Salmonid Spawner Survey

PROJECT APPROVAL

- Not required

TRAINING

- Not necessary

TIME COMMITMENT

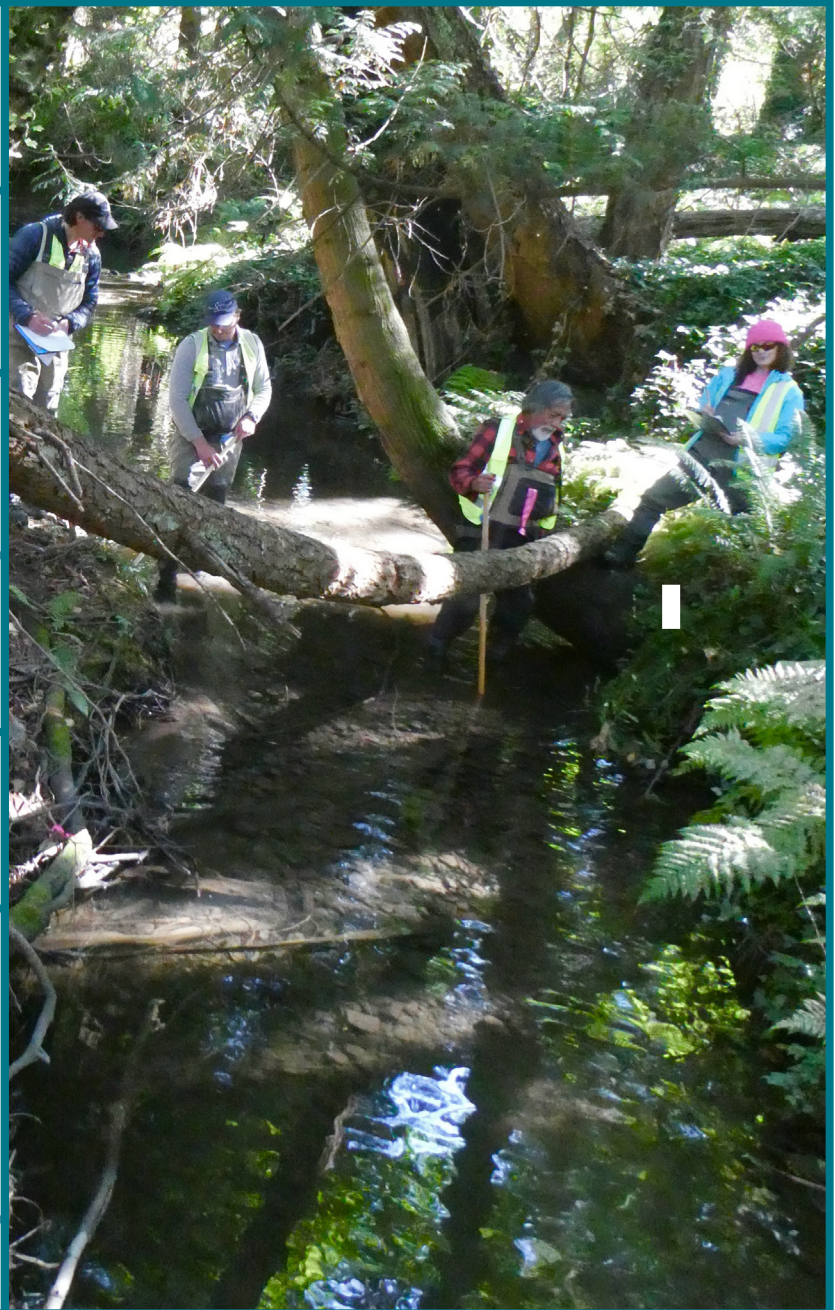- One day or more

NUMBER OF PEOPLE

- 2 or more

TIME OF YEAR

- Spring through fall

This survey involves walking streams during the spawning season to count fish and observe their condition.

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Pêches et Océans Canada

Fisheries and Oceans Canada

Canada

Welcome to Streamkeepers

The Department of Fisheries and Oceans Community Involvement Program provides the Streamkeepers training modules. These modules encourage "hands on" environmental activities in watersheds in British Columbia. Volunteer groups, First Nations, schools, and individuals are using this material to monitor and restore local waterways. Your local Fisheries and Oceans Community Advisor can provide more information.

Project Purpose

Spawner survey data gathered in Module 12 can help inform DFO stock assessment division to prepare annual reports of specific salmon streams to assess trends in fish populations. Volunteer groups carrying out salmonid enhancement or habitat restoration projects can use spawner survey results to help assess the success of their projects.

Overview

The spawner survey protocols in Module 12 are based on established federal and provincial standards (Stream Inspection Log). You will record information on salmon returning to spawn on the Data Sheet as you walk the stream several times (once a week) during the spawning season, counting the dead and live fish, and observing their condition. This method is simple, does not take much time, and works well on small to mid-sized streams. Data you enter into the Streamkeepers Database at the end of the season will allow you to easily see and decipher a variety of statistical information. Following this consistent method produces quality data that can be used with confidence to compare results with data from previous years and with results from other streams.

Spawner surveys provide information about the number and species of adult salmonids that reach the spawning grounds, the proportion that spawn successfully, general fish and habitat health, size of fish, timing of runs, and effectiveness of restoration activities.

Health of the Salmonid Populations

This is affected by harvest rates, stream conditions (habitat damage, water quantity, and water quality), climate change and ocean conditions. Salmonid enhancement or habitat restoration projects can help more fish reach the spawning grounds. Information about stream habitat, such as obstructions, changes in stream beds, pollution, and other potential problems can be recorded during the spawner survey. Immediate concerns should be reported to

ORR **(see Module 9)**. All these factors interact to affect the escapement in a single year, or over many years. The results of previous surveys can help you recognize trends in relative abundance of various fish populations.

Timing of Salmon Migration and Spawning

This depends on the species, the run, and geographic location of the stream (north, south, inland, coastal). Adults may migrate to the streams weeks or months before they begin to spawn.

Table 1 lists the typical peak spawning time for salmonids, but there are exceptions.

Best Time to do the First Survey

Conduct the first survey before the first freshet of the season as high water flows trigger most species to begin migrating to spawning grounds. Subsequent surveys should be done weekly. However, there are times during the spawning season when high stream flows make it unsafe for a survey. It is important to survey again as water levels begin to drop, visibility improves, and fish are easier to see.

Counting Spawning Salmon

This is easier in some streams than others. Some species, like coho, are elusive and difficult to count. DFO biologists sometimes use an easily surveyed stream as an indicator or "index" stream for a general area, when other streams are too difficult to survey.

This survey involves counting fish in defined sections of a stream. Do the surveys throughout the period when fish return to the stream to spawn (**Table 1**). Do not do a spawner survey during high water or floods, when travel along stream banks can be dangerous and silt loads can reduce water visibility, making fish difficult to see. The survey may involve walking long distances along the stream and some wading across streams.

Project Guidance and Approval

You need no project approval for a spawner survey, unless you plan to collect samples or tags. However, you should contact local property owners if you need to cross their property to get to your stream. You may want to contact your local Community Advisor, DFO office, or provincial ministry office for advice on resources, stream conditions, and historical data before planning a survey. They may also provide practical information about run timing, access points, danger areas, and maps.

Level of Effort

A full survey involves completing the Data Sheets for an identified stream section once a week during the spawning season (**Table 1**). If you are surveying more than one section on a stream, coordinate the survey so that everyone goes out at the same time, to avoid counting the same fish more than once. The time involved depends on the length of the section surveyed, the number of spawners and the stamina of the volunteers. The survey may involve walking long distances along the stream and some wading across streams.

Background

In large watersheds, surveys are often done on specific streams or sections of streams where spawners can be counted accurately and consistently from year to year. If a spawning area is not accessible, you may be limited to counting fish in key holding areas of a stream.

Table 1

Timing of the Spawner Survey Period for Salmonid Species

SPECIES	SPAWNING PERIOD
pink salmon	August through September
chum salmon	EARLY RUN: late July through late September
	LATE RUN: late September through November
chinook salmon	EARLY RUN: July through August or early September
	LATE RUN: mid-September through mid-November
coho salmon	EARLY RUN: late August through December
	LATE RUN: January through February
sockeye salmon	August through October
kokanee	September through November
cutthroat trout	December through June
steelhead trout	March through May
rainbow trout	April through June
dolly varden/bull trout	September through November

Personal Safety

Concern for personal safety is essential when working outdoors. Always tell someone where you are going and when you will return. Work in pairs, never alone. Carry emergency response phone numbers.

Do not attempt to wade fast water or water deeper than your knees. Watch out for slippery stream beds, undercut banks, waterfalls, and fast flowing areas. Avoid log jams, which can be unstable.
Get permission to cross or use private property. Beware of domestic animals and wildlife.

Health

Do not drink stream water or expose cuts and wounds. Although it may look pristine, water can harbour bacteria or parasites that will make you sick. Know the symptoms and treatment for hypothermia. Carry a first aid kit. When working in isolated areas, carry a survival kit containing at least a lighter, fire starter, candle, flares, and a portable radio telephone or cell phone.

Clothing

Dress for the weather and stream conditions. Wear highly visible clothing. Wear waders with felts when walking in the stream and disinfect with Ovadine after each survey.

Wildlife Awareness

Bears, wolves, and other predators may be common and bold around streams during the spawning season. Reduce your chances of encounter by making lots of noise, so animals will avoid you. Keep food in airtight containers and leave no food scraps behind. Walk so bears can hear and smell you and leave the area. Avoid confined areas

Material and Equipment

- data sheets
- waders or boots
- map
- camera/phone
- bear spray
- rubber gloves
- measuring tape
- pencils
- talley counters
- compass or GPS
- first aid kit
- polarized sunglasses
- notebook/clipboard
- thermometer
- safety equipment
- wading stick
- zac knife

Spawner Survey Protocols

The spawner survey protocols in Module 12 are based on established federal and provincial standards (Stream Inspection Log). The survey frequency of once a week was developed to coincide with spawning characteristics and length of time fish tend to reside in the stream. This timing is affected by location, species, run type (summer, fall), and stream conditions. Counts of live and dead fish are combined to produce an estimate of total numbers for the season.

Scheduling

Factors that affect scheduling of the survey and accuracy of the count should be considered. For example, fish may start migrating earlier or later than expected and you may miss part of a run. Fish may be in the spawning area for shorter or longer times than expected, and should be noted. The count may include fish that are not spawning in the area, but are migrating through.

Planning Your Survey

A full survey involves completing a DATA SHEET for an identified stream section once a week during the spawning season. The following steps will guide you through the planning process.

Conduct the survey in an area expected to provide spawning habitat for the species of interest. Make an extra copy of the map and any working sketches from previous spawner surveys. Update the map with information on species-specific spawning areas, vehicle access points, changes in stream channel, and other useful information.

1. Establish Survey Areas

Define the survey sections on the map considering the species-specific spawning areas, terrain, physical abilities of the volunteers, and time commitment. Some sections may be difficult to survey. Make the sections short if you expect high numbers of spawners. Aim for reasonable access by vehicle or short hike. Use landmarks such as bridges, roads, and barriers as the start and finish points of a section when practical.

2. Collect and Review Existing Data

Review the information obtained from Streamkeepers **Module 1 and 2 surveys,** including maps. You may wish to use a topographic map or aerial photographs to locate important features such as canyons, waterfalls, and access points. Contact your DFO Community Advisor for information about local salmonid species. Look at historical spawner records and stream reports for information about typical run timing and spawner abundance.

3. Timing of Survey

Do the first survey before the first freshet of the season as high water flows trigger most species to begin migrating to spawning grounds. This gives you a "zero" starting count. Count through your run timing and end your survey when the run timing is over, and you have had "zero" live and dead counts.

Midday usually is the best time of day to see and count fish as the sun is directly overhead and not shining in your eyes. Sometimes fish spawn at night or in the early morning, and stay in deeper pools during the day. You also may need to time the survey to avoid contact with wildlife.

Avoid conducting a survey during high flows or turbid conditions; postpone a day or two to avoid unsafe conditions. travel along stream banks can be dangerous and silt loads can reduce water visibility, making fish difficult to see. Ideally, surveys are conducted on a bright day when water clarity is good. *Polarized sunglasses reduce glare and make it easier to see into the water.* Fish are difficult to see on rainy days.

4. Determine inspection method:

(A) Bank walk
(B) Stream walk

Choosing between a bank walk or a stream walk depends on the species being counted. A bank walk is typically used to count chum, pink, sockeye, or chinook as these species may be easily seen from the bank. A stream walk is more appropriate for coho and steelhead as these species hide in deep pools or undercut banks and under logs and can be difficult to see from the bank.

(A) Bank walks require:

A person on the bank on <u>each side</u> of the stream (a minimum of 2 people) Everyone walks up the stream bank in tandem, counting live and dead fish which are easily observed in pools, riffles and undercuts (some dead may be found on the stream banks).

Observers record number count and species on the **DATA SHEET.**

(B) Stream walks require:

ON THE BANK: a person on each side of the stream (a minimum of 2 people) *and . . .*
IN THE WATER: a person on each side of the stream (only 2 people)

People in the water are to remain on their side of the stream to avoid crisscrossing the stream and disturbing redds.

Everyone walks up the stream *in tandem*, counting live and dead fish in pools, riffles and undercuts (some dead may be found on the stream banks). In shallow water everyone should be able to accurately count live and dead fish. In deeper water the people in the stream can run a wading stick through the water, around logs and rocks and explore undercut banks to encourage fish movement. Observers on the banks watch carefully for disturbed fish and record number count and species on the **DATA SHEET.**

5. Develop a Coordinated Plan

Identify a Coordinator for the surveys.

1. Arrange transportation to and from the survey locations.

2. Set up a central first aid and emergency response location. Make everyone familiar with safety emergency procedures.

3. Bring **DATA SHEET** printed on waterproof paper. Assign one person to be data recorder and assign a team for each stream bank.

4. Train team members in survey and data collection methods, species identification **(see appendix 1),** and survey locations. Remind volunteers to avoid criss-crossing the stream and disturbing fish, their habitat, and redds (nests of salmonid eggs).

5. Arrange to collect completed forms, go over results with team members, and enter information in the Streamkeepers Data Base.

6. Make a simple schedule **(example below)** and keep it in your survey records. Prepare a large map showing all the survey sections and team members.

Spawner Survey Schedule		
Date/Time	Stream Section	Team members/Contact Info

Data Sheet
STEP 1

Conduct a Cross Sectional Survey

▶ **Record the following on Data Sheet: STEP 1**

Stream Name   **Watershed Code**

Section No.   **Date of Survey**

Distance: *(start to end in metres)*

Survey Area: (*location - street etc*)   and   **(***GPS coordinates*)

Team Observers: (*first/last names*)   **Affiliation:**

Target Species   **Survey Start - Survey End: (***times*)

Primary Inspection Method: *(bank walk or stream walk)*

Data Sheet
STEP 2

Water Properties

▶ **Record the following on Data Sheet: STEP 2**

• **Water Temperature**

• **Percent Bankfull:** estimate percent bankfull (amount of water compared with bankfull channel size), defined by the edge of perennial vegetation growth. Instructions found in Module 2.

• **Water Clarity**

Data Sheet
STEP 3

Weather Conditions

▶ **Record the following on Data Sheet: STEP 3**

• **Air Temperature**

• **Percent Cloudy**

• **Brightness**

• **Precipitation (type and intensity)**

Locating Spawners

Look for live fish in pools, riffles and undercuts. Sometimes fish congregate at the confluence of a tributary, so check those locations carefully. Species like coho hide in deep pools, undercut banks and under logs, and can be difficult to find making a stream walk more appropriate than a bank walk. Watch carefully to spot and count disturbed fish. Polarized sunglasses reduce glare and make it easier to see into the water.

Counting Spawners

Position observers:
• One on each side of the stream ON BANK
• One on each side of the stream IN WATER

Walk up the stream, counting and recording. In shallow water, observers on both sides of the stream walk in tandem to accurately count live and dead fish. In deeper waters, they can run a walking stick through the water and around logs, rocks, undercut banks and other hiding areas to encourage fish movement. Count both live and dead fish as you go, with live spawners recorded according to habitat type (pool, riffle, or undercut).

Collecting Data From Tag Studies

If you find a visible, external tag on a fish (live or dead) count it, leave it in place, take a photo (dead only) and contact your DFO Community Advisor for guidance. You may be able to recover data if tagging studies have been done.

Data Sheet
STEP 4

Recording Data

▶ **Record the following on Data Sheet: STEP 4**

FOR LIVE FISH:
At *each* Habitat Type record *all* of each species on their own line. Log according to habitat type (pool, riffle, undercut). Add information about fish condition and identifying marks (e.g., health, signs of stress or damage).

Repeat the following information for all of each <u>species</u> found.

• **SPECIES** - identify using Appendix 1 Key.
• **HABITAT TYPE** - circle pool, riffle or undercut.
• **NUMBER** - within this habitat.
• **CONDITION** - use prompts from the Data Sheet.

FOR DEAD FISH:

Record the following information for ***each dead fish*** found.
Use one line for each fish.

• **SPECIES** - identify using Appendix 1 (page 14).

• **LENGTH** - from back of eye to the 'U' in the peduncle.

• **FIN CLIP** - record if clipped. If you find a visible, external tag on a fish, live or dead, count it, leave it in place, take a photo, and contact your DFO Community Advisor for guidance. You may be able to recover data if tagging studies have been done.

• **GENDER** - male / female - determined by cutting open the fish abdomen with a Zac knife.

• **PERCENT SPAWN** - for females only   100% indicates all eggs are laid,   0% indicates no eggs laid and is a pre-spawn mortality. Data from the number of pre-spawn mortalities provides information about stream and fish conditions over the years. In years with poor conditions e.g., low water, high temperatures) pre-spawn mortality may be high.

• **CONDITION** - use prompts from the Data Sheet.

DEAD FOUND BUT PREVIOUSLY COUNTED - record the number of dead fish (already opened from your previous surveys) as this provides information on how long a fish remains in the system, providing ecosystem benefits.

Counting Large Numbers of Fish

If there are large numbers of live fish, there are strategies that help you estimate numbers **(see Figure 1)**. Use a hand tally to count the live as you slowly walk upstream. For even distribution
(e.g., in a large riffle), you can divide the riffle into imaginary strips and calculate the average number of fish in a strip, then extrapolate the number per strip into a count for the whole riffle.

For a clustered distribution (e.g., in a deep pool), you can imagine the cluster as a circle, count the number of spawners` in a quarter of the cluster and extrapolate to a total number. In either case, record the number as an *estimate* under comments, as this is not an accurate count.

Figure 1
Estimating techniques for high numbers of fish

Pool cluster: Divide into quarters and multiply the count by 4 to estimate total.
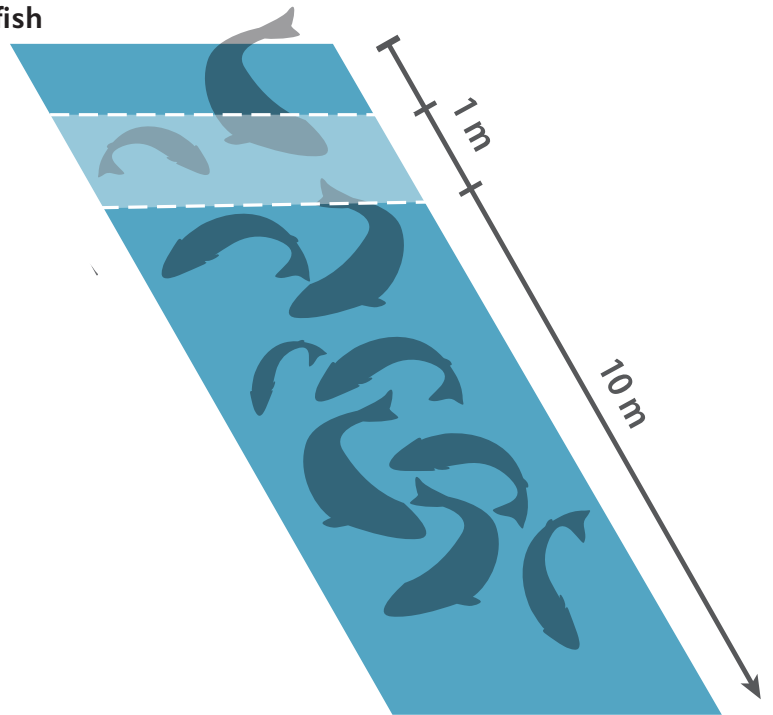
Divided riffle: section into imagined strips to estimate total.

Data Sheet
STEP 5

Summarize and Report Data

WHILE STILL AT THE STREAM:

▶ Record the following on the Data Sheet:

TOTAL Spawner Count and the SUMMARY Section for each of the following:

• TOTAL LIVE SPAWNERS

• TOTAL DEAD SPAWNERS (dissected)

• TOTAL DEAD SPAWNERS (not dissected)

• DEAD FOUND BUT PREVIOUSLY COUNTED

• STREAM VISIBILITY

• PERCENT OF HABITAT SEEN

• FISH COUNTABILITY - countability refers to the level of confidence in the count. It is affected by volunteer effort, weather (wind or rain disturbs the water surface), turbidity and water colour, which reduce the ability to see and count fish accurately.

Enter Data in Streamkeepers Database

This can be done after each survey date or at the end of the season. The Streamkeepers database will produce a **graph** of total counts that can be used to compare results from year to year. Also, save any photos, sketches, and notes you take during the surveys.
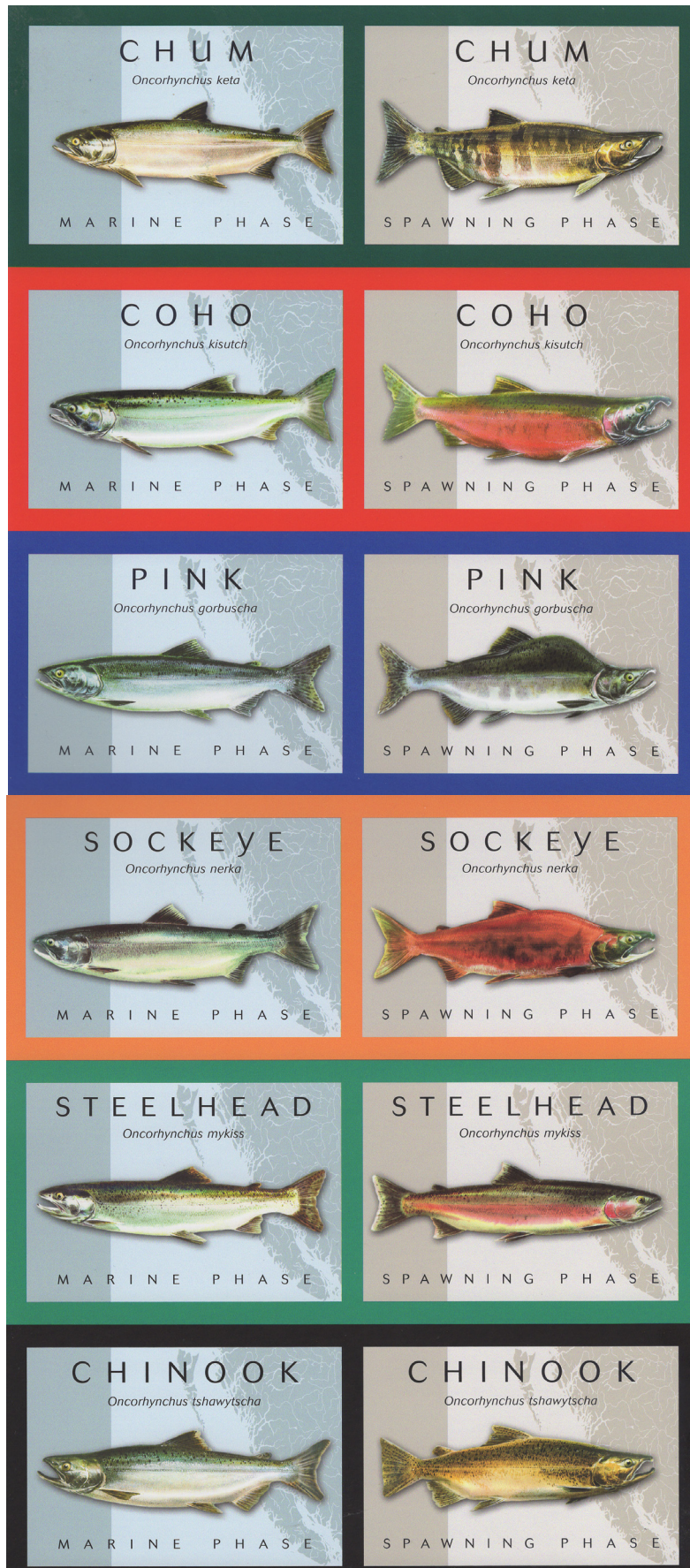
Reporting Information

Send copies of your summary and graph to any people who helped you with the survey, including DFO staff, agency and municipal staff. They may be able to use your data to help with their own assessments and plans. Compare your survey data with previous data to assess the health of the population. If you have been involved in a salmonid enhancement or habitat restoration project, you can use the data to learn how the population has responded to your efforts.

Public Relations

You can clean up streams, monitor their condition, and undertake enhancement projects, but you need the support of your community for these projects to succeed. Talk about your project with others whenever and wherever you can, including at schools and public meetings. Place signs at visible project sites and share on social media pages. Contact newspapers, radio stations and television stations. **Module 10** contains specific information about increasing community awareness and working with the media.

CHUM
Oncorhynchus keta
MARINE PHASE

CHUM
Oncorhynchus keta
SPAWNING PHASE

COHO
Oncorhynchus kisutch
MARINE PHASE

COHO
Oncorhynchus kisutch
SPAWNING PHASE

PINK
Oncorhynchus gorbuscha
MARINE PHASE

PINK
Oncorhynchus gorbuscha
SPAWNING PHASE

SOCKEYE
Oncorhynchus nerka
MARINE PHASE

SOCKEYE
Oncorhynchus nerka
SPAWNING PHASE

STEELHEAD
Oncorhynchus mykiss
MARINE PHASE

STEELHEAD
Oncorhynchus mykiss
SPAWNING PHASE

CHINOOK
Oncorhynchus tshawytscha
MARINE PHASE

CHINOOK
Oncorhynchus tshawytscha
SPAWNING PHASE

Module 12 – Spawner Survey Stream Inspection Log - Enter data at www.streamkeepers.info

Step 1

Stream name:		**Alias:**	**Watershed code:**
Section number:	**Distance:**		**Date (YYYY-MM-DD)**
Inspection area directions:		**Start Lat:**	**Start Lon:**
		End Lat:	**End Lon:**
Observers: First and last name		**Contact for survey:**	
Affiliation:		**Email:**	
		Contact for Stock Assessments:	
Target Species:		**Start Time:**	**End Time:**	**Total Hours:**
Primary Inspection Method: ☐Bank walk ☐Stream walk			

Step 2

Water Properties:	**Water Temp:**
% Bankfull ☐less than 25% ☐25-50 % ☐50-75 % ☐75-100 % ☐more than 100%	
Water Clarity ☐Tea ☐Clear ☐Slightly Turbid ☐Muddy	
Water properties can affect stream visibility	

Step 3

Sky Condition:	**Air Temp:**
% Cloudy ☐0% ☐25% ☐50% ☐75% ☐100%	Precipitation Type: ☐Rain ☐Snow ☐None
Brightness ☐Full ☐ Bright ☐ Medium ☐ Dark	Intensity ☐ Light ☐ Medium ☐ Heavy

Comments:

Unusual Conditions:

Report immediate concerns to the ORR office toll free 1-800-465-4336 or email dfo.orr-ons.mpo@dfo-mpo.gc.ca

Module 12 – Spawner Survey Stream Inspection Log - Enter data at www.streamkeepers.info

Step 4

Live: Species	Habitat Code (circle one)	Number of Salmon Counted	Comments – condition of fish
	pool – riffle – undercut		
	pool – riffle – undercut		
	pool – riffle – undercut		
	pool – riffle – undercut		
	pool – riffle – undercut		
	pool – riffle – undercut		

Dead: Species	Length* (cm)	Fin clips – External clip or tag	Male	Female (% spawn)	Comments – watch for growths, lesions, marks on outer body, colour, cuts, general condition of fish, colour of gills, photo number if picture taken, easy to id photo if named volunteer is in the shot

Step 5

Total Live Count:	**Stream Visibility:** High _____ Medium _____ Low _____ This is a classification of the average visibility of the fish as influenced by water properties, sky conditions and precipitation
Total Dead dissected:	**% Habitat Seen:** _____ % **Fish Countability:** Good___ Fair___ Poor
Total Dead not dissected:	This is the observer's opinion of the overall reliability of the estimate for this inspection. It should be based on stream visibility, habitat seen, and observers efficiency. For example, if Stream Visibility was high and the majority of the habitat and population was observed then Reliability should be high. If the above was true, but there was difficulty in distinguishing the species then the reliability should be lower.
Dead found but previously counted:	* Post Orbital Hypural Length – measured from the back of the eye to the Hypural Plate (start of the caudal fin) ** Note protocol as to choosing fish to dissect Ie: 1 in 5, 1 in 10 or every fish
Total Dead:	Page # _____ of _____

Module 12 – Spawner Survey Stream Inspection Log - Enter data at www.streamkeepers.info

Live: Species	Habitat Code (circle one)	Number of Salmon Counted	Comments – condition of fish
	pool – riffle – undercut		
	pool – riffle – undercut		
	pool – riffle – undercut		
	pool – riffle – undercut		
	pool – riffle – undercut		
	pool – riffle – undercut		
	pool – riffle – undercut		
	pool – riffle – undercut		

Dead: Species	Length* (cm)	Fin clips – External clip or tag	Male	Female (% spawn)	Comments – watch for growths, lesions, marks on outer body, colour, cuts, general condition of fish, colour of gills, photo number if picture taken, easy to id photo if named volunteer is in the shot

*Post orbital Hypural Length – measured from the back of the eye to the Hypural Plate (start of the caudal fin)   Page # _____ of _____

Module 12 – Spawner Survey Stream Inspection Log - Enter data at www.streamkeepers.info

Stream Name: _____ **Date:** _____

Dead: Species	Length* (cm)	Fin clips – External clip or tag	Male	Female (% spawn)	Comments – watch for growths, lesions, marks on outer body, colour, cuts, general condition of fish, colour of gills, photo number if picture taken, easy to id photo if named volunteer is in the shot

*Post orbital Hypural Length – measured from the back of the eye to the Hypural Plate (start of the caudal fin)

Stream Name: _____ **Date:** _____   Page # _____ of _____