Condition	*[GON]*	The developmental stage of the gonads based upon internal examination, options: 10 = undeveloped; 20 (dormant (21), developing(22), fully developed (23), spawning(24) or spent(40)); 99 = unknown.
End Date	*[LIFT DATE]*	The date that the net was lifted (yyyy.mm.dd).
End Time	*[LIFT TIME]*	The time the net was lifted (24 hr clock; hh:mm), recorded when first anchor begins to be pulled up
Gear Depth Mid	*[MID DEPTH]*	Depth of the net at the mid point of the set (to nearest metre)
Index Gear Family	*[NET HEIGHT]*	Circle whether standard height 2m or low profile 1m high gangs was used
Sub Effort Number	*[PANEL]*	The panel (i.e., mesh) a fish was captured in, measured in millimetres (three characters, e.g., 038). Use 000 when fish are not linked to a particular mesh size.

APPENDIX I – Data Dictionary for the Broad-scale Fish Community Monitoring Protocol (cont'd)

FN3 Field Names	Form Abbr.	Description
Process Type	*[PROCESS TYPE]*	Indicate the level to which catch was identified to strap, gang and/or panel
Round Weight	*[RWT]*	The round weight of the individual fish, measured in grams. Hand held spring scales should be calibrated each day prior to use, and fish weighed with appropriate capacity spring scale.
Selection Type	*[SEL]*	Indicate whether the fish was selected as part of the mandatory sample requirement (1) or a supplemental sample (0)
Start Date	*[SET DATE]*	The date that the net was set (yyyy.mm.dd).
Start Time	*[SET TIME]*	Time the net was set (24 hr clock; hh:mm), recorded when the second marker buoy is set in the water.
Sex Type	*[SEX]*	Gender of fish based upon internal examination, options: 1 = male, 2 = female, and 9 = unknown.
Sample Site	*[SITE]*	Unique identifier for [EFF / SAM] fishing location on field map; typically numeric but can be alphanumeric.
Fish Species	*[SPC]*	Fish species code using the fish species codes in Appendix II; 000 for unknown and 900 unident. (rotten or partial)
Gear Depth Start	*[START DEPTH]*	Depth of the net at the start of the set (to nearest metre)
Stomach Contents	*[STOM]*	Indicates whether stomach contents were present and processed, options: 0 = examined but no contents, 1 = examined with contents, 3 = not examined
Gear Depth	*[STRATUM DEPTH]*	Minimum depth for stratum (eg. 20 = 20-35 stratum)
Bottom Type	*[SUBSTRATE TYPE]*	only for 1-3m stratum - options BR: bedrock with no overburden; BO: boulders (>volleyball size); RU: medium rocks (tennis to volleyball size); GP: gravel (< tennis ball size); SA: sand; CL: clay/muck/silt
General Substrate	*[SUBSTRATE]*	Classifies the lake bottom materials in the visible area of the net set, options: 1 = gravel, pebble, sand (>75%), 2 = boulder/rubble/cobble mix (>75%), 3 = sand (>75%), 4 = soft mix (>75%), 5 = bedrock (>75%), 6 = other.
Sample Area	*[SURVEY AREA]*	Identifies the geographic area in which the netting is done.
Food Item Taxon	*[TAX_1]*	Field to capture taxonomic data for items in the stomach. 2000= crustaceans; 3000= insects; 900=fish remains; species code for identifiable (e.g. 331).
Food Item Taxon	*[TAX_2]*	Field to capture taxonomic data for items in the stomach. 2000= crustaceans; 3000= insects; 900=fish remains; species code for identifiable (e.g. 331).
Tissues Sampled	*[TIS]*	Indicates the types of tissue collected from a fish, options: 1 = flesh (muscle), 8 = stomach, 9 = gonads, A = whole fish, X =other; eg fin punch (genetics)
Total Length	*[TLEN]*	The total length (in millimetres) of a fish measured from tip of the snout (mouth closed) to the furthest extremity of the caudal fin (compress the upper and lower lobes together to obtain maximum extension)
UTM Start	*[UTM EASTING]*	Number of metres from the Central Meridian in each UTM Zone. Typically taken at the mid point of the set and recorded to the metre = 6 digit number without the leading 0
UTM Start	*[UTM NORTHING]*	Number of metres from the Equator, typically recorded to the metre = 6 digit number
UTM Start	*[UTM ZONE]*	The Universal Transverse Mercator (UTM) zone for the lake. Two characters
Waterbody Name	*[WATERBODY NAME]*	Common name of lake

APPENDIX II - Protocol for the Collection of Sport Fish for Contaminant Analyses



APPENDIX II - Protocol for the Collection of Sport Fish for Contaminant Analyses (cont'd)

Updated January 2011

The Sport Fish Contaminant Monitoring Program of the Ontario Ministry of the Environment has been monitoring various contaminants in Ontario fish since the late 1960s. The following sample collection procedures should be closely followed in order to ensure that data generated by the program is both consistent and meaningful.

Fish and Sample Size

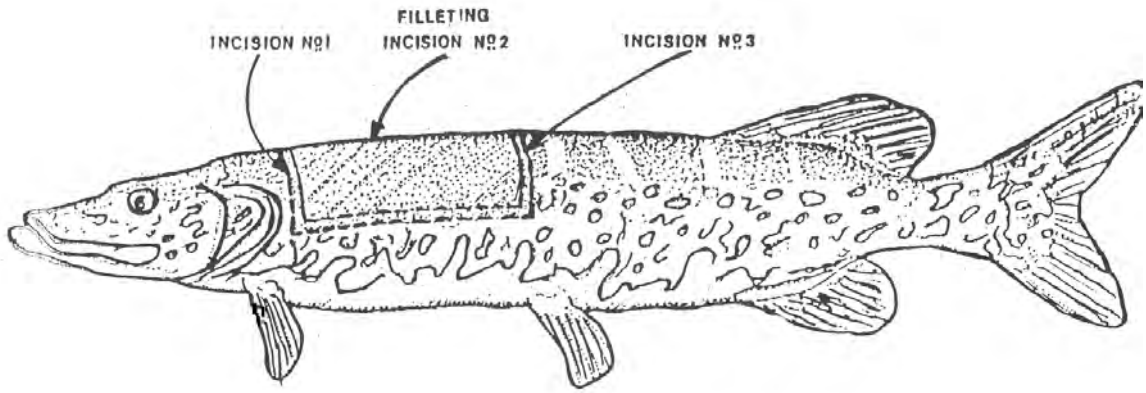
For each species, target 10 to 20 fish of a good size range (15-75+cm). Fish smaller than 15 centimeters in length (total length), or with a sample size of two or less (for a given species) should not be submitted. For smelt, separate the fish into groups of 10 fish of approximately the same length and wrap each group in aluminum foil. Five to ten samples should be taken per location. Please report average lengths and weights for these samples.

The absolute minimum amount of a tissue required is dictated by analytical methodologies, varies from 20 to 50 grams for each analysis and is inflexible. As such, a minimum of 100 grams of each tissue sample is required. Larger tissue samples (200-300g) are preferred. The larger the sample size the better and more representative the analyses.

Sample Preparation

Filleting

Samplers are requested to submit skinless, boneless fillets (rather than whole fish) for routine analyses. Normally the analyses are carried out on tissue from the epaxial muscle (see Figure 1) by making an incision with a clean stainless steel knife on the dorsal surface of the fish as shown (incision no.1). The epaxial muscle is then removed by cutting from the initial incision toward the tail (incision no.2) until a sufficient quantity of tissue is obtained. The muscle can be separated from the body by incision no.3. The skin is then removed from the sample and wrapped as indicated (see Sample Containers). It is very important not to remove tissue from below the lateral line because of the high fat content in this region which makes PCB and organic analyses unrepresentative. The sample should be frozen immediately after filleting and should be in this condition when shipped to the laboratory. Freezing is the only acceptable preservation technique. When a collection is ready for shipment, call the sport fish information line at (416) 327-6816 or 1-800-820-2716.



APPENDIX II - Protocol for the Collection of Sport Fish for Contaminant Analyses (cont'd)

Sample Containers

Individual samples should be placed in food grade plastic bags (e.g. Whirl-paks) and then frozen. Samples can also be submitted using aluminum foil if whirl-paks are not available.

It is no longer required to rinse aluminum foil with hexane or acetone.

Clearly indicate on the outside of the bag the location name, date, species, total length, weight, gender, and a sample number in permanent ink. Alternatively, a labelled (in pencil) piece of waterproof paper can be inserted into the plastic bag. If the fish information cannot be determined from the sample it will be discarded.

If you use foil, it is helpful to place the foil wrapped fillet inside a plastic bag and write the sample number and other information on the outside of the bag.

All samples must then be frozen and shipped in a frozen state using ice packs, frozen bottles of water, or if available, dry ice.

These recommendations apply to samples submitted for Hg, heavy metals, PCBs and all other organic parameters such as Dioxin.

Samples should have enough tissue to perform all analyses required (see section on sample size).

Samples should be shipped in a sturdy (styrofoam or hard plastic) container, preserved with ice or the like, and staff of the Sport Fish Contaminant Monitoring Program contacted for instructions as to when to ship and availability of staff to receive them.

To avoid samples sitting in a warm courier facility or truck it is wise to remember to
NEVER SHIP ON A THURSDAY or FRIDAY of any given week.

SUBMITTING SAMPLES

We have moved from paper submission forms to an Electronic Submission process. Email us to receive a copy of the MS Excel template and see below (p. 42) for instructions on how to complete it.

OTHER CONSIDERATIONS

Analysis of tissue other than fish is possible, but, can only be done through special arrangement. Any inquiry concerning these types of samples must be made prior to sample submission.

Sport Fish Contaminant Monitoring Program
Ministry of Environment
Environmental Monitoring and Reporting Branch
125 Resources Road
Etobicoke, Ontario M9P 3V6
(416) 327-6816 or 1-800–820-2716
sportfish.moe@ontario.ca

APPENDIX II - Protocol for the Collection of Sport Fish for Contaminant Analyses (cont'd)

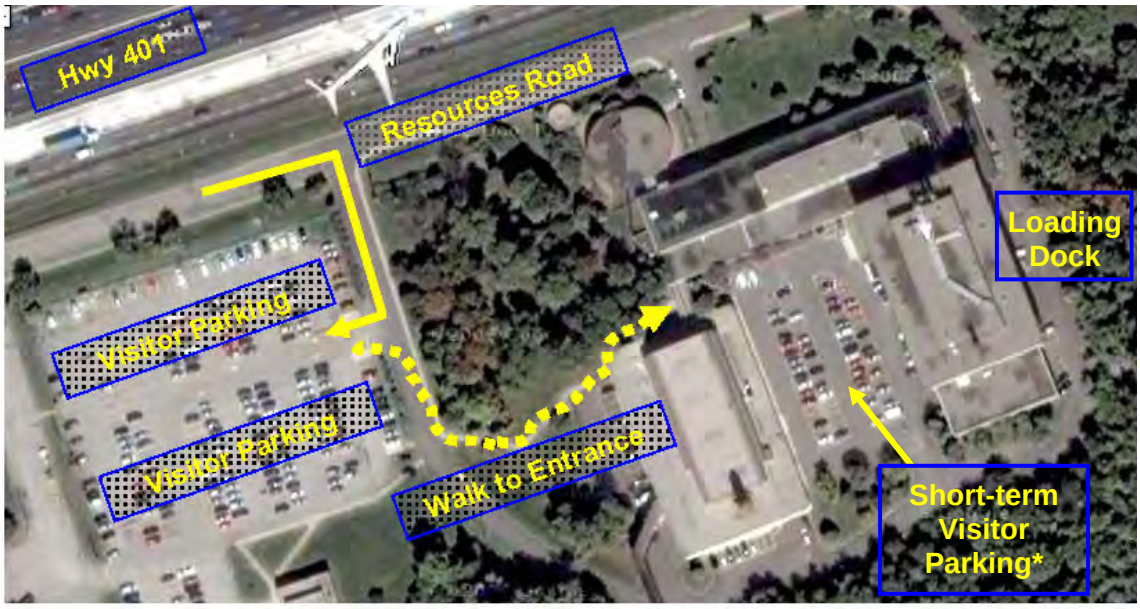
Directions to the lab:

From Westbound Hwy. 401:
- Exit Hwy. 401 at Islington Avenue;
- proceed under overpass and turn right onto Islington Avenue (southbound);
- cross-over Hwy. 401 and stay in right lane;
- turn right onto Resources Road on-ramp;
- proceed under Islington Avenue overpass;
- laboratory is at the end of the road on right side (125 Resources Road)

From Eastbound Hwy. 401:
- Exit Hwy. 401 at Islington Avenue;
- proceed under overpass and take ramp for Islington Avenue South;
- stay in right lane and cross-over Islington Avenue to Resources Road;
- proceed under Islington Avenue overpass;
- laboratory is at the end of the road on right side (125 Resources Road)

If shipping by courier please indicate full address as listed above and include important phone numbers where you can be reached.

125 Resources Road, Toronto, ON M9P 3V6 (at Hwy 401 and Islington Ave.)



*only park in designated "Visitor" spots in the short-term parking lot

APPENDIX II - Protocol for the Collection of Sport Fish for Contaminant Analyses (cont'd)

Instructions for Submitting Field Data for Contaminant Samples

The Sport Fish Contaminant Monitoring Program submits field data for contaminant samples to our labs electronically. To facilitate transfer of field data from clients to our labs, we ask that those submitting samples also submit the associated field data using our standardized Electronic Sample Submission Template (ESST).

The ESST is a simple Microsoft Excel spreadsheet; however, restrictions on cell formatting have been applied to ensure that inputted information conforms to our formatting standards. You will find that instructional text appears when certain cells are selected within the spreadsheet. Please follow any and all instructions which appear, since these outline acceptable formats for each field. Table 1 outlines the basic guidelines for sample information inputting.

Table 1 – Guidelines for Input of Sample Information

FORM HEADINGS	FORMAT	MANDATORY	MAX. LENGTH
BSM Project Name	TEXT	√	19
Zone	NUMBER	√	2
Northing (1)	NUMBER	√	7
Easting (2)	NUMBER	√	6
Latitude	NUMBER (DMS, DDM, DD)		6
Longitude	NUMBER (DMS, DDM, DD)		6
Sample Location and Description	TEXT	√	100
Sample Date	DATE (DD-MMM-YY)	√	9
Contact Name	TEXT	√	20
Contact Phone	TEXT	√	12
Contact Email	TEXT		50
Field Sample ID (3)	TEXT	√	25
Species Name	PULLDOWN	√	N/A
Total Length	NUMBER	√	4 (1 Decimal)
Total Weight	NUMBER		6 (No decimal)
Sex (4)	PULLDOWN		N/A
Portion Included (5)	PULLDOWN	√	N/A
Age	NUMBER		
Structure (6)	PULLDOWN		N/A
Notes	TEXT		60

Notes:

(1) Include either UTM coordinates or latitude and longitude
(2) Easting should be 6 digits; Northing should be 7 digits
(3) Field Sample IDs must be unique (no duplicates), must match label on samples
(4) If sex is unknown, please leave this value blank
(5) If portion is unknown, choose "Other" and describe in notes
(6) If "Other" is selected, please explain/ describe in notes

If at any time you have questions or concerns regarding the use of the ESST, please do not hesitate to contact our program staff via the information below. If your sample information is incompatible with the ESST, please contact us for assistance

Please submit all templates electronically by e-mail to Sportfish.moe@ontario.ca

APPENDIX III– Partial List of Gear Manufacturers

Company	Address	City	Prov	PC	Contact Person	Phone #	E-mail	Web site
Lakefish Net and Twine	547 King Edward St.	Winnipeg	MB	R3H 0N9	Warren Stephenson	877-866-2935	w.stephenson@lakefish.net	http://www.lakefish.net/leckies/
Johnston Net and Twine	859 Talbot road East P.O. Box 371	Wheatley	ON	N0P 2P0	Vald Demelo	519-825-4991	johnstontwine@hotmail.com	http://www.johnstonnetandtwine.com
Superior Net and Twine	2095 B Paquette Road	Thunder Bay	ON	P7G 1M4	George Sameluk	807-767-4064	superiornet@tbaytel.net	http://superiornet.ca/index.htm
Les Industries Fipec Inc.	235 La Grande-Allee Est, C.P 92	Grande Riviere	QC	G0C 1V0	M. Boudreau	800-760-3631	fipec@bmcable.ca	http://www.fipec.qc.ca/default.htm

APPENDIX IV - Ontario Species Codes

Code	FISH_TYPE_NAME
000	Unknown (any or all fish species)
010	**LAMPREYS**
011	American brook lamprey
012	Northern brook lamprey
013	Silver lamprey
014	Sea lamprey
015	*Ichthyomyzon sp.*
016	Chestnut lamprey
020	**PADDLEFISHES**
021	Paddlefish
030	**STURGEONS**
031	Lake Sturgeon
032	Caviar
040	**GARS**
041	Longnose gar
042	Spotted gar
043	*Lepisosteus sp.*
044	Florida gar
050	**BOWFINS**
051	Bowfin
060	**HERRINGS**
061	Alewife
062	American shad
063	Gizzard shad
064	*Alosa sp.*
065	Blueback herring
066	Skipjack herring
070	**SALMON&TROUT subfamily**
071	Pink salmon
072	Chum salmon
073	Coho salmon
074	Sockeye salmon
075	Chinook salmon
076	Rainbow trout
077	Atlantic salmon
078	Brown trout
079	Arctic char
080	Brook trout
081	Lake Trout
082	Splake
083	Aurora trout
084	*Oncorhynchus sp.*
085	*Salmo sp.*
086	*Salvelinus sp.*
087	Lake Trout Backcross
090	**WHITEFISH subfamily**
091	Lake whitefish
092	Longjaw cisco
093	Cisco
094	Bloater
095	Deepwater cisco
096	Kiyi
097	Blackfin cisco
098	Nipigon cisco
099	Shortnose cisco
100	Shortjaw cisco
101	Pygmy whitefish
102	Round whitefish
103	Chub
106	*Coregonus sp.*
107	*Prosopium sp.*
110	**GRAYLING subfamily**
111	Arctic grayling
120	**SMELTS**
121	Rainbow smelt
130	**PIKES**
131	Northern pike
132	Muskellunge
133	Grass Pickerel
134	*Esox sp.*
135	Chain pickerel
140	**MUDMINNOWS**
141	Central mudminnow
150	**MOONEYES**
151	Goldeye
152	Mooneye
160	**SUCKERS**
161	Quillback
162	Longnose sucker
163	White sucker
164	Lake chubsucker
165	Northern hog sucker
166	Bigmouth buffalo
167	Spotted sucker
168	Silver redhorse
169	Black redhorse
170	Golden redhorse
171	Shorthead redhorse
172	Greater redhorse
173	River redhorse
174	Black buffalo
175	Smallmouth buffalo
176	*Catostomus sp.*
177	*Moxostoma sp.*
178	*Ictiobus sp.*
180	**CARPS and MINNOWS**
181	Goldfish
182	Northern redbelly dace
183	Finescale dace
184	Redside dace
185	Lake chub
186	Common carp
187	Gravel chub
188	Cutlip minnow
189	Brassy minnow
190	Eastern silvery minnow
191	Silver chub
192	Hornyhead chub
193	River chub
194	Golden shiner
195	Pugnose shiner
196	Emerald shiner
197	Bridle shiner
198	Common shiner
199	Blackchin shiner
200	Blacknose shiner
201	Spottail shiner
202	Rosyface shiner
203	Spotfin shiner
204	Sand shiner
205	Redfin shiner
206	Mimic shiner
207	Pugnose minnow
208	Bluntnose minnow
209	Fathead minnow
210	Eastern blacknose dace
211	Longnose dace
212	Creek chub
213	Fallfish
214	Pearl dace
215	Silver shiner
216	Central stoneroller
217	Striped shiner
218	Ghost shiner
219	Grass carp
220	Rudd
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	**CATFISHES**
231	Black bullhead
232	Yellow bullhead
233	Brown bullhead
234	Channel catfish
235	Stonecat
236	Tadpole madtom
237	Brindled madtom
238	Margined madtom
239	Flathead catfish
241	*Ictalurus sp.*
242	*Noturus sp.*
243	*Ameiurus sp.*
244	Northern madtom
250	**FRESHWATER EELS**
251	American eel
260	**TOPMIN. /KILLIFISHES**
261	Banded killifish
262	Blackstripe topminnow
270	**CODS**
271	Burbot
280	**STICKLEBACKS**
281	Brook stickleback
282	Threespine stickleback
283	Ninespine stickleback
284	Fourspine stickleback
290	**TROUT-PERCHES**
291	Trout-perch
300	**TEMPERATE BASSES**
301	White perch
302	White bass
303	*Morone sp.*
304	Striped bass
310	**SUNFISHES**
311	Rock bass
312	Green sunfish
313	Pumpkinseed
314	Bluegill
315	Longear sunfish
316	Smallmouth bass
317	Largemouth bass
318	White crappie
319	Black crappie
320	*Lepomis sp.*
321	*Micropterus sp.*
322	*Pomoxis sp.*
323	Warmouth
324	Orangespotted sunfish
330	**PERCHES**
331	Yellow perch
332	Sauger
333	Blue pike (walleye)
334	Walleye
335	Eastern sand darter
336	Greenside darter
337	Rainbow darter
338	Iowa darter
339	Fantail darter
340	Least darter
341	Johnny darter
342	Logperch
343	Channel darter
344	Blackside darter
345	River darter
346	Tessellated darter

APPENDIX IV - Ontario Species Codes (Cont'd)

Code	FISH_TYPE_NAME
347	*Sander sp.*
348	*Etheostoma sp.*
349	*Percina sp.*
350	Ruffe
351	Johnny/Tesselated darter
360	**NEW WORLD SILVERSIDES**
361	Brook silverside
365	**GOBIES**
366	Round goby
367	Tubenose goby
370	**DRUMS**
371	Freshwater drum
380	**SCULPINS**
381	Mottled sculpin
382	Slimy sculpin
383	Spoonhead sculpin
384	Deepwater sculpin
385	*Cottus sp.*
386	*Myoxocephalus sp.*
387	Fourhorn sculpin
390	LUMPFISHES
391	Lumpfish
395	Righteye flounders
396	European flounder
400	SALMONIDAE hybrids
420	Salmon & Trout - hybrids
421	Brown trout x Atlantic salmon
422	Tiger trout
423	Coho x Chinook salmon
450	Whitefish - hybrids
451	Lake whitefish *x* Cisco
460	Characins
461	Redbellied pacu
470	Suckermouth Armoured Catfishes
471	Royal panaque
472	Amazon sailfin catfish
473	*Pterygoplichthys* sp.
480	**CICHLIDS**
481	Oscar
482	Jaguar guapote
500	Pike – hybrids
501	Northern pike x Grass pickerel
502	Tiger muskellunge
550	Sucker – hybrids
551	*Ictiobus* hybrids
600	Minnow hybrids
601	Goldfish x Carp
602	Phoxinus hybrids
603	Nothern redbelly dace x Finescale dace
604	Nothern redbelly dace x Pearl dace
605	Finescale dace x Pearl dace
610	Notropis hybrids
611	Common shiner x Rosyface shiner
612	Common shiner x Creek chub
613	Common shiner x Longnose dace
614	Common shiner x River chub
615	Common shiner x Brassy minnow
616	Striped shiner x Rosyface shiner
617	Striped shiner x Mimic shiner
620	Fathead minnow x Bluntnose minnow
621	Blacknose dace x Creek chub
622	Longnose dace x River chub
623	Longnose dace x Lake chub
624	Creek chub x Redside dace
630	Western blacknose dace
631	Silver carp
632	Bighead carp
633	Black carp
650	Bullhead Catfish hybrids
651	Black Bullhead x Brown Bullhead
690	MORONIDAE - Hybrids
691	*Morone* hybrids
692	White bass x Striped bass
700	Sunfish hybrids
701	Lepomis hybrids
702	Pumpkinseed x Bluegill
703	Green Sunfish x Pumpkinseed
704	Green Sunfish x Longear Sunfish
705	Green Sunfish x Blue Gill
706	White Crappie x Black Crappie
707	Pumpkinseed x Orangespotted sunfish
750	Perch hybrids
751	Sauger x Walleye
752	Logperch x Channel darter
753	Logperch x Blackside darter
800	Sculpin hybrids
801	Mottled Sculpin x Slimy Sculpin
900	UNIDENTIFIABLE
997	BAITFISH
998	ROE
999	MIXED SCRAP FISH (ANIMAL FOOD)
070N	NON-SALMONIDS
997N	NON-BAITFISH

APPENDIX V – Assortment of Commonly Used Taxon Codes (*incomplete list*)

Code	Name	Common Name
1001	**ANNELIDA**	**segmented worms**
1002	**OLIGOCHAETA**	**bristle worms**
1100	**HIRUDINEA**	**leeches**
1200	**NEMATA = [NEMATODA]**	**round worms**
1300	**NEMATOMORPHA**	**gordian worms, horsehair worms**
1400	**NEMERTEA**	**proboscis worms**
1500	**PLATYHELMINTHES**	**flatworms**
1550	**ROTIFERA**	**rotifers**
1800	**TARDIGRADA**	**water bears**
1901	**ARANEIDA**	**spiders**
1950	**HYDRACARINA**	**water mites**
2000	**CRUSTACEANS**	
2001	**AMPHIPODA**	**scuds, sideswimmers**
2008	Echinogammarus ischnus	Gammarid
2020	**ANOSTRACA**	**fairy shrimps**
2100	**CLADOCERA**	**water fleas**
2116	Cercopagis pengoi	Fishhook water flea
2117	Bythotrephes longimanus	Spiny water flea
2300	**CONCHOSTRACA**	**clam shrimps**
2540	**DECAPODA**	**crayfishes, lobsters**
2541	Astacidae	crayfishes
2548	Orconectes rusticus rusticus	Rusty crayfish
2560	**ISOPODA**	**aquatic sow bugs**
2580	**MYSIDACEA**	**opposum shrimps**
2585	Hemimysis anomala	Bloody red shrimp
2600	**NOTOSTRACA**	**tadpole shrimps**
2650	**OSTRACODA**	**seed shrimps**
3000	**INSECTS**	
3001	**COLEOPTERA**	**beetles**
3002	Amphizoidae	trout stream beetles
3010	Chrysomelidae	leaf beeetles
3020	Dytiscidae	predacious diving beetles
3030	Elmidae	riffle or marl beeetles
3040	Gyrinidae	whirlygig beetles
3050	Haliplidae	crawling water beetles
3060	Helodidae	marsh beetles
3070	Hydrophilidae	water scavenger beetles
3080	Psephenidae	water pennies
3101	Ceratopogonidae	biting midges
3110	Chaoboridae	phantom midges
3120	Chironomidae	chironomids
3310	Culicidae	mosquitoes
3350	Dixidae	dixa midges
3360	Psychodidae	moth and sand flies
3370	Simulidae	blackflies
3380	Tabanidae	horseflies
3390	Tipulidae	craneflies
3400	**EPHEMEROPTERA**	
3401	Baetidae	small mayflies
3500	Ephemeridae	burrowing mayflies
3520	Heptageniidae	stream mayflies
3800	**HEMIPTERA**	**bugs**
3801	Belostromatidae	giant water bugs
3810	Corixidae	water boatmen
3820	Gerridae	waterstriders
3830	Hebridae	velvet waterbugs
3840	Mesovelidae	watertreaders
3850	Nepidae	water scorpions
3860	Notonectonidae	backswimmers
3870	Pleidae	pygmy backswimmers
3880	Vellidae	broadshouldered waterstriders
4020	**LEPIDOPTERA**	**butterflies and moths**
4040	**MEGALOPTERA**	**alderflies, fishflies**
4041	Corydalidae	dobsonflies, fishflies
4100	**NEUROPTERA**	**fishflies, snakeflies, lacewings**
4200	**ODONATA**	**dragonflies and damselflies**
4201	**ANISOPTERA**	**dragonflies**
4202	Aeshnidae	darners
4230	Cordulegastridae	biddies
4240	Corduliidae	green-eyed skimmers
4270	Gomphidae	clubtails
4290	Libellulidae	common skimmers
4320	Macromiidae	belted and river skimmers
4341	Calopterygidae	broad- winged damselflies
4350	Coenagrionidae	narrow-winged damselflies
4380	Lestidae	spread-winged damselflies
4400	**PLECOPTERA**	**stoneflies**
4401	Capniidae	small winter stoneflies
4410	Chloroperlidae	green stoneflies
4430	Leuctridae	rolled-winged stoneflies
4450	Nemouridae	spring stoneflies
4470	Perlidae	common stoneflies
4480	Perlodidae	perlodid stoneflies
4500	Pteronarcidae	giant stoneflies
4510	Taeniopterygidae	winter stoneflies
4520	**TRICOPTERA**	**caddisflies**
4600	Hydropsychidae	net-spinning caddisflies
4650	Hydroptilidae	micro-caddisflies
4750	Limnephilidae	northern caddisflies
4850	Phryganeidae	large caddisflies
6000	**MOLLUSCS**	
6001	**GASTROPODA**	**snails**
6019	Potamopyrgus antipodarum	New Zealand mudsnail
6090	Pleuriceridae	river snails
6100	Valvatidae	round-mouthed snails
6150	Viviparidae	mystery snails
6155	Cipangopaludina chinensis	Chinese mysterysnail
6156	Viviparus georgianus	Banded mysterysnail
6200	**PELECYPODA**	**mussels and clams**
6697	Dreissena bugensis	Quagga mussel
6698	Dreissena polymorpha	Zebra mussel
7000	**FISH**	
8000	**AMPHIBIANS**	
8001	**SALIENTIA**	**Frogs and toads**
8002	Bufonidae	toads
8003	Bufo americanus	American toad
8004	Bufo fowleri	Fowler's toad
8010	Hylidae	Tree frogs
8011	Acris gryllus	cricket frog
8012	Hyla crucifer	spring peeper
8013	Hyla versicolor	tree frog
8014	Pseudacris triseriata	swamp tree frog
8020	Ranidae	true frogs
8021	Rana castesbeiana	bullfrog
8022	Rana clamitans	green frog
8023	Rana palustris	pickerel frog
8024	Rana pipiens	leopard frog
8025	Rana septentrionalis	mink fog
8026	Rana sylvatica	wood frog
8030	**URODELA**	**salamanders**
8031	Ambystomidae	mole salamanders
8033	Ambystoma maculatum	spotted salamander
8034	Ambystoma tigrinum	tiger salamander
8040	Plethodontidae	lungless salamanders
8041	Eurycea bislineata	2-lined salamander
8042	Hemidactylium scutatum	4-toed salamander
8043	Plethodon cinereus	red-backed salamander
8050	Proteidae [=Necturidae]	mud puppies
8100	REPTILES	
8101	**CHELONIA**	**turtles**
8102	Chelydra serpentina	snapping turtle
8103	Chrysemys picta marginata	Midland painted turtle
8104	Clemmys guttata	Spotted turtle
8105	Clemmys insculpta	wood turtle
8106	Emydoidea blandingi	Blandings turtle
8107	Malaclemmys geographica	map turtle
8108	Stenotherus odoratus	musk turtle
8109	Trionyx spiniferus spiniferus	softshell turtle
8120	**SERPENTS**	**snakes**
8121	Colubridae	water and garter snakes
8125	Eaphe vulpina gloydi	Eastern fox snake
8130	Lampropeltes doliata triangulum	Eastern milk snake
8135	Natrix sipedon insularum	Lake Erie water snake
8140	Natrix sipedon sipedon	Northern water snake
8145	Thamnophis sirtalis sirtalis	Eastern garter snake
8160	Crotalidae	pit vipers
8165	Sistrurus catenatus catenatus	Eastern Massasauga
8200	**BIRDS**	
8201	Gaviidae	loons
8203	Gavia immer	common loon
8205	Podicipediformes	grebes
8210	Pelecanidae	pelicans
8215	Phalacrocoracidae	cormorants
8220	Ardeidae	herons and bitterns
8221	Ardea herodias	great blue heron
8230	Ixobrychus exilis	least bittern
8250	Anatidae	ducks and geese
8280	Lophodytes cucullatus	hooded merganser
8281	Mergus merganser	common merganser
8350	Panionidae	ospreys
8351	Pandion halietus	osprey
8450	Laridae	gulls and terns
8460	Larus argentatus	herring gull
8550	Alcedinidae	kingfishers
8551	Megaceryle alcyon	belted kingfisher
8800	**MAMMALS**	
8806	Soricidae	shrews
8825	Talipidae	moles
8850	**RODENTIA**	
8851	Cricetidae	mice, voles, lemmings
8870	Muridae	rats, house mouse
8890	Sciuridae	squirrels and chipmunks
8900	Zapodidae	jumping mice
9000	**PLANTS**	

APPENDIX VI - Field Code Strips

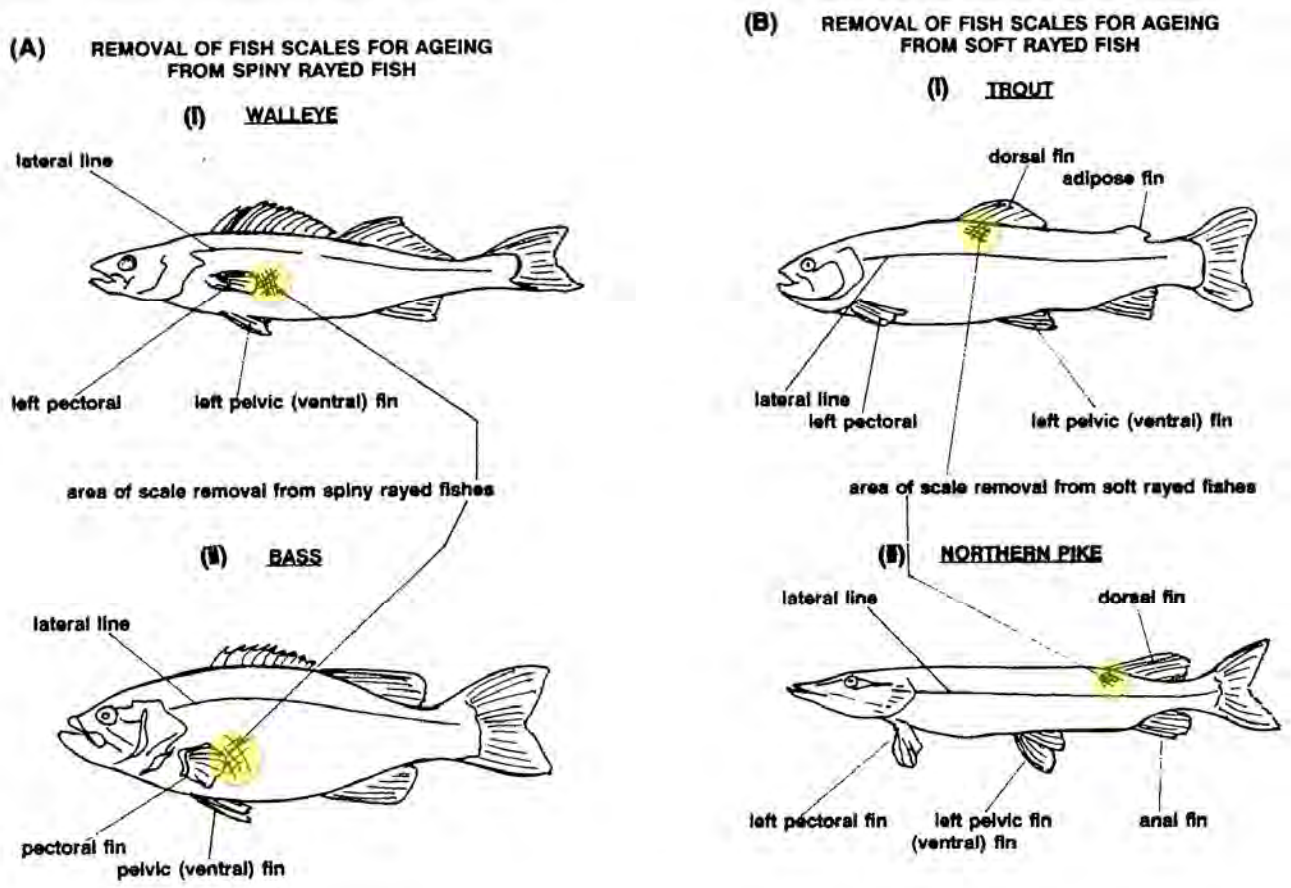
FATE		SEX		GON		CLIP_C		AST		TIS		STOM		TAX	
D	dead on capture	1	male	10	undeveloped	0	no clip	0	none	1	Flesh	0	empty	2000	crustaceans
K	killed (sacrifice)	2	female	21	dormant	1	R pectoral	2	Scales (L side)	8	Stomach	1	with contents	3000	insects
R	released	9	unknown	22	developing	2	L pectoral	4	Pectoral Ray	9	Gonads	3	not examined	6000	molluscs
				20 23	fully developed	3	R ventral	7	Dorsal Spine	A	Whole fish			FNcode	fish (900 for no ID)
				30	ripe/running	4	L ventral	A	Otolith	B	Head			8000	amphibians
				40	spent	5	Adipose	B	Operculum	C	Viscera			8800	mammals
				99	unknown			D	Cleithrum	X	Genetic			9000	plants

EFFST		SUBSTRATE		SUBSTRATE TYPE		FISH COVER		COVER TYPE	
1	good no probs	1	gravel,pebble, sand (>75%)	BR	bedrock no overburden	1	no cover	LT	logs and trees
2	min probs data ok	2	boulder/rubble/cobble mix (>75%)	BO	boulders (>vollyballs)	2	low (1-25%)	MA	macrophytes
3	maj probs data not ok	3	sand (>75%)	RU	med rocks (tennis-vollyball size	3	mod (25-75%)	OT	man made
		4	soft mix (>75%)	GP	gravel (< tennis ball size)	4	high (>75%)		
		5	bedrock (>75%)	SA	sand				
		6	other	CL	clay/muck/silt				

APPENDIX VII - Field Sheet of Ontario Fish Code (organized by common name)

FISH SPECIES CODES

61	alewife	271	burbot	194	golden shiner	98	nipigon cisco	14	sea lamprey
11	american brook lamprey	141	central mudminnow	151	goldeye	12	northern brook	171	shorthead redhorse
251	american eel	216	central stoneroller	181	goldfish	165	northern hog sucker	100	shortjaw cisco
62	american shad	135	chain pickerel	219	grass carp	244	northern madtom	99	shortnose cisco
77	atlantic salmon	234	channel catfish	133	grass pickerel	131	northern pike	191	silver chub
83	aurora trout	343	channel darter	187	gravel chub	182	northern redbelly	13	silver lamprey
261	banded killifish	16	chestnut lamprey	172	greater redhorse	324	orangespotted sunfish	168	silver redhorse
166	bigmouth buffalo	75	chinook salmon	312	green sunfish	21	paddlefish	215	silver shiner
174	black buffalo	72	chum salmon	336	greenside darter	214	pearl dace	382	slimy sculpin
231	black bullhead	93	cisco (lake herring)	192	hornyhead chub	71	pink salmon	316	smallmouth bass
319	black crappie	73	coho salmon	338	iowa darter	207	pugnose minnow	82	splake
169	black redhorse	186	common carp	341	johnny darter	195	pugnose shiner	383	spoonhead sculpin
199	blackchin shiner	198	common shiner	185	lake chub	313	pumpkinseed	203	spotfin shiner
97	blackfin cisco	212	creek chub	164	lake chubsucker	101	pygmy whitefish	201	spottail shiner
210	blacknose dace	188	cutlips minnow	31	lake sturgeon	161	quillback	42	spotted gar
200	blacknose shiner	95	deepwater cisco	81	lake trout	337	rainbow darter	167	spotted sucker
344	blackside darter	384	deepwater sculpin	91	lake whitefish	121	rainbow smelt	235	stonecat
262	blackstripe topminnow	335	eastern sand darter	317	largemouth bass	76	rainbow trout	217	striped shiner
94	bloater	190	eastern silvery	340	least darter	205	redfin shiner	236	tadpole madtom
314	blue gill	196	emerald shiner	342	logperch	184	redside dace	346	tessellated darter
333	blue pike (blue pickerel)	213	fallfish	315	longear sunfish	193	river chub	282	threespine stickleback
208	bluntnose minnow	339	fantail darter	92	longjaw cisco	345	river darter	291	trout-perch
51	bowfin	209	fathead minnow	211	longnose dace	173	river redhorse	367	tubenose goby
189	brassy minnow	183	finescale dace	41	longnose gar	311	rock bass	334	walleye (yellow pickerel)
197	bridle shiner	239	flathead catfish	162	longnose sucker	202	rosyface shiner	323	warmouth
237	brindled madtom	387	fourhorn sculpin	238	margined madtom	366	round goby	302	white bass
361	brook silverside	284	fourspine stickleback	206	mimic shiner	102	round whitefish	318	white crappie
281	brook stickleback	371	freshwater drum	152	mooneye	220	rudd	301	white perch
80	brook trout	218	ghost shiner	381	mottled sculpin	350	ruffe	163	white sucker
233	brown bullhead	63	gizzard shad	132	muskellunge	204	sand shiner	232	yellow bullhead
78	brown trout	170	golden redhorse	283	ninespine stickleback	332	sauger	331	yellow perch



Appendix VIII Location of Scale Removal Area for Age Analysis

Drawings by Susan Mann

APPENDIX IX - Material Safety Data Sheets

Formalin, 10% Solution

1. === Product Identification ===

B>Synonyms: None
CAS No.: 50-00-0
Molecular Weight: Not applicable to mixtures.
Chemical Formula: Not applicable to mixtures.

2. === Composition/Information on Ingredients ===

Ingredient	CAS No	Percent	Hazardous
Formaldehyde	50-00-0	3 - 4%	Yes
Methyl Alcohol	67-56-1	1 - 1.5%	Yes
Water	7732-18-5	94 - 96%	No

3. === Hazards Identification ===

Emergency Overview

DANGER! MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. STRONG SENSITIZER. MAY CAUSE BLINDNESS. COMBUSTIBLE LIQUID AND VAPOR. SUSPECT CANCER HAZARD. CONTAINS FORMALDEHYDE WHICH MAY CAUSE CANCER. Risk of cancer depends upon duration and level of exposure.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Cancer Causing)
Flammability Rating: 0 - None
Reactivity Rating: 0 - None
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

The perception of formaldehyde by odor and eye irritation becomes less sensitive with time as one adapts to formaldehyde. This can lead to overexposure if a worker is relying on formaldehyde's warning properties to alert him or her to the potential for exposure.

Inhalation:
May cause sore throat, coughing, and shortness of breath. Causes irritation and sensitization of the respiratory tract. Concentrations of 25 to 30 ppm cause severe respiratory tract injury leading to pulmonary edema and pneumonitis. May be fatal in high concentrations.
Ingestion:
Can cause severe abdominal pain, violent vomiting, headache, and diarrhea. Larger doses may produce decreased body temperature, pain in the digestive tract, shallow respiration, weak irregular pulse, unconsciousness and death. Methanol component affects the optic nerve and may cause blindness.
Skin Contact:
Toxic. May cause irritation to skin with redness, pain, and possibly burns. Skin absorption may occur with symptoms paralleling those from ingestion. Formaldehyde is a severe skin irritant and sensitizer. Contact causes white discoloration, smarting, cracking and scaling.

APPENDIX IX - Material Safety Data Sheets (cont'd)

Formalin, 10% Solution

Eye Contact:
Vapors cause irritation to the eyes with redness, pain, and blurred vision. Higher concentrations or splashes may cause irreversible eye damage.
Chronic Exposure:
Frequent or prolonged exposure to formaldehyde may cause hypersensitivity leading to contact dermatitis. Repeated or prolonged skin contact with formaldehyde may cause an allergic reaction in some people. Vision impairment and enlargement of liver may occur from methanol component. Formaldehyde is a suspected carcinogen (positive animal inhalation studies).
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance. Previously exposed persons may have an allergic reaction to future exposures.

4. ===First Aid Measures ===

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. === Fire Fighting Measures ===

Fire:
Flash point: 85C (185F) CC
Combustible liquid and vapor! Gas vaporizes from solution and is flammable in air.
Explosion:
Above the flash point, explosive vapor-air mixtures may be formed. Containers may explode when involved in a fire.
Fire Extinguishing Media:
Water spray, dry chemical, alcohol foam, or carbon dioxide.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Water spray may be used to keep fire exposed containers cool. Use water spray to blanket fire, cool fire exposed containers, and to flush non-ignited spills or vapors away from fire.

6. === Accidental Release Measures ===

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

APPENDIX IX - Material Safety Data Sheets (cont'd)

Formalin, 10% Solution

7. === Handling and Storage ===

Store in a tightly closed container. Protect against physical damage. Outside or detached storage is preferred. Inside storage should be in a standard flammable liquids storage room or cabinet. Separate from oxidizing materials. Storage and use areas should be No Smoking areas. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Protect from freezing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. === Exposure Controls /Personal Protection ===

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
0.75 ppm (TWA), 2 ppm (STEL), 0.5 ppm (TWA) action level for formaldehyde
200 ppm (TWA) for methanol
-ACGIH Threshold Limit Value (TLV):
0.3 ppm Ceiling formaldehyde, Sensitizer, A2 Suspected Human Carcinogen
200 ppm (TWA) 250 ppm (STEL) skin for methanol

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece respirator with a formaldehyde cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres. Irritation also provides warning. For Methanol: If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134). Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Other Control Measures:
See OSHA Standard for more information on personal protective equipment, engineering and work practice controls, medical surveillance, record keeping, and reporting requirements. (29 CFR 1910.1048)

APPENDIX IX - Material Safety Data Sheets (cont'd)

Formalin, 10% Solution

9. === Physical/Chemical Properties ===

Appearance:
Clear, colorless liquid.
Odor:
Pungent odor.
Solubility:
Complete (100%)
Specific Gravity:
1.09
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
ca. 100C (ca. 212F)
Melting Point:
ca. 0C (ca. 32F)
Vapor Density (Air=1):
Essentially the same as water.
Vapor Pressure (mm Hg):
Essentially the same as water.
Evaporation Rate (BuAc=1):
Essentially the same as water.

10. === Stability and Reactivity Data ===

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
May form carbon dioxide, carbon monoxide, and formaldehyde when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Incompatible with oxidizing agents and alkalis. Reacts explosively with nitrogen dioxide at ca. 180C (356F). Reacts violently with perchloric acid, perchloric acid-aniline mixtures, and nitromethane. Reaction with hydrochloric acid may form bis-chloromethyl ether, an OSHA regulated carcinogen.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

APPENDIX IX - Material Safety Data Sheets (cont'd)

Formalin, 10% Solution

11. === Toxicological Information ===

Formaldehyde: Oral rat LD50: 100 mg/kg; skin rabbit LD50: 270 uL/kg, Irritation data: eye, rabbit, 750ug Severe; inhalation rat LC50: 203 mg/m3; investigated as a tumorigen, mutagen, reproductive effector; Cancer Status: an OSHA regulated carcinogen. Methanol: oral rat LD50: 5628 mg/kg; inhalation rat LC50: 64000 ppm/4H; skin rabbit LD50: 15800 mg/kg; investigated as a tumorigen, mutagen, reproductive effector.

--------\Cancer Lists\----------

	---NTP Carcinogen---		
Ingredient	Known	Anticipated	IARC Category
Formaldehyde (50-00-0)	No	Yes	2A
Methyl Alcohol (67-56-1)	No	No	None
Water (7732-18-5)	No	No	None

12. === Ecological Information ===

Environmental Fate:

The following statements refer to the environmental fate of formaldehyde. When released into the soil, this material is expected to leach into groundwater. When released into water, this material is expected to readily biodegrade. When released into water, this material is not expected to evaporate significantly. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to be readily degraded by photolysis. When released into the air, this material is expected to be readily removed from the atmosphere by dry and wet deposition. When released into the air, this material is expected to have a half-life of less than 1 day.

The following statements refer to the environmental fate of methanol. When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into water, this material is expected to readily biodegrade. When released into the water, this material is expected to have a half-life between 1 and 10 days. When released into the air, this material is expected to exist in the aerosol phase with a short half-life. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to be readily removed from the atmosphere by wet deposition. When released into air, this material is expected to have a half-life between 10 and 30 days.

Environmental Toxicity:

The following toxicity information is for the formaldehyde portion. This material is expected to be slightly toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

The methanol portion is expected to be slightly toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

13. === Disposal Considerations ===

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. === MSDS Transport Information ===

Not regulated.

APPENDIX IX - Material Safety Data Sheets (cont'd)

Formalin, 10% Solution

15. === Regulatory Information ===

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Formaldehyde (50-00-0)	Yes	Yes	Yes	Yes
Methyl Alcohol (67-56-1)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

	--Canada--			
Ingredient	Korea	DSL	NDSL	Phil.
Formaldehyde (50-00-0)	Yes	Yes	No	Yes
Methyl Alcohol (67-56-1)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Formaldehyde (50-00-0)	100	500	Yes	No
Methyl Alcohol (67-56-1)	No	No	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------

	-RCRA-	-TSCA-	
Ingredient	CERCLA	261.33	8(d)
Formaldehyde (50-00-0)	100	U122	No
Methyl Alcohol (67-56-1)	5000	U154	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

WARNING:

THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

APPENDIX IX - Material Safety Data Sheets (cont'd)

Formalin, 10% Solution

16. === Other Information ===

NFPA Ratings: Health: **2** Flammability: **2** Reactivity: **0**
Label Hazard Warning:
DANGER! MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. STRONG SENSITIZER. MAY CAUSE BLINDNESS. COMBUSTIBLE LIQUID AND VAPOR. SUSPECT CANCER HAZARD. CONTAINS FORMALDEHYDE WHICH MAY CAUSE CANCER. Risk of cancer depends upon duration and level of exposure.

Label Precautions:
Keep away from heat, sparks and flame.
Do not breathe vapor.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Do not get in eyes, on skin, or on clothing.
Physical and health hazard information is available from employer and from material safety data sheets.

Label First Aid:
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. In all cases get medical attention immediately.

Product Use:
Laboratory Reagent.

APPENDIX IX - Material Safety Data Sheets (cont'd)

MS222

1. **Product and company identification:** Product Name: MS222 Name and address of contact: PHARMAQ Ltd Unit 15 Sandleheath Industrial Estate, Fordingbridge, Hampshire. SP6 1PA Tel: (01425) 656081 Fax: (01425) 655309

2. **Composition/information of ingredients:** Chemical name: 100% Tricaine Methane Sulphonate Also known as Tricaine Mesilate (The methane sulphonate of meta amino benzoic acid ethylester) CAS No: 886-86-2 Other information: A fine white odourless crystalline powder

3. **Hazards identification:** May be irritating by inhalation, ingestion or absorption through the skin.

4. **First aid measures: Eye Contact:** Rinse immediately with plenty of water and seek medical advice. Skin Contact: Remove contaminated clothing. Wash affected areas with soap and water. Inhalation: Remove to fresh air. If breathing is affected seek medical advice Ingestion: Drink milk or warm water. Seek medical advice. Have label or data sheet on hand. When giving drinks be aware that swallowing may be impaired increasing the risk of aspiration of liquid into the lungs.

5. **Fire fighting measure:** The product itself does not present a fire hazard but toxic fumes will be produced when involved in a fire. Suitable extinguishers: Foam, carbon dioxide or water spray.

6. **Accidental release measures:** Sweep up any spillage, avoid raising dust. Store in a closed container for disposal as hazardous waste. Moisten spillage area and wipe carefully to remove residue. Avoid entry of material to watercourses.

7. **Handling and storage:** Avoid skin and eye contact. Wear suitable protective clothing. Store in airtight containers in a cool dry place. Protect from light. Do not eat, drink or smoke whilst handling the material.

8. **Exposure controls and personal protection:** Where dust is a problem (i.e. when handling bulk), use local exhaust ventilation. Exposure Limits: Not determined. Personal Protection: Protect skin and eyes with protective overalls, gloves and goggles.

9. **Physical and chemical properties:** Appearance: Fine, white, odourless crystalline powder Melting Point: 147°C to 150°C Flash Point: Not applicable Solubility: Freely soluble in water (20°C)

10. **Stability and reactivity:** Stable under normal conditions. Avoid exposure to moisture. Incineration produces toxic fumes of oxides of nitrogen, sulphur and carbon. Hazardous reactions with acids, acid chlorides, acid anhydrides, chloroformates and strong oxidising agents.

11. **Toxicological information:** LD Rat (Oral) 5200mg/kg50 Mouse (Oral) 2400mg/kg Rabbit (Oral) 4000mg/kg Mouse (I.V.) 170mg/kg. LD50 LD50 LD50

12. **Ecological information:** Assumed to be biodegradable but do not discard into the natural environment.

APPENDIX IX - Material Safety Data Sheets (cont'd)

MS222

13. **Disposal considerations:** Product: In accordance with Special Waste Regulations 1991 Or other local authority regulations. Packaging: In compliance with Environmental Protection (Duty of Care) Regulations 1990.

14. **Transport information:** This product is not classified under RID/ADR

15. **Regulatory information:** R-Phrases: R36/37/38: Irritating to eyes, skin and respiratory system. S-Phrases: S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S7: Keep container tightly closed. S22: Do not breathe dust. S36: Wear suitable protective clothing.

16. **Other information: Note:** This information is based on the most recent safety data available and is given in good faith. It is the responsibility of the user to take appropriate precautions when handling the product. Suppliers of veterinary products are not required to provide safety data sheets but as there are health considerations in handling this product the above information is given to fulfil obligations under the Health and Safety at Work Acts and to assist in compiling assessments required by COSHH regulations.

APPENDIX IX - Material Safety Data Sheets (cont'd)

Household Bleach

The Clorox Company
1221 Broadway
Oakland, CA 94612
Tel. (510) 271-7000

Material Safety Data Sheet

I Product:	CLOROX REGULAR-BLEACH
Description:	CLEAR, LIGHT YELLOW LIQUID WITH A CHARACTERISTIC CHLORINE ODOR

Other Designations	Distributor	Emergency Telephone Nos.
Clorox Bleach EPA Reg. No. 5813-50	Clorox Sales Company 1221 Broadway Oakland, CA 94612	For Medical Emergencies call: (800) 446-1014 For Transportation Emergencies Chemtrec (800) 424-9300

II Health Hazard Data

DANGER: CORROSIVE. May cause severe irritation or damage to eyes and skin. Vapor or mist may irritate. Harmful if swallowed. Keep out of reach of children.

Some clinical reports suggest a low potential for sensitization upon exaggerated exposure to sodium hypochlorite if skin damage (e.g., irritation) occurs during exposure. Under normal consumer use conditions the likelihood of any adverse health effects are low.

Medical conditions that may be aggravated by exposure to high concentrations of vapor or mist: heart conditions or chronic respiratory problems such as asthma, emphysema, chronic bronchitis or obstructive lung disease.

FIRST AID:

Eye Contact: Hold eye open and rinse with water for 15-20 minutes. Remove contact lenses, after first 5 minutes. Continue rinsing eye. Call a physician.

Skin Contact: Wash skin with water for 15-20 minutes. If irritation develops, call a physician.

Ingestion: Do not induce vomiting. Drink a glassful of water. If irritation develops, call a physician. Do not give anything by mouth to an unconscious person.

Inhalation: Remove to fresh air. If breathing is affected, call a physician.

III Hazardous Ingredients

Ingredient	Concentration	Exposure Limit
Sodium hypochlorite CAS# 7681-52-9	6.15%	Not established
Sodium hydroxide CAS# 1310-73-2	<1%	2 mg/m^{3} [1] 2 mg/m^{3} [2]

[1]ACGIH Threshold Limit Value (TLV) - Ceiling

[2]OHSA Permissible Exposure Limit (PEL) – Time Weighted Average (TWA)

None of the ingredients in this product are on the IARC, NTP or OSHA carcinogen lists.

IV Special Protection and Precautions

No special protection or precautions have been identified for using this product under directed consumer use conditions. The following recommendations are given for production facilities and for other conditions and situations where there is increased potential for accidental, large-scale or prolonged exposure.

Hygienic Practices: Avoid contact with eyes, skin and clothing. Wash hands after direct contact. Do not wear product-contaminated clothing for prolonged periods.

Engineering Controls: Use general ventilation to minimize exposure to vapor or mist.

Personal Protective Equipment: Wear safety glasses. Use rubber or nitrile gloves if in contact liquid, especially for prolonged periods.

KEEP OUT OF REACH OF CHILDREN

V Transportation and Regulatory Data

DOT/IMDG/IATA - Not restricted.

EPA - SARA TITLE III/CERCLA: Bottled product is not reportable under Sections 311/312 and contains no chemicals reportable under Section 313. This product does contain chemicals (sodium hydroxide <0.2% and sodium hypochlorite <7.35%) that are regulated under Section 304/CERCLA.

TSCA/DSL STATUS: All components of this product are on the U.S. TSCA Inventory and Canadian DSL.

VI Spill Procedures/Waste Disposal

Spill Procedures: Control spill. Containerize liquid and use absorbents on residual liquid; dispose appropriately. Wash area and let dry. For spills of multiple products, responders should evaluate the MSDS's of the products for incompatibility with sodium hypochlorite. Breathing protection should be worn in enclosed, and/or poorly ventilated areas until hazard assessment is complete.

Waste Disposal: Dispose of in accordance with all applicable federal, state, and local regulations.

VII Reactivity Data

Stable under normal use and storage conditions. Strong oxidizing agent. Reacts with other household chemicals such as toilet bowl cleaners, rust removers, vinegar, acids or ammonia containing products to produce hazardous gases, such as chlorine and other chlorinated species. Prolonged contact with metal may cause pitting or discoloration.

VIII Fire and Explosion Data

Flash Point: None

Special Firefighting Procedures: None

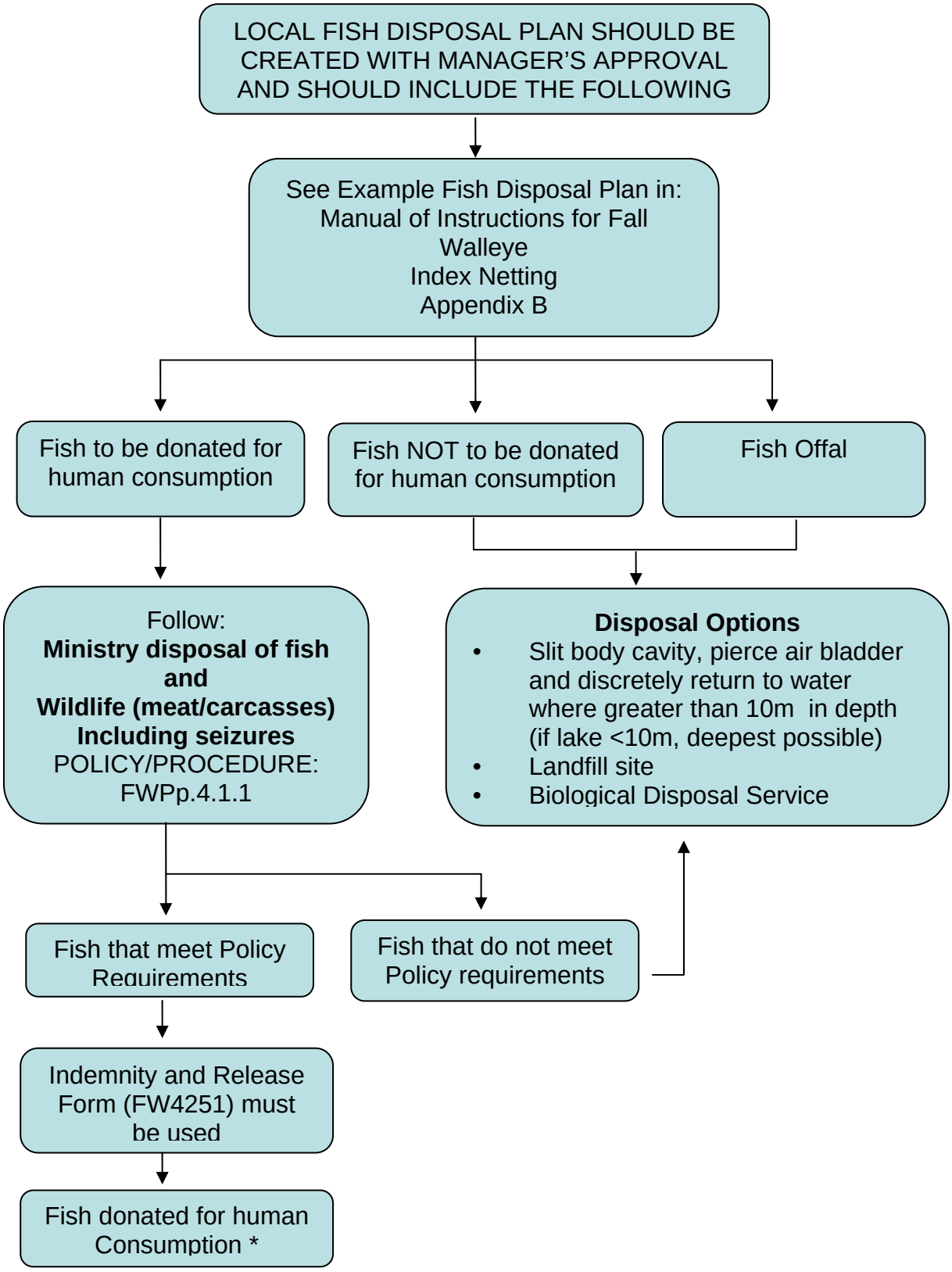
Unusual Fire/Explosion Hazards: None. Not flammable or explosive. Product does not ignite when exposed to open flame.

IX Physical Data

Boiling point	approx. 212°F/100°C
Specific Gravity (H_2O=1)	~ 1.1 at 70°F
Solubility in Water	complete
pH	~11.4

DATA SUPPLIED IS FOR USE ONLY IN CONNECTION WITH OCCUPATIONAL SAFETY AND HEALTH DATE PREPARED 05/05

APPENDIX X - Broad-scale Monitoring Fish Disposal Guidelines



*** Under <u>no circumstances</u> should fish, or parts there of, be retained by field crew staff for their, or their friends/family, consumption**

APPENDIX X - Broad-scale Monitoring Fish Disposal Guidelines (cont'd)

SECTION: Transportation, Release, and Sale of Fish and Wildlife

SUBSECTION: Sale/Disposal

SUBJECT: Ministry disposal of fish and wildlife (meat/carcasses) including seizures

POLICY/PROCEDURE: FWPp.4.1.1

ISSUE DATE: October 12, 2004

DEFINITIONS

In this policy/procedure**,**

- *"Act"* means Fish and Wildlife Conservation Act (FWCA)
- "*carcass*" as defined in the *Possession, Buying and Selling of Wildlife* Regulation (O. Reg. 666/98) includes any part of a carcass.
- "*farmed animals*" as defined in the Act means a white-tailed deer, elk, bison, fisher, fox, lynx, marten, mink, raccoon or member of another species prescribed by the regulations that is being kept in captivity in Ontario for the purpose of commercial propagation or the commercial production of meat, hides, pelts, antler products or other products;
- "*fish*" has the same meaning as in the *Fisheries Act* (FA)
- *"furbearing mammal"* as defined in schedule 1 of the *Act* or the *Wildlife Schedules Regulation* (O. Reg. 669/98) means badger, beaver, bobcat, coyote, fisher, fox (Arctic red and gray), lynx, marten, mink, muskrat, opossum, otter, polar bear, raccoon, red squirrel, striped skunk, weasel, (least, long tailed, short-tailed or ermine), wolf and wolverine.
- *"game wildlife"* as defined in the *Act* means a furbearing mammal (schedule 1), game mammal (schedule 2), game bird (schedule 3), game reptile (schedule 4) and game amphibian (schedule 5).
- *"Lot" means* one or more fish acquired on the same day from a specific source or waterbody (eg. Individual seizures, fish culture station, netting project)
- *"migratory bird"* has the same meaning as the *Migratory Birds Convention Act* Regulations
- *"pelt"* as defined in the *Act* means the untanned skin of a furbearing mammal, whether or not the skin is on the carcass
- *"specially protected wildlife"* as defined in the *Act* means a specially protected mammal (schedule 6), specially protected bird (raptor, schedule 7), specially protected bird (other than raptors, schedule 8), specially protected reptile (schedule 9), specially protected amphibian (schedule 10), and specially protected invertebrate (schedule 11).
- *"meat"* means the meat or carcass of wildlife that has not been inspected pursuant to the *Meat Inspection Act* (MIA).
- *"wildlife"* as defined in the *Act* means an animal that belongs to a species that is wild by nature, and includes *game wildlife* and *specially protected wildlife* and in this policy includes "*farmed animals*" as defined in the *Act.*.

APPENDIX X - Broad-scale Monitoring Fish Disposal Guidelines (cont'd)

RATIONALE

Periodically staff may come into possession of fish or meat from a number of sources, including:

1) nuisance animals which were dispatched (e.g. bear, deer, and moose in urban environment)
2) escaped farmed animals which were dispatched;
3) injured animals which were dispatched (e.g. deer caught in fences, vehicle accidents where animal is not killed);
4) animals which were dispatched as a part of fish and/or wildlife research projects;
5) fish which were acquired due to system failures or sampling processes at fish culture stations or from assessment projects and,
6) forfeitures and seizures under the respective legislation and pursuant to Enforcement Policy ENFPO 2.01.02.

Every effort should be made to utilize this fish and meat, while protecting the public from exposure to known food safety risks.

Edible Fish and Meat Suitable For Human Consumption

The Ministry of Health and Long Term Care (MOHLTC), Ministry of Agriculture and Food (OMAF) and the Ministry of Natural Resources (MNR) have the following responsibilities regarding food safety and public health:

- OMAF administers and enforces the *Meat Inspection Act* which generally prohibits the sale, offering for sale, transportation, and delivery to any person of meat from domestic animals unless it was inspected before slaughter.
- MNR administers the *Fish Inspection Act* which prohibits the sale or offering for sale of unwholesome, tainted, or decomposed fish.
- MOHLTC administers the *Health Protection and Promotion Act* (HPPA) and the *Food Premises* regulation (Reg 562, R.R.O. 1990) under that Act. This regulation governs the serving of all foods, including uninspected meats at a food premise. Generally, uninspected meat may not be served at a food premise, including hospitals, soup kitchens, and seniors homes.

MOHLTC and OMAF and MNR are committed to ensuring that fish and wild game consumed by the public are safe for consumption. This policy has been developed in conjunction with these Ministries to mitigate concerns in this regard.

This policy and procedure deals with MNR's practice of donating fish and meat for personal consumption on a "recipient beware basis" and establishes procedures to minimize the risk of food borne illness connected with this activity.

Fish and Meat not suitable for human consumption

Fish and meat in the ministry's possession that is not suitable for human consumption may be utilized by public museums or educational institutions that possess legal authorizations to possess the wildlife, or individuals who can use the meat as animal food, provided that the procedures set out in this policy and procedure document are followed.

APPENDIX X - Broad-scale Monitoring Fish Disposal Guidelines (cont'd)

PROGRAM DIRECTION

Donations of fish and meat that has been seized by MNR shall be consistent with this policy, as well as with Enforcement Branch policies and procedures. Please see enforcement policy ENFPO 2.01.02 for more information on the relevant Enforcement Branch policies and procedures.

In all cases where fish and/or meat is donated for human consumption, the Manager responsible for the program that is making the donation must ensure that a reliable system is in place to enable effective tracking of the recipients of each carcass and lot of fish. This is required in the event that it becomes necessary for the local Health Unit Officials to notify all pertinent individuals in the case of sickness or other adverse reaction from the donated fish or meat.

In all cases where fish or meat is donated, regardless of whether it is for human consumption or not, the required **Indemnity and Release form** shall be completed, signed by the receiver and witnessed by MNR staff.

Where **fish** is being donated by MNR for human consumption, a copy of the MOE "Guide to Eating Ontario Sport Fish" shall be provided to the recipient of the fish. Fish that are not recommended for human consumption under the MOE "Guide to Eating Ontario Sport Fish" shall not be donated for human consumption by MNR. Where the applicability of the MOE "Guide to Eating Ontario Sport Fish" cannot be determined (information lacking on source, size or species), the fish may still be donated if the acceptor is advised of this and if the acceptor agrees that the fish will not be used for human consumption.

Road killed *meat* will not be donated by MNR for human consumption; however, individuals will not be prevented from picking-up these carcasses on their own initiative.

Persons receiving meat from MNR pursuant to this policy are **not required to report** its acquisition under s. 2 of O. Reg. 666/98

Specially protected wildlife will **not** be donated to anyone for human consumption.

Non-inspected fish and meat may be donated to:

1. A needy **individual** or an individual who requires it for medical reasons (eg. unable to eat domestic meat). In all cases where the fish or wildlife is donated to an individual the acceptor must:
   - be given written notice by MNR that the fish or meat has not been inspected under the *Fish Inspection Act* or the *Meat Inspection Act* respectively and the fish or meat is for the use of his or her immediate family only;
   - be provided with the relevant Indemnity and Release form FW 4251 (10/04). which must be signed and witnessed prior to the receipt of the meat or fish;
   - be given a copy of the Safe Food Handling guidelines as provided by MOHLTC (copy appended); and
   - in the case of fish, be given a copy of the MOE "Guide to Eating Ontario Sport Fish"

APPENDIX X - Broad-scale Monitoring Fish Disposal Guidelines (cont'd)

2. A non-profit group or **organization**, for the purpose of distributing to the individuals in item 1, provided that the organization satisfy the following requirements. The acceptor for the organization or group shall:

- assume responsibility for tracking individual recipients;
- assume responsibility for providing the Safe Food Handling guidelines as provided by MOHLTC (copy appended) or the MOE "Guide to Eating Ontario Sport Fish" as appropriate to all recipients;
- provide written notice to the recipients that the fish or meat has not been inspected under the *Fish Inspection Act* or *Meat Inspection Act* respectively and that the fish or meat is for the use of his or her immediate family only;
- sign a copy of the relevant Indemnity and Release form FW 4251 (10/04).

Non inspected fish or meat shall not be donated to:

- soup kitchens or,
- institutions such as Senior Citizens homes, hospitals, group homes or any similar institution.

This restriction does not apply to any facility or organization that is exempted under the HPPA and Food Premises Regulation.

The MOHLTC is currently reviewing it's policy and regulations with regards to fish and wildlife fundraising dinners as authorized under the FWCA (WilPp.5.3.2). Pending the results of this review, no fish or meat shall be donated to an individual or an organization for the purpose of consumption at a wild game fundraising dinner.

Handling Procedures

All fish or meat that is potentially being donated shall be visually examined by MNR staff to discern to the best of their ability that the fish or meat has been handled in such a manner that it was not subject to unsanitary conditions and the quality of the flesh has not been jeopardized so as to make it unsuitable for human consumption.

In addition:

- internal surfaces of vehicles and containers used for transporting wild game should be kept clean. Skinned carcasses should not come into contact with the floor of the vehicle and should be transported so that they are protected from contamination;
- where staff anticipate the acquisition of quantities of fish, they should ensure that a supply of ice is available to ensure the fish is kept cool to prevent deterioration;
- fish or meat that is being considered for donation shall be transported and stored separately from other fish or meat that is not suitable for human consumption in a manner that would prevent any cross contamination that could occur;
- The carcasses of big game should be cooled to a temperature of 7 degrees C or less and in the case of small game carcasses, 4 degrees Celsius or less. If the ambient temperature is not cool enough to achieve this, the carcass should be placed in refrigeration within 8 hours;
- if the carcass of big game is to be butchered, it should be transferred to a provincially licensed abattoir/meat packing plant or a food premise that has been inspected by a local health unit for hanging/aging as soon as practical;
- ensure that carcasses are processed and tracked so that individual animals (or lots in the case of fish) may be tracked through the donation process.

APPENDIX X - Broad-scale Monitoring Fish Disposal Guidelines (cont'd)

If meat is processed, wrapped and frozen for donation by MNR or a non profit group or charitable organization, this must be done at a provincially licenced abattoir/meat packing plant or at a food premise that has been inspected by a local health unit.
Quantities of fish may be sent to fish processing plants that are federally registered (under CFIA) or inspected under the provincial Fish Inspection Act.

While all fish and meat shall be considered for donation, **if there is any doubt as to whether all of the above safe handling procedures have been applied, or if there is any doubt at all as to the quality of the meat or fish, the meat or fish shall not be donated for human consumption**

Donations For Non Human Consumption

Fish or Wildlife excluding *migratory birds* may be donated to educational institutions such as universities, colleges, or public museums that can use the fish or wildlife for scientific or educational purposes.

Migratory birds may only be donated to universities, colleges, or public museums that have the legal authority to possess them under the *Migratory Birds Convention Act*.

Wildlife specified on a Wildlife Scientific Collectors Authorization may be donated to the holder of the authorization. (WilPp.6.2.2 Wildlife Scientific Collectors Authorization)

Fish specified on a Licence to Collect Fish for Scientific Purposes may be donated to the holder of the licence.

If the donation is of a *furbearing mammal,* Subsection 3(1) of O. Reg. 666/98 applies. When a *furbearing mammal* (*pelt* attached) is to be donated, then a Licence to Possess a *Pelt* should be issued. *Carcasses* of *furbearers* without *pelts* may be donated and the receiver should be issued a receipt to comply with subsection 20(7) of O. Reg. 666/98.

Meat including road kills suitable for non-human consumption may be donated for use as animal food.

PROCEDURE

The District Enforcement Supervisor has been delegated the authority to determine the disposition of seized or forfeited fish and meat that is in MNR's possession. In all other cases, the manager responsible for the program is responsible for determining the appropriate disposition of fish and meat that is acquired within the program.

All fish or meat which is to be donated shall be uniquely identified such that individual carcasses or lots of fish can be identified and tracked through the donation process.

1. For edible *fish and/or meat* donated to an individual, the acceptor signs the Indemnity and Release form FW4251 (10/04) which contains notice that the meat has not been inspected under the *Meat Inspection Act* or *Fish Inspection Act* and is for his or her immediate family only. The Indemnity and Release form witness information must be completed by an MNR employee. The person is also provided with a copy of the MOHLTC "Safe Food Handling" guidelines and MOE "Guide to Eating Ontario Sport Fish" pertinent to the lot of fish, if applicable. A copy of the

APPENDIX X - Broad-scale Monitoring Fish Disposal Guidelines (cont'd)

signed Indemnity and Release form is given to the acceptor. A copy of the Indemnity and Release form which contains the name and contact information will be retained on file to serve as a tracking mechanism.

2. When edible *fish and/or meat* is donated to a nonprofit group or organization for distribution to individuals, the acceptor signs the Indemnity and Release form FW4251 (10/04) that contains written notice that the meat has not been inspected under the *Meat Inspection Act* or the fish has not been inspected under the *Fish Inspection Act* must be signed by the receiver and witnessed. A copy of the signed Indemnity and Release form which contains the name and contact information is given to the acceptor of the recipient organization. The Indemnity and Release form specifies that the organization shall:
    - assume responsibility for tracking recipients (copy of form FW 4253 to be provided to the organization for this purpose);
    - advise each recipient of the fish or meat that the fish or meat has not been inspected under the Fish Inspection Act or the Meat Inspection Act, respectively;
    - ensure that each recipient is advised that the fish or meat is for his or her immediate family only
    - assume responsibility for providing MOHLTC Safe Food Handling guidelines (as appended)to each recipient.

    A copy of the Indemnity and Release form will be retained on file to serve as a tracking mechanism

3. Where non edible *fish* or *meat* is donated to a university, college, or public museum any required certificates or licences should be provided when the fish or meat is transferred. When no such legal instruments are required the receiver should be provided with a Non-edible Fish or Meat Indemnity and Release form FW 4252 (10/04) stating the species and quantity of *fish or meat* being donated, that it is for scientific and educational use only, and clearly identify that the items are not suitable for human consumption. A copy of the Indemnity and Release form which contains the name and contact information will be retained on file to serve as a tracking mechanism.

4. Where non-edible fish or meat is donated to an individual for animal food, a Non-edible Fish or Meat Indemnity and Release form FW 4252 (10/04) must be signed by the receiver and witnessed by MNR staff. A copy of the Indemnity and Release form which contains the name and contact information will be retained on file to serve as a tracking mechanism.

APPENDIX X - Broad-scale Monitoring Fish Disposal Guidelines (cont'd)

REFERENCES

Legal References

Fish and Wildlife Conservation Act, SO. 1997, c. 41

- O. Reg. 666/98 – Possession, Buying and Selling of Wildlife Regulation
  Section 1 - Definition of a carcass
  Subsection 3(1) - Possession of pelts
  Subsection 20(6) Invoice for furbearing mammal carcass
- Fish Inspection Act RSO 1990

- Meat Inspection Act RSO 1990, c. M-5
- Food Premises Regulations Regulation 562, RRO 1990
- Health Protection and Promotion Act, RSO 1990, c. H-7
- Food Safety and Quality Act, S.O. 2001, c. 20

- Migratory Birds Convention Act
  Section 2 - Interpretation - Definition of migratory bird

Related References

- Policies/Procedures
  WilPp.5.3.2. Authorization of fish and wildlife fundraising dinners
- Safe Food Handling fact sheet, created by MOHLTC – appended
- Indemnity and release forms – appended.

Appendix XI MNR Fisheries Animal Care Class Protocols (excerpt)

Category: Capture Methods

Protocol: Lethal gillnetting

Protocol Code: GN-L

General Protocol Description:

A gillnet is a passive fishing gear used to capture fish by entanglement. There are three ways in which fish are caught by gill nets: (1) wedged – held by the mesh around the body, (2) gilled – held by mesh slipping behind the opercula, or (3) tangled – held by teeth, spines, maxillaries, or other protrusions without penetration of the mesh. In any event, the gillnet is stationary in the water and fish must swim into the net to be captured. Typically, lethal gillnetting involves the use of overnight net sets (at least 12 hours in duration and as long as 72 hours). Mesh sizes may be graded from 19 mm to 152 mm to capture a wide range of species and sizes. This method should only be used if there are no other means of acquiring samples for the particular research project.

Animal care recommendations/considerations:

- Due to the lethal nature of this technique the experimental design should be reviewed to ensure the necessity of the sample/information obtained by the use of this method.
- Consideration should be given to using non-lethal methods of fish capture to obtain the equivalent information
- Every effort should be made to maximize the information obtained beyond the primary sampling objective of the project e.g. Fish health status, genetic analysis, gamete collection, population data, calcified tissue collection, type specimens as may be required by other researchers
- Due to the nature of the net set, most fish die of anoxia once entangled in the net. Upon retrieval of the net, live fish are killed by a blow to the head or through a lethal dose of anaesthetic.(see Protocols – BLOW and ANAES)
- Use selective mesh sizes to minimize the capture or entanglement of non-target species
- OMNR currently uses standardized gill-net sets for Fall Walleye Index Netting, as an example
- Set nets during periods of the year or areas in the water body that minimize incidental catches, maximize efficiency for target species and reduce multiple sets to capture the sample size required

Related references:

Hubert, W.A. 1983. Passive capture techniques. p. 95-122 *in* Nielsen, L. and D. Johnson (eds). Fisheries Techniques. Amer. Fish. Soc., Bethesda, MD.

Hicks, F. 1999. Manual of Instructions: Spring Littoral Index Netting (SLIN). Ontario Ministry of Natural Resources publication, Queen's Printer, Toronto.

Appendix XI MNR Fisheries Animal Care Class Protocols (excerpt) (cont'd)

Category: Handling and Marking

Protocol: Biological sampling

Protocol Code: BI-SA

General Protocol Description:

This protocol outlines the procedures to be used when collecting fish attribute data at the capture site and the fish are returned to the water. This technique usually entails weighing and measuring fish, identifying gender, sexual maturity and a gross examination of other external parameters. Scale samples may also be removed for aging purposes.

Live capture techniques using trap nets, seines, trawls, short set gill nets, or electrofishing are commonly used prior to biological sampling. Please refer to class protocols on CAPTURE techniques for proper procedures using these types of equipment.

Animal care recommendations/considerations:

- Set duration and/or length of the capture gear should be adjusted to maintain a manageable number of fish handled per set, thus reducing containment time for fish.
- Fish should be removed from the capture gear using dip nets and held in floating pens constructed of ABS pipe and ace netting or onboard live wells. The netting in both the dip net and holding pen should be knotless to minimize slime removal from fish.
- Woolen, cotton or neoprene gloves should be worn to minimize the pressure required to hold fish safely and minimize slime loss. This also reduces the chance of dropping fish and having them hit hard surfaces (boat floors etc.) resulting in possible internal damage (Stickney, 1983).
- Non target species should be immediately returned to the water
- A second containment pen should be used for the recovery of stressed animals.
- The amount of time that a fish is out of water should be kept to a minimum. Basic attributes such as fin clip presence, sex and maturity, fork length, total length, scale samples and weight should be obtainable in 30 seconds or less. To lower the risk of infection, scale samples should only be taken when necessary (i.e. When scales are no longer a reliable form of age determination (Lake trout > 6yrs.)).
- Use of anaesthetic is required prior to sampling using more invasive techniques such as pectoral spine removal, tissue biopsies or implantation of tags and transmitters.
- Using experienced personnel, organizing equipment and recording materials, and following the same routine (sequence of attribute recording) will minimize the time a fish is out of water and reduce handling related stressors.

Related references:

Stickney, R.R. 1983. Care and Handling of Live Fish. P. 85-94 *in* Nielson, L. and D. Johnson (eds). Fisheries Techniques. Amer. Fish. Soc., Bethesda, MD.

Appendix XI MNR Fisheries Animal Care Class Protocols (excerpt) (cont'd)

Category: Euthanasia

Protocol: Euthanasia by blow to the head

Protocol Code: BLOW

General Protocol Description:

A blow to the head is a humane form of euthanasia that produces a sudden massive cerebral hemorrhage causing an immediate depression of the central nervous system. This renders the fish unconscious and insensitive to pain, and leads to a quick death.

The use of this procedure would be appropriate during the course of a research study to end the pain and suffering or extreme distress of a fish, which could not be relieved by any other method or care. It would also be appropriately applied to dispatch animals that need to be disposed of at the end of a project when no other use of these animals is approved or found.

The use of this method of euthanasia would be precluded where a fish is too large, or too small, to properly deliver an effective lethal blow and dispatch the animal humanely.

Animal care recommendations/considerations:

- It should be recognized that the use of this technique to euthanize fish could be emotionally traumatic to some staff and members of the public. It may be an inappropriate technique to use to euthanize fish in some instances, for this reason alone.
- It is essential that the procedure always be carried out in a professional and respectful manner.
- Staff should be trained by another familiar with the technique in order to carry out the procedure properly; otherwise the fish may only be stunned and leave it conscious and in pain.
- Staff carrying out this procedure should be familiar with the anatomy of the species to ensure that they can deliver the blow to the appropriate site on the head to cause the required cerebral trauma.
- Staff must have sufficient physical strength to deliver a lethal blow.
- Wherever possible, a fish to be dispatched by a blow to the head should first be anesthetized (see Anesthesia - TMS Class Protocol) to reduce unnecessary injury and distress to the animal prior to the delivery of the lethal blow. Anesthetizing the animal will also immobilize it, which will permit a more controlled and efficient delivery of the blow. Handling fatigue and the possibility of accidental personal injury to staff carrying out the procedure (due to deflected blows) will also be reduced.
- It is essential that the blunt object used to carry out the procedure be of sufficient mass to adequately deliver a fully lethal blow. Consideration needs to be given to the size of the tool, in relation to the size of the fish being dispatched.
- The fish should be placed on a hard surface before being struck to help ensure the force of the blow will be fully transferred to the cranium of the animal, and not absorbed by the supporting surface.
- Following the delivery of the lethal blow, the death of the fish should be confirmed. Death will be recognized by a cessation of respiration (lack of opercular flap movement), total flaccidity of the trunk (epaxial) muscles, and a loss of reflex responses. It should be noted that immediately after being dispatched, the fish will often exhibit reflexive muscular twitching of the trunk muscles. This reflexive muscle response does not indicate the perception of pain.
- If the use of this method fails to consistently produce immediate death, the procedure should be abandoned in favour of another method.

Appendix XI MNR Fisheries Animal Care Class Protocols (excerpt) (cont'd)

Related references:

Anon. 1993. Report of the AVMA panel on euthanasia. Journal of the American Veterinary Medical Association. 202: 229-249.

Anon. 1998. Guidelines for use of fishes in field research. Fisheries. 13: 16-22.

Anon. 1998. Laboratory Animal Care and Use Handbook. University of New Mexico Health Sciences Center.

Grossblatt, N. (ed.). 1996. Guide for the Care and Use of Laboratory Animals. Institute of Laboratory Animal Resources. Commission on Life Sciences. National Academy Press. Washington, D.C.

Olfert, E.D., Cross, B.M., and A.A. McWilliam (eds.). 1993. Guide to the Care and Use of Experimental Animals, Vol. 1. Canadian Council on Animal Care. Ottawa.

Appendix XI MNR Fisheries Animal Care Class Protocols (excerpt) (cont'd)

Category: Euthanasia

Protocol: Euthanasia by anaesthesia

Protocol Code: ANAES

General Protocol Description:

The use of a lethal overdose of an anaesthetic causes a painless loss of consciousness with a minimum of distress, followed by death. The use of an anesthetic overdose to euthanize a fish is especially appropriate where a fish is too large, or too small, to dispatch the animal effectively and humanely using a blow to the head.

Tricaine methanesulfonate, commonly known as "MS-222" or "TMS", is probably the most commonly used anesthetic for this purpose to date. MS-222 acts to depress the respiratory center of the central nervous system, leading to anoxia. Short-term exposure at lower concentrations permits a reversible state of sedation or anesthesia in fish; extended exposure and/or exposure to higher concentrations can lead to death.

The use of this procedure would be appropriate during the course of a research study to end the pain and suffering or extreme distress of a fish, which could not be relieved by any other method or care. It would also be appropriately applied to euthanize animals that need to be disposed of at the end of a project when no other use of these animals is approved.

Animal care recommendations/considerations:

- It is essential that this procedure always be carried out in a professional and respectful manner.
- Staff should be trained by another familiar with the technique in order to carry out the procedure properly with a minimum of pain and distress. Training should include familiarity with the normal responses of the fish to handling and anesthesia, methods to reduce distress during handling, and an understanding of how the mechanism of euthanasia induces unconsciousness and death.
- It should be reiterated that precautions to reduce stress and injury during handling must be observed, despite the fact that the animals involved are to be euthanized.
- MS-222 is most commonly administered using a lethal bath, however it can also be delivered by removing the fish from the water and flushing a concentrated solution over the gills
- The lethal bath should be prepared with the same attention to temperature, oxygen level, pH, etc. as would be given to a bath being used for sedation or anesthesia. (see Anesthesia – TMS Protocol).
- The anesthetic concentration required to act as an effective lethal bath will depend on a number of factors including species, genetic strain, age, state of health, water temperature and exposure time. Bell (1987) indicated that MS-222 dosages much above 100ppm (which induces deep anesthesia in less than one minute) can be lethal to salmonids. One manufacturer cited an LC50 for rainbow trout of 65 ppm for a 15-minute exposure; for channel catfish the LC50 was 139 ppm for a 15-minute exposure (Argent Chemical Laboratories, 1987).

Appendix XII Net / Float Label

DO NOT LIFT

This net is part of the Ontario Ministry of Natural Resources Broad-scale Monitoring Program. The small number of nets placed in this lake, and over 1600 other lakes across the province, will provide the information necessary for managing fish populations within the various Fisheries Management Zones. The data will also be used to monitor the effects of climate change, pollution and invasive species on fish populations within each Zone. Research has shown that these nets typically catch only a small fraction of the fish population in a lake, many of which can be released, and will not harm the fish population. This work here will typically last less than a week. We would appreciate your support by not disturbing this equipment and by reporting any violations. Thank-you.

(over)

Ontario

Ontario

DO NOT LIFT

Do not fish or anchor between the floats

Property of the Ministry of Natural Resources

This net is scientific equipment being used to study the fish population in this lake, interfering or tampering with this net is an offence under the Fish and Wildlife Conservation Act, 1997 and punishable by a fine of up to $25,000 and/or one year in jail.

To report violations phone 1-877-TIPS-MNR or Crime Stoppers at 1-800-222-TIPS

FOR MORE INFORMATION ABOUT THIS WORK CALL:

_____

Appendix XII Net / Float Label (cont'd)

Ontario

NE PAS LEVER

Ne pas pêcher ni jetter l'ancre entre les flotteurs
Propriété du Ministère des Ressources Naturelles

Ce filet est un équipement scientifique utilisé pour l'étude des populations de poisson de ce lac. Toute interférence ou manipulation de ce filet est un offense contre le règlement de la conservation de la faune (1997) et est passable d'une amende de 25 000$ et/ou d'un an de prison.

Pour rapporter toute violation, composez le 1-877-TIPS-MNR ou Crime Stoppers au 1-800-222-TIPS

POUR PLUS D'INFORMATION À PROPOS DE CET APPEL, COMPOSEZ LE :

_____

NE PAS LEVER

Ce filet appartient au Ministère des Ressource Naturelle l'Ontario et est utilisé pour un programme d'inventaire à grande échelle. Le petit nombre de filets placés dans ce lac et dans 1600 autres plans d'eau répartis dans la province, vont fournir l'information nécessaire afin de faire une bonne gestion des populations de poissons des différentes Zones de Pêche. Les données vont aussi être utilisées pour surveiller les effets des changements climatiques, de la pollution et des espèces envahissantes sur les populations de poissons de chaque zone. Des recherches ont démontrées que ces filets ne capturent qu'une petite fraction de la population de poissons d'un lac, dont plusieurs peuvent être relâchés, et n'ont par le fait même aucun effet sur la population. Le travail réalisé ici devrait durée moins d'une semaine. Nous apprécions votre soutient en ne dérangeant pas cet équipement et en signalant toutes violations. Merci.

Ontario

Appendix XIII Stable Isotopes Collection Protocol

General Approach

Stable isotope analysis provides a time integrated sketch of the energy flow through food webs. In lakes, the ratio of isotopes ^{13}C and ^{12}C remains consistent in organism tissues as feeding interactions transfer energy from prey to predator, but this ratio differs at the base of the food web among primary producers occupying different habitats. These differences in ^{13}C fractionation at the base of the web are useful to address questions about spatial structure, such as, what proportion of an organism's food is channelled from near shore (littoral) versus open water (pelagic) habitat sources. Alternatively, the ratio of ^{15}N to ^{14}N increases consistently as energy moves from prey to predator yet is similar among organisms at the base of the food web throughout a given lake. This consistent increase in the fraction of ^{15}N in consumers, as they feed further above the base resource, provides an estimate of trophic position in the web. Primary levels of ^{13}C and ^{15}N can also vary across the landscape, so in order to assemble webs that can be compared among lakes it is necessary to establish baseline signals of both ^{13}C and ^{15}N. Baselines for lake ecosystems are often determined from isotope signatures of long lived primary consumers (mussels and snails) that are known to feed on particular primary producers like phytoplankton or epiphytic algae. The protocol outlined below provides a description of the sampling procedures needed to establish baseline isotope values and to construct food webs for lake trout and walleye populations (see Figure XX). A similar protocol applies for studying other top predators (e.g. northern pike, smallmouth bass), but surveys in 2010 target selected lake trout and walleye lakes.

Food web components

Lake trout, walleye and forage fish

Most often, the isotope signature of fish is determined using muscle tissue. For this reason, collectors are asked to obtain a sample of the epaxial muscle from lake trout, walleye and forage fish. For lake trout and walleye, follow the guidelines described for contaminant sampling (Appendix II), but be sure to remove a larger piece of epaxial muscle, allocating at least 5 grams of tissue for isotope analysis. Once removed, store each tissue sample in a container (Whirl-pak or plastic sealable freezer bag) labelled according to contaminant guidelines (ID number, species, lake name, date collected). Labelling samples on the outside of the container with a permanent marker and inside with pencil on a piece of waterproof paper is advised. This tissue must be frozen immediately to minimize decomposition (icepacks, freezer, or dry ice).

Forage fish samples need to be collected from littoral and pelagic zones. The sample of littoral forage fish should include potential prey from shallow areas (0-6 m) that are roughly no

Appendix XIII Stable Isotopes Collection Protocol (cont'd)

larger than the size of your hand (e.g. yellow perch, cyprinid or minnow species). Pelagic forage fish live offshore in deeper water and generally include species like cisco, smelt and occasionally small whitefish. In general, fish that are in the size range of cisco (or smaller) are likely to be within the size available to lake trout and are appropriate for the sample. You may sample tissue from forage fish using the same protocol as used for lake trout and walleye (see above). However, if time is limited and cooler space is available, simply divide forage fish into littoral (yellow perch and minnow) and pelagic samples, then bag and freeze fish whole. Each bag should contain a label that includes the contents (e.g. littoral forage fish and species if possible), lake name, and date collected.

Like muscle tissue, fish scales carry an isotope signature that integrates fish diet across time. Use of scales to determine the isotopic signature of fish is quite promising, but needs further investigation. Because standard protocol requires that scales are collected from sport-fish, collectors are not required to collect additional scales for isotope analysis. Otherwise, scales should be stored in a labelled envelope that identifies fish number, species, lake name, date sampled.

Target sample:

lake trout ≈ 20 fish each species > 32 cm in total length

walleye ≈ 20 fish each species (range of size caught)

littoral forage fish ≈ 40 fish (20 yellow perch + 20 minnows/cyprinids etc.)

pelagic forage fish ≈ 20 fish (e.g. cisco, whitefish, smelt)

Materials and equipment:

Whirl-paks or plastic sealable freezer bag (up to 80 per lake)

Littoral Invertebrates

Benthic macro invertebrates are an important source of food to predators in lake littoral zones. All visible invertebrates (insect larvae, leeches, crayfish) may end up in the diet of fish in the littoral zone. Consequently, a preferable invertebrate sample includes a range of organisms, sampled in a few different (rocky, weedy or woody) habitats. Collecting littoral invertebrates may be as easy as picking individuals from the surface of turned over rocks or woody debris. Use of a sturdy long handled net may increase capture success when used to dislodge and scoop organisms from vegetation and sediments. Other methods to collect invertebrates include use of a benthic sled, dredge or an Eckman grab sampler in deeper waters. If sampling equipment is used, then separate invertebrates from sediment and other unwanted materials. Forceps are handy for separating invertebrates from unwanted debris and also for picking invertebrates from rocks or wood surfaces.

Appendix XIII Stable Isotopes Collection Protocol (cont'd)

Once separated, place invertebrates in labelled bags with rough description of contents (e.g. Littoral inverts), lake name, date sampled and freeze them.

Target sample:

25 individuals (mixed insects and other invertebrates)

Materials and Equipment:

Whirl-pak or plastic sealable freezer bag

Long handled, metal frame net

Forceps with safety string

Eckman grab (if required)

Benthic sled (if required)

An invertebrate field guide (taxonomic identification is NOT necessary)

Zooplankton

Zooplankton are small primary or secondary consumers that feed in the water column and can be an important source of prey for fish. Sampling crews are requested to collect zooplankton by hauling a suitable zooplankton net from below the thermocline through the water column to the surface. Once at the surface, wash zooplankton into the collection vessel by splashing lake water on the outside of the mesh portion of the net and by spraying the net with a squirt bottle of water. The squirt bottle can also be used to wash the contents of the net into the sample container. Put the sample in a labelled (e.g. zooplankton, depth of location, lake name, and date collected) container and immediately freeze the sample. Please record and submit the depth of the haul and number of hauls taken with the samples. Zooplankton hauls can be collected mid-day at the location of maximum depth in the deepest basin of the lake. Basically, this is the same place that temperature and dissolved oxygen profiles are taken (do not take at the same time in exactly the same place as samples might interfere with each other).

Target sample:

5 hauls per lake

Materials and Equipment:

250 μm mesh zooplankton net attached to nylon rope

Wash bottle

Plastic sample containers (jars)

Appendix XIII Stable Isotopes Collection Protocol (cont'd)

Baseline components

Mussels

Mussels are long lived filter feeders of phytoplankton used to determine ^{15}N and the ^{13}C baseline for the pelagic zone. Mussels often aggregate on or bury in the substrate near shore in many lakes. In these locations, the most effective technique for finding mussels is to swim and visually scan the substrate using a mask and snorkel. In shallow waters (1m or less), mussels can be also collected by searching the substrate visually and/or by feeling by hand. In slightly deeper waters scanning while wading and feeling the bottom with your feet can be useful on soft bottom substrates. More efficient techniques for deeper waters include use of a benthic sampler such as an Eckman grab or dredge. However, snorkelling and shallow water searches will often be sufficient to collect requested mussel samples because few individuals are requested. Additionally, some mussels may be collected at the same time as littoral insects using the sampling equipment detailed above. To prevent deterioration, freeze mussels samples in a bag labelled with contents (mussels), number collected, lake name and date sampled.

Target sample: 10 individuals

Materials and Equipment:

Whirl-pak or plastic sealable freezer bag
Mask and snorkel
Long handled metal frame net
Eckman grab (if required)
Eckman dredge (if required)

Gastropods (Snails)

The littoral grazing habits of gastropods (snails) makes them a good indicator of baseline ^{15}N and littoral ^{13}C. Snails graze attached aquatic algae found on the substrate and plant surfaces in the littoral zone of many lakes. Snorkelling is an effective means to find snails in near shore areas. Another easy way to collect snails is to simply wade in shallow areas visually scanning sand, rocks and macrophytes (both attached and floating). When wading, a sturdy long handled net may be helpful for collecting snails from vegetation and benthic sediments. Collecting and shaking macrophytes in a container may dislodge snails when individuals are not immediately obvious. Be careful to collect an organism and not empty shells because isotope analysis is performed on tissue. Snails should be placed in a bag, labelled (snails, total number, lake name, date sampled) and frozen.

Appendix XIII Stable Isotopes Collection Protocol (cont'd)

Target sample: 20 individuals

Materials and Equipment:

Whirl-pak or plastic sealable freezer bag

Mask and snorkel

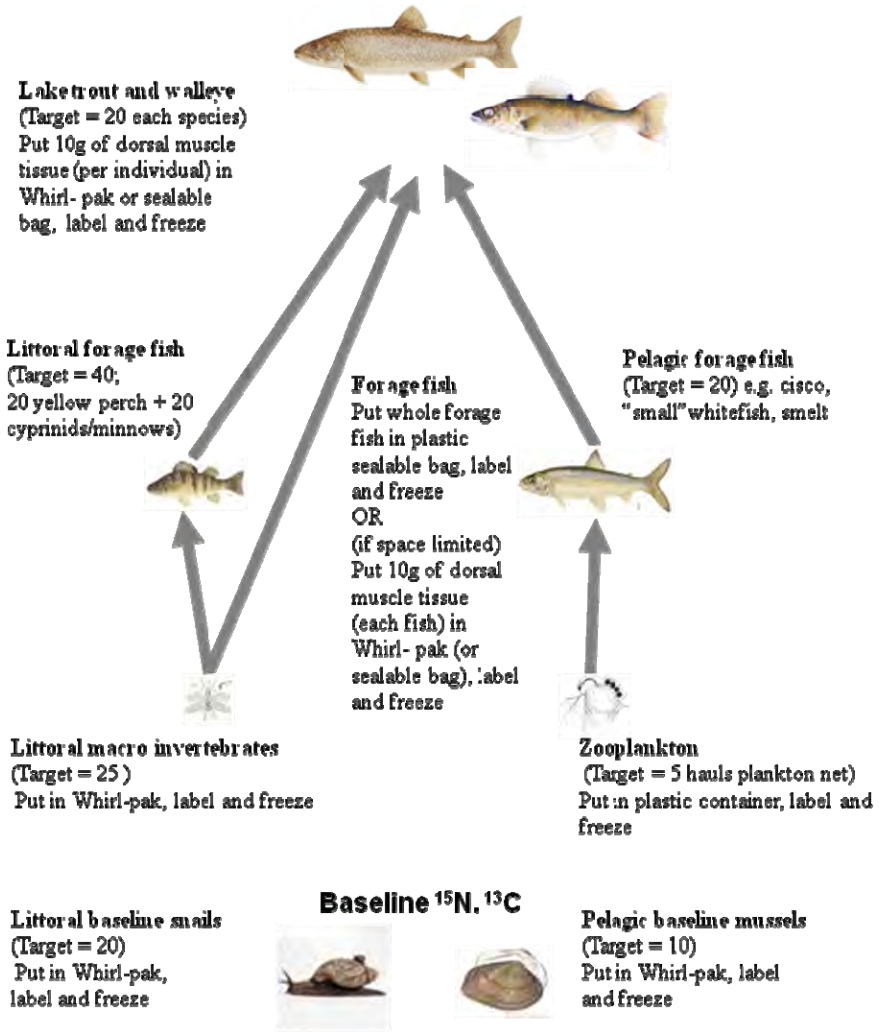
Long handled, metal frame net

Bucket for shaking macrophytes

Preservation note:

If isotope tissue samples cannot be kept frozen in the field and are deteriorating, then alcohol may be used as a last resort to preserve tissue. In this case, place tissue/organisms in a labelled container and fill it with ethanol (95%) so that there is a sufficient amount to preserve the tissue.

What data are required:



Appendix XIV Instructions for sampling fish tissues (fins) for genetic analysis

Sampling procedures for live release

Collect a fin clip (pectoral, pelvic, adipose or caudal) from each fish being sampled. This method is minimally invasive and nonlethal, and works well for releasing fish alive. This is also an easy method to use if members of the public are assisting in the sampling program. Whenever possible, it is preferable to get a large sample size (at least 30 to 50 fish) from each population to ensure a representative sample for that population. Larger sample collections (up to 100 fish per population) are also useful, but not essential. Taking more than 100 samples is not necessary, and is unlikely to provide additional useful information from a population perspective.

Taking a fin clip for genetic samples

- We routinely use a common one-hole paper punch to remove a piece of fin; alternatively, a clean knife, scalpel, or scissors can be used to remove a small (less than 0.5cm^2) piece of fin tissue. It doesn't matter which fin is sampled for DNA extraction purposes – if the fish is to be released alive, consideration should be taken for minimizing fin wear. If sampling is done by cutting off a portion of fin with a knife or scissors, take the sample from the end of the fin to promote faster healing and regeneration.
- It is important to take only <u>one</u> tissue sample per fish. Avoid the temptation to take whole fins from large fish – more is <u>not</u> better for preserving tissue.
- Dirt and any visible parasites should be removed, as these can affect genetic analyses.
- Place the fin punch in a vial or bottle with preservative (95% ethanol).
- Clean the cutting tool(s) and forceps between samples to minimize sample cross-contamination. Rinsing in water and wiping with a clean tissue or cloth is recommended. For hole punches, a quick rinse in lake or river water is sufficient to prevent cross-contamination of DNA between samples.

Tissue storage – pooled (population) samples

How the finclips are stored and preserved may vary depending on what information is desired from the population and/or individual fish. If it is not necessary to link genetic data back to morphological data for individual fish (i.e. link genetic profiles of individuals back to their length, weight, age, sex, etc.), finclips from multiple fish within a single population can be pooled for preservation and storage. For population-level surveys, this is the simplest and most appropriate method.

a) Place all fin clips from a single population into a glass or plastic jar containing high strength (95%) ethanol. Make sure that the total volume of the combined tissues does not exceed 10% of the liquid volume.

b) <u>ONLY</u> fish of the same species and from the same location should be placed in the same bottle. Make sure to use one bottle per species if collecting multiple species from the same site.

c) Label each bottle with a permanent marker. Ensure that each sample set can be identified later to collection site, date, fish species, individual number or ID if appropriate, etc. It is advisable to tape over the completed label with transparent tape (e.g. Scotch® tape or clear packing tape) to prevent the written information from being damaged by spilled ethanol.

Appendix XIV Instructions for sampling fish tissues (fins) for genetic analysis (cont'd)

d) Use a pencil to write out the same label information on a piece of regular paper or card stock and place it inside the sample bottle. This will ensure that sample collections can still be correctly identified if the outside label comes off or becomes illegible. Do not use plastic paper or "Rite in the Rain" – these contain chemicals that may interfere with DNA storage and extraction.

e) Store the sample bottles at room temperature until ready to be shipped (see below).

If no ethanol is available, fins from individual fish can be dried and stored together, although this can be tricky and should be avoided if possible. Individual finclip samples should be dried before putting them together in an envelope or bottle, to prevent fins from sticking together and causing cross-contamination between samples. Dried fins are also much more fragile, and may break apart during shipping or storage. For these reasons, it is better to preserve pooled population samples in ethanol rather than drying them.

Label Information

Clearly label each population bottle with its associated source information. Without information on source water body, location, and species, even well-preserved samples are of little use. Please check to be sure that the following information is included with each bottle:

PROJECT CODE
WATERBODY ID
WATERBODY NAME
SITE COORDINATES (include latitude and longitude if possible)
SPECIES:
DATE: (YYYY/MM/DD)

Shipping

- Contact us to let us know samples are coming or arrange for samples to be picked up.
- If sending samples, please provide shipping details (bus/courier/airline, waybill no., etc.).

Send to:

Chris Wilson / Kristyne Wozney
Ontario Ministry of Natural Resources
Trent University
2140 East Bank Drive,
Peterborough, Ontario
K9J 7B8

phone: (705) 755-2260 / 755-2261
fax: (705) 755-1559
e-mail: chris.wilson@ontario.ca
kristyne.wozney@ontario.ca

Appendix XV Invasive Species Reconnaissance Protocol

Equipment Required

- Plankton tow net
- 100 metres of weighted rope (5 mm in diameter) marked in 1 m intervals and spooled on a rope board or plastic spool used for electrical wire
- Spray bottle
- Invasive species reconnaissance forms (see Appendix 1)
- Thermometer
- Pencil
- Lake map
- Sample bottles
- Zip lock bags

Equipment must be disinfected between lakes

- Remove all vegetation, mud or debris from equipment (all parts).
- Submerse all equipment that came into contact with lake water in water heated to 50^{O}C or warmer for 5 minutes (refer to invasive species prevention guidelines for other tips).

Do <u>not</u> use bleach or cleaning solvents on the equipment. Do not submerse the thermometer in hot water – it will break.

Inspect Equipment prior to each use

- Check all fittings and clamps for tightness.
- Check all knots and re-tie if necessary

How to Choose Sample Sites

- Use the map to choose 3 sample sites as follows, before going out on the lake to do the sampling:

    1. the deepest location in the lake;
    2. location near an access point (public boat launch, marina) that has adequate depth (9m) to do a vertical haul where possible, otherwise use horizontal haul (3m to 8m);
    3. location on the windward side of the lake – vertical haul is preferred if minimum depth of 9 metres is available, otherwise use horizontal haul (depths of 3m to 8 m). Veligers and water fleas are passive swimmers so will collect on the windward side of lakes.

- Identify and number sites on a lake map.
- Sites should be at least 9 metres deep to collect a sample using the vertical haul method described. Otherwise, a horizontal haul can be used, but not if deeper sites exist.
- If the lake has two or more main basins try to take a sample from each basin to end up with your 3 samples. In large lakes with multiple basins if time permits, 3 samples from each basin are preferable.
- If there is only time to sample one site, choose a windward site (if possible near an access point) that has adequate depth (9 m) to do a vertical haul. However, it is strongly recommended that crews collect samples from at least three sites on the lake as you are less likely to miss sampling zebra mussel veligers and/or water fleas if they are present.

Appendix XV Invasive Species Reconnaissance Protocol (cont'd)

At the Sampling Site

- Anchor your boat and turn off the motor.
- Complete the Invasive Species Reconnaissance Form and Sample Bottle Labels. Be sure to include weather conditions, wind speed and direction on the form.
- Sample # should correspond with the number you recorded on the lake map.
- Hold thermometer underwater for approximately 20 seconds then take the reading immediately.
- In comments box indicate if sample site is close to marinas, boat launch etc.
- Fill in a sample bottle label with the following information:
    - Lake name
    - Waterbody LID
    - Sample number
    - Date
    - Vertical or horizontal haul
    - Water depth.
- Tie the loose end of the rope on the plankton haul net to your boat. This ensures that the net is not lost overboard.
- Fill the spray bottle with lake water.
- Determine which haul method you can use: Vertical or Horizontal.

If the lake has areas that are 9 m or more deep, use the ***Vertical Haul*** method. This is the preferred method. If there are no areas of your lake that are this deep, sample using the ***Horizontal Haul*** method in depths to 3 meters to 8 meters.

The plankton haul net looks like a windsock with a plastic cup attached to the end. The mesh size of the net is 63 microns, which can filter microscopic organisms (plankton) like the spiny water flea and the zebra mussel veligers from the water. The plastic cup portion of the net is called the cod end and it collects the plankton sample as the water passes through the net.

Appendix XV Invasive Species Reconnaissance Protocol (cont'd)

VERTICAL HAUL

Use this method when water depth is equal to, or greater than 9 metres.

Step 1: Select a site (see section "How to Choose a Sampling Site")

Step 2: Measure the depth with the depth sounder

STEP 3: Slowly let the net sink to within 2 meters of the bottom.
The rope is marked in one-metre intervals so taking the height of the net into consideration, count each mark to reach the depth 2 m from bottom.

STEP 4: Pull up the net slowly

Use a hand over hand motion to lift the net approximately 1 meter every 3 seconds. Lift the net so the cod end is completely out of the water and let the water drain from the net so that plankton is collected in the cod end.

HORIZONTAL HAUL

Use this method when water depth is less than 9 metres

STEP 1: Let the net sink about 3m.
Don't allow the net to hit the bottom.

STEP 2: Slowly travel approximately 7 metres in your boat
Slowly (approx. 1 meter every 3 seconds if possible) tow the net behind the boat taking care the net does not get caught in the propeller. Keep a firm hand on the rope and ensure that the loose end is tied to the boat. After travelling the 7 metres stop the boat by putting engine in neutral or shutting engine off to minimize risk of net getting caught in propeller.

STEP 3: Quickly lift the net from the water

Let the water drain from the net, collecting the plankton in the cod end.

Other Steps for Both Vertical and Horizontal Hauls

- Once the water has been drained from the net, there will be a very thin layer of microorganisms and plankton on the inside of the net. Rinse these microorganisms into the cod end by gently dipping the net into the water and lifting it up and down.
- **Do not** lower the mouth of the net below the water's surface, as this will allow some of the microorganisms trapped inside the net to escape.
- After you have rinsed the net in the lake, there will ***still*** be some plankton on the net surface. To clear the net, use the spray bottle, to flush these particles into the cod end by liberally squirting water from the outside of the net into the mesh.

Appendix XV Invasive Species Reconnaissance Protocol (cont'd)

- The mesh-covered holes of the cod end may become clogged so water cannot drain from it. Use the spray bottle to squirt water from the outside of the cod end through the mesh covered holes to remove the blockage until sufficient water drains from the sample into the bottle.
- Once the net has been adequately sprayed and brought inside the boat, remove the cod end by lifting the metal flaps and then turning clockwise. This should release the lock and you can now remove the cod end from the net.

Please Note: If the sample collected is contaminated with large volumes of sediment and debris, you may have hit the lake bottom, thoroughly clean out the net and attempt to take a new sample from the same location, without sediments.

- Pour the sample from the cod end into a labelled sample bottle then rinse the inside of the cod end with the spray bottle and pour the remaining contents into the sample bottle.
- For all but the deepest site, repeat the haul to collect a second sample and put it in the same sample bottle. To save time and effort only do one haul at the deepest site but do 2 at the other 2 sites chosen.
- To properly preserve the sample, add roughly double the amount of alcohol to the sample (ratio of 2 parts alcohol: 1 part sample) you collected. Samples are preserved using 95 % ethanol.
- You need to preserve the sample and the microorganisms it contains to ensure that they don't spoil. **A spoiled sample cannot be analysed**.
- Proceed to your next sample station and follow the same procedures as described above using a new sample bottle at each sample station.

Ensure you fill out the Sample Form and Sample Bottle labels at each site

Disinfect and inspect all equipment before using it on another lake!

Courier the sample bottles to Dr. Shelley Arnott, Queens University

Courier Address:
Dr. Shelley Arnott
Department of Biology
Room 4232
Biosciences Building
Queen's University
116 Barrie St.
Kingston, ON K7L 3N6
Phone number: 613-533-6384

Before sending the samples make sure the box includes:

- **Preserved samples in labelled bottles placed in sealable bags as a precaution in case of leakage**
- **Invasive Species Reconnaissance Form**
- **Lake map with sample sites identified**

MNR Contact for more Information is: Jeff Brinsmead; 705 755-5424; jeff.brinsmead@ontario.ca

Appendix XVI List of Changes to 2013 Manual

Location	Page	Revision Details
Table 5	11	added sets to stratum 20-35m and deeper for ON (small mesh)
Table 4	10	addition of new targeted sampling allocation for NA (large mesh)
Table 4 and 5	11,10	change from maximum depth to maxium stratum with >5% area
Table 6	17	major changes to biological sampling requirements
2.14.3.7	22	addition of request to take reference photo of each species caught
2.14.2	18	removal of Wisconsin Fish ID website - difficult to access now
Appendix		added sheet of voucher labels
Appendix VI	47	corrections made to Field Code sheets