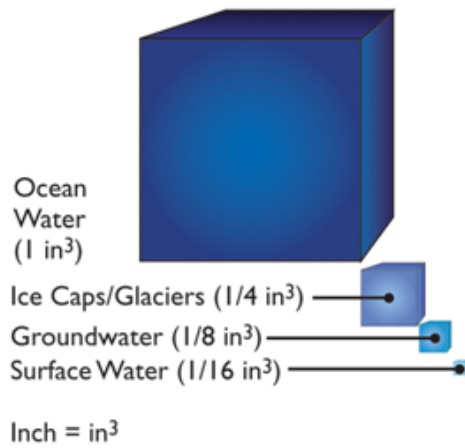


The Earth's Water Supply

If the volume of water in the oceans is represented by a one-inch (2.5 cm) cube, a one-fourth inch (0.6 cm) cube would represent the water stored in the ice caps and glaciers. A one-eighth inch (0.3 cm) cube would represent groundwater, and a one-sixteenth inch (0.15 cm) cube would represent surface water.



What is Stewardship?

Stewardship is one of those words that we hear all the time without really knowing what it means. In fact stewardship is a hard thing to define, but it is about how we are in the world: the way we care for it, respect it, live in it. It is about being actively involved in making the world be a place we want to live in. Our goals as stewards are to develop the skills necessary to make the changes we desire, and to organize ourselves and others to take action in a responsible, caring and knowledgeable way.

Why Watershed Stewardship?

Ninety percent of the world's water is contained in salt oceans. Of the remainder, 69 percent is in the form of ice and snow. Freshwater for human use, found in lakes, swamps, rivers and underground, makes up only 0.008 percent of the world's water. In British Columbia we are lucky: we have streams, lakes, rivers and estuaries covering 1.25 percent of our province. But as the population grows, more and more of this available water is being contaminated by human development.

Many kinds of skills are useful to a watershed steward, but all stewards share some characteristics. A steward is worthy of trust, demonstrates respect for life, carries a genuine heart, embodies constancy of mind, and acts with autonomy.

WATERSHED KEY TERMS...

Miramichi River Watershed: This is the area of land where all the water on the surface flows into the Miramichi River and makes it's way towards the ocean.

Tributary: Is a stream or a brook or a spring that flows into a river (Miramichi River) and adds more water to it.

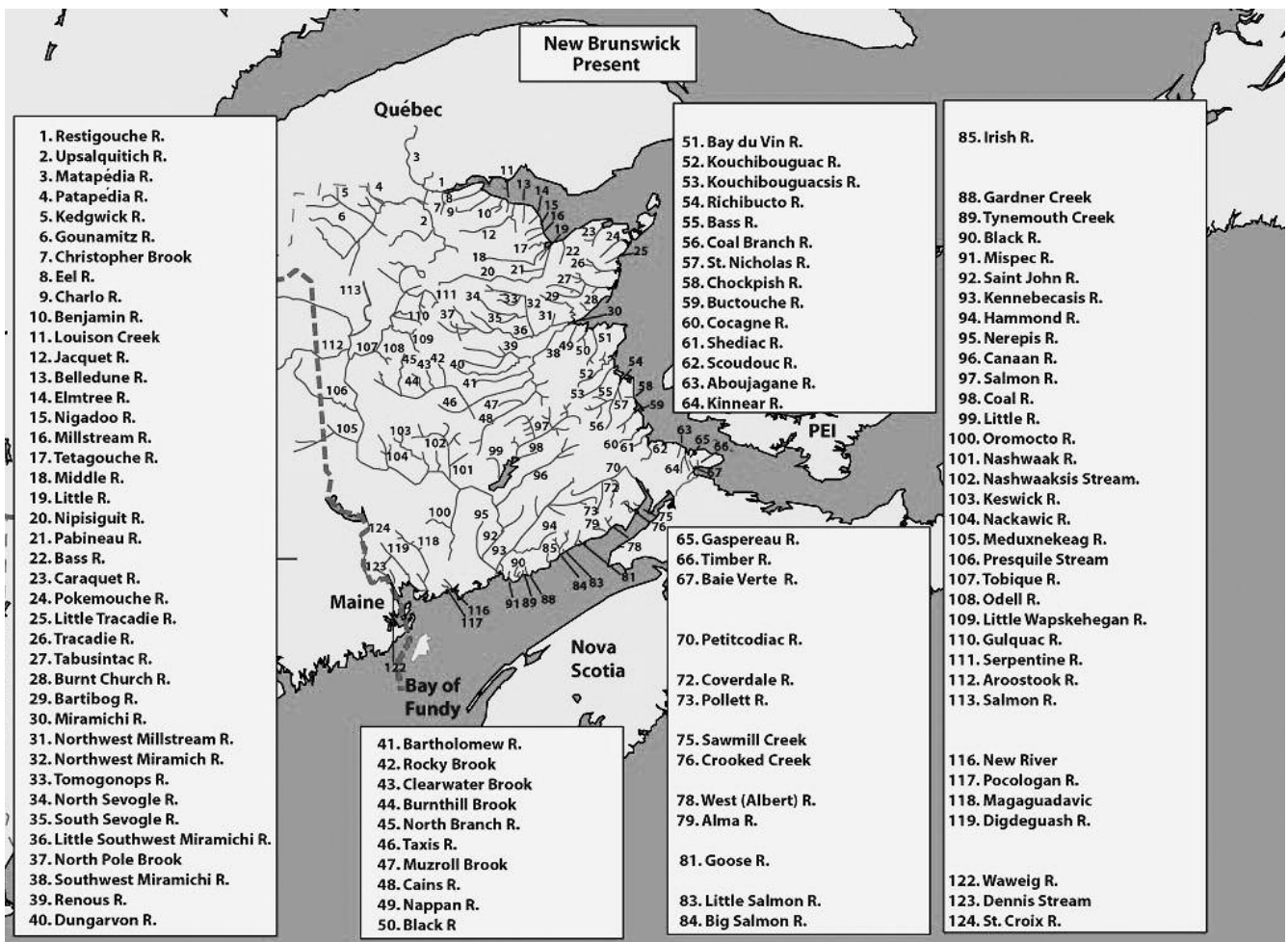
example: Renous River, Cains River, Dungarvon River, etc...

Erosion: Is when the current from the river or stream washes away the stream bank or river bank because there is NO vegetation (no plants, no trees, no bushes). Erosion is bad because it turns rivers and streams brown and muddy which suffocates and kills young fish and other aquatic organisms.

Sediment: Fine particles that are found on the bottom of a river stream (smaller than sand).

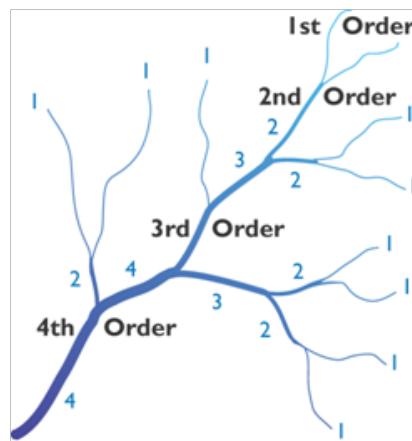
Substrate: The type of bottom a river or stream has (rocky, sand, mud, sediment or silt).

Dissolved oxygen: all water contains dissolved oxygen. We can measure how much oxygen water contains. Cold water holds more oxygen and is better for fish and other organisms.



Stream Classification

Streams are classified by their size. The smallest streams are first-order streams. When two first-order streams meet they form a second-order stream. The place where the two streams meet is the confluence. The stream formed at the confluence of two second-order streams is a third-order stream. The process continues until the stream or river empties into a lake or the ocean. The place where the river system ends is its mouth.



Magic on the River - MODULE 3

READING A RIVER

READING A RIVER,

READING A SCALE,

KNOW THE FLY ROD THAT MATCHES YOU

Introducing the 21st Century Angler!

What makes a 21st century angler? First, there needs to be an awareness of the resource, that is, how plentiful, how fragile, and how vulnerable it is to others who may not be so aware. For instance, for the Atlantic salmon, it is a struggle for survival today more than ever.

Wouldn't it be wonderful to stand at the edge of a river and "know", with a quick glance, that it is indeed, the right (or wrong) place to angle? It is possible to learn this skill that is so often thought as being reserved for "old wise men of the river". The key is patience, perseverance, and common sense.

Why is "Reading the Water" an Integral Part of the Experience?

It is a truly rewarding experience to approach a stream, survey it, and then to cast your line to immediately catch a fish.

For an experienced angler, this isn't just a chance occurrence. It comes from effectively surveying an area to determine if fish inhabit this space. Like solving a puzzle, reading the water requires common sense and an analytical approach.

Reading a River - this is YOUR key to the sport of angling

The importance of reading a river was understood more than 500 years ago:

"Here I will declare in what place of the water you must angle...in a river you must angle in every place where it is deep and cleare at the bottoom, as in gravel or clay without mud or weeds, and especially if there is a kind of whirling of water or a covert - such as a hollow bank or great roots of trees or long weeds floating above in the water - where the fish can...hide themselves at certain times...Also...in deep, swift streaks, and also in waterfalls and weirs, floodgates and millraces...and where the water rests by the bank and where the current runs close by and it is deep and cleare at the bottoom; an in any other places where you can see any fish or do any feeding."

Jullana Berners,

The Treatyse of Fly Fysshing with an Angle, 1494

Some key characteristics of streams:

- *Water runs downhill.* Everything else follows from this basic fact.
- Depending on the *shape* of the streambed and its drop in elevation, this will determine the stream's changes in depth and speed.
- The *character* of the streambed will create areas that vary the speed and direction of the flow.
- Streambeds can consist of *bedrock, mud, clay, gravel, boulders and various other debris.*



Salmon Sense Currents

Atlantic salmon and trout are able to sense currents through sensing organs within their lateral line. Through most of its life in streams, Atlantic salmon are 'programmed' to face up-current, and hold their position.

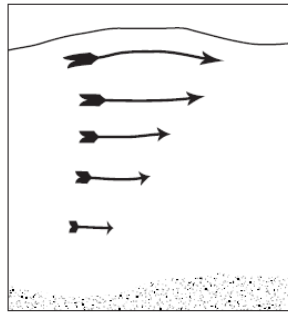
However, changes in the hormone balance while Atlantic salmon are becoming smolt change that behaviour to swimming down-current, especially during night-time.

Atlantic salmon also use their ability to sense current in order to find upwellings below rapids and waterfalls. These upwellings allow them to boost their speed as they power up over the obstacle on their migration back upstream as adults.

Get To Know the Flow — Puzzling out Currents

Learning the basic rules about water flow will help you understand a stream. It will help you understand where food accumulates, where salmon and trout swim, and where they will lie quietly, using the least energy.

- While water tries to flow smoothly, the stream edge and bottom cause resistance. This makes water currents fastest near the surface, and away from the edges of the stream.
- Turns in a streambed, obstructions such as boulders or trees all help to break up the stream's currents into many different currents. As they flow downstream, over time they will eventually merge. New obstacles almost always continue to break up this even flow into more swirling currents.



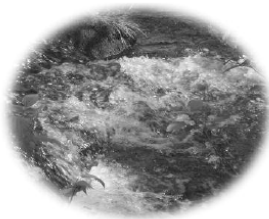
First rule: Currents are likely to flow faster near the surface than near the bottom of a stream.

What is a Current Seam?

A **current seam** occurs where two different current speeds meet and run alongside each other for a while before merging into one (see page 51). Current seams offer ideal places for fish to rest and have access to a variety of food. Trout will lie in the slower water, taking advantage of the fact that food dislodged or pushed along by the faster water will be swept by them. Salmon in migration upstream do not eat, but will still take advantage of these areas to reduce energy use.

It would take more effort, and hence burn more precious calories, to fight the current and chase after a meal. Unless competition is fierce, a fish—especially a large fish—will seek out the easiest, most economical way to eat. In moving water, feeding fish will usually lie facing upstream where there is shelter from the moving water and the current will bring dinner within easy reach.

Words to Help You Understand Currents



Eddy: A submerged boulder or log is the first place most anglers learn to look for fish. The obstruction slows down water and creates an eddy, a slow, swirling area on the downstream side.

Undercut: An area where the bank overhangs the water, is another good place to look for trout. Undercuts are usually formed on the outside of a curve, where fast moving water cuts the channel more deeply than it does on the inside. There is usually a nice, deep lie at the bottom of the channel.

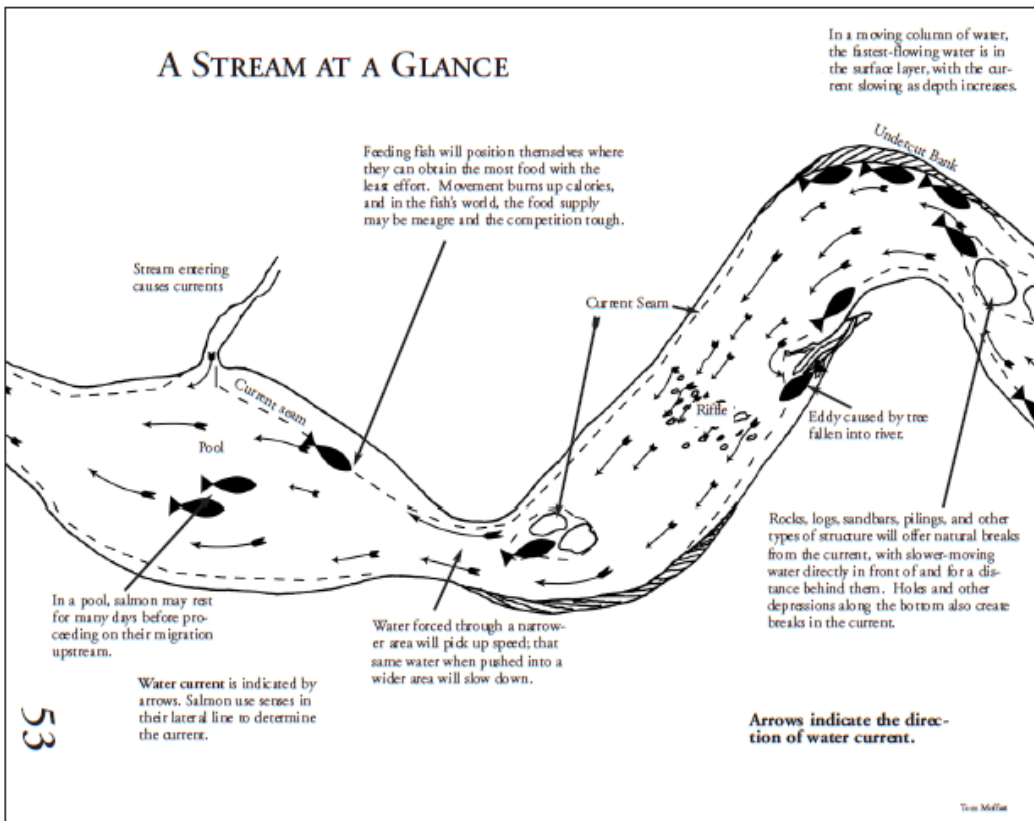


Gilbert van Byckervorst

Pools are wide, deep sections of water. Salmon usually rest in the slow water at the bottom of the pool. They tend to feed at the head or tail of the pool, because there is a constriction there to funnel food items together.

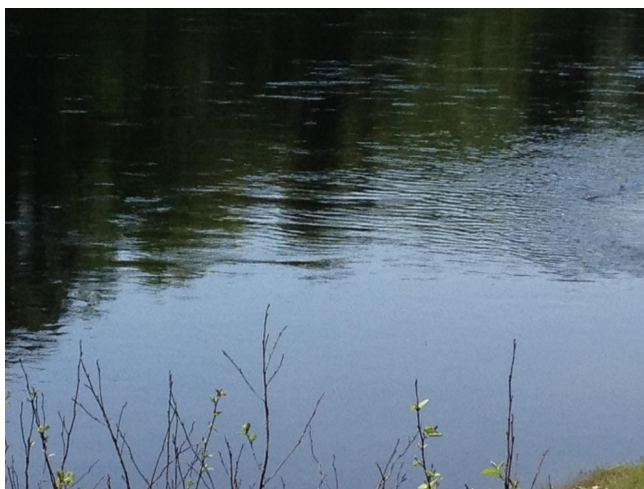
Riffle: An area where friction breaks up a stretch of water. Riffles are usually caused by beds of small to medium sized boulders.





Clues to Look for in Streamside Exploration:

1. Direction of stream flow
2. Disturbance of the surface to give hints on water speed, stream bottom unevenness
3. Speed of stream flow in different stream areas, and where eddies and other areas of calm water exist
4. Stream curvature, that affects current speed
5. Riffle areas
6. Where is it likely that side streams or springs flow into the stretch of stream or river.
7. Imagine the ways in which higher water flows and levels, and lower water flows and levels, will impact the stream bottom. That may help in planning other trips to the stream.



HERE IS WHAT A RIVER NEEDS TO GIVE TO A SALMON OR TROUT...

Oxygen

- *Fish will thrive in oxygen-rich waters.* Most animals cannot exist long without a supply of oxygen
- Wave action, riffles, wind, and green plants all help dissolve oxygen into the water.
- Stagnant, very warm, weed-choked water tends to have less oxygen and, as a result, fewer life forms than cool, clean, moving water.
- **Indicators** - an abundance of riffles in a stream, bright green healthy plants in a pond, or a rich variety of readily seen life forms all indicate a healthy body of water.



Mayfly nymph

illustrations by J. O. Pennanen



Caddisfly nymph

Food

- *A healthy population of fish will exist only where there is a good food supply.*
- Some species have definite dietary preferences and are built to capture and eat a particular type of forage in a specific manner that is easiest for them.
- The main food items of interest to the fly fisher are baitfish of all sizes and shapes; *crustaceans*, such as crayfish and shrimp; *aquatic creatures* such as leeches and frogs, as well as insects like mayflies and stoneflies; *terrestrial creatures* that fall in the watersomewhat, such as worms, caterpillars, and mice, plus insects such as grasshoppers and crickets; *miscellaneous items* such as eggs, mulberries, etc.



Damselfly adult



Caddisfly adult



Mayfly adult



Dragonfly nymph

Shelter

- *In the more confined quarters of lakes, streams, rivers, or inshore habitat, fish will usually be found confidently but cautiously feeding somewhere near an area that will provide them sanctuary if threatened.*
- On streams and lakes, this protection will come in the form of **undercut banks**, **deadfalls** (trees that have fallen into the water), **weed beds**, **sharp drop-offs**, or **rock ledges**.

Comfort

- *A single body of water is likely to have a variety of temperature readings.*
- Fish will choose an area in which to feed that is within a preferred temperature range.
- Freshwater fish are usually classified into either coldwater or warmwater categories.
- Shallow water can change temperature quickly. Sun, wind, cooler evenings, and tide changes all can have a dramatic effect on water temperature in a short time.
- Deeper water will tend to be cooler and maintain a steady temperature longer.
- Temperature will also be affected by the existence of springs, inlets, power plant discharges, dam releases, and currents.

Attachments

Magic on the River.pdf