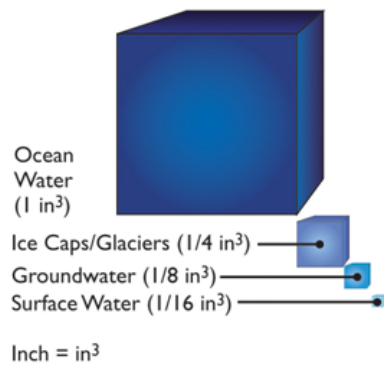


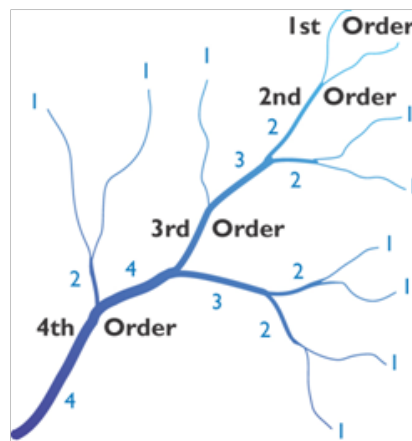
The Earth's Water Supply

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.



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 clear at the bottom, 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 streams, 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 clear at the bottom; and 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.

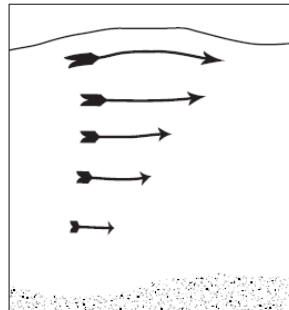
However, changes in the hormone balance while Atlantic salmon are becoming smolt change that behaviour to swimming down-current, especially during night-time.

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.



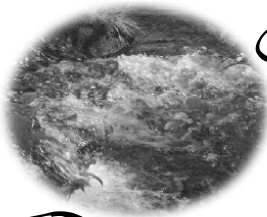
First rule: Currents are likely to flow faster near the surface than near the bottom of a stream.

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.



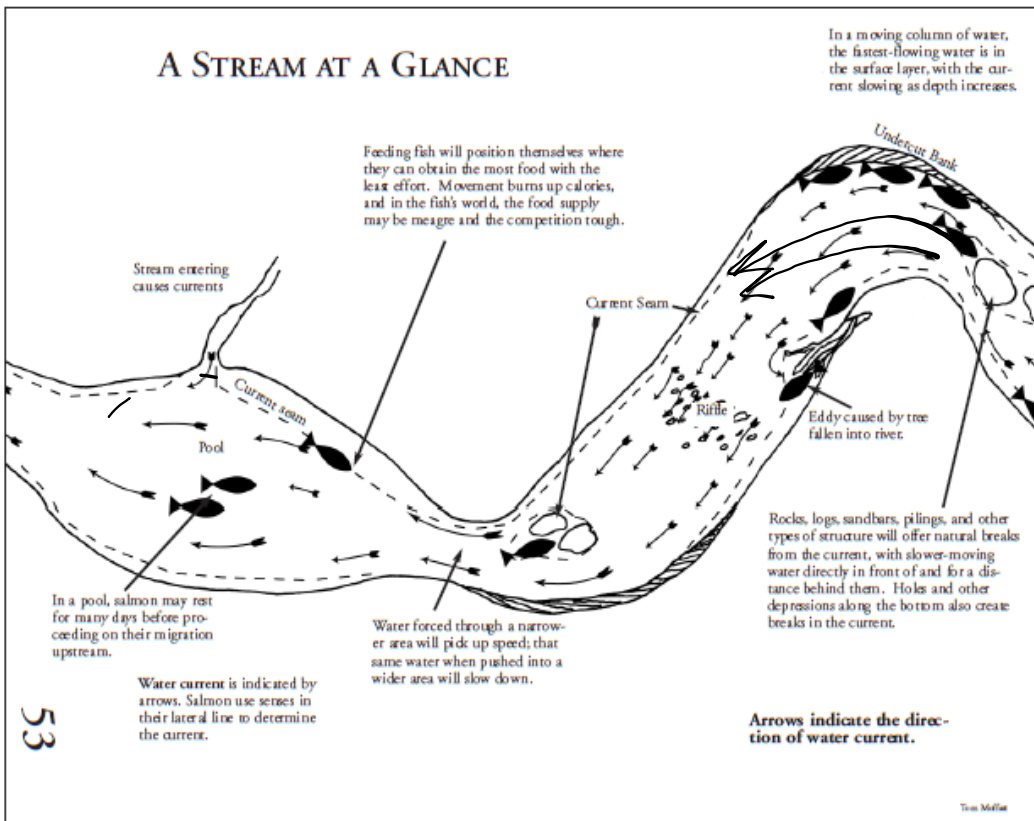
Pools are wide, deep sections of water. Salmon usually rest in the slow water at the bottom of the pool. They tend to feed at the head or tail of the pool, because there is a constriction there to funnel food items together.

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.



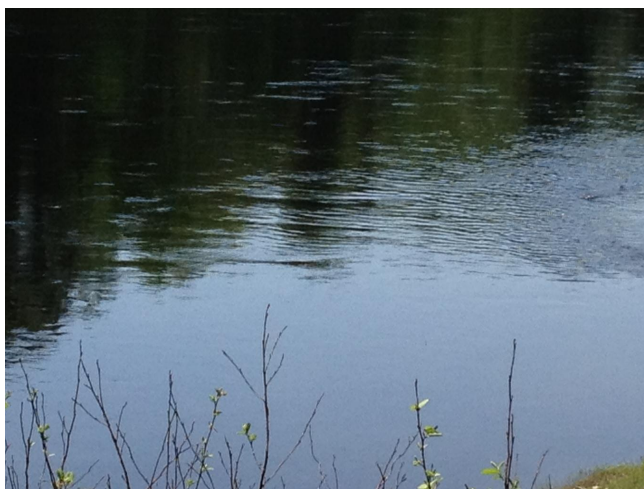
Riffle: An area where friction breaks up a stretch of water. Riffles are usually caused by beds of small to medium sized boulders.





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.



Water: Temperatures and Levels

Temperature

How warm or how cold the water happens to be on a particular day will affect whether or not a fish will choose to take a fly. In summer, when temperatures reach an excessive level, it is a good idea to choose to fish earlier in the day or in a location that would be cooler for the fish.

Similarly, when temperatures are colder, fish will tend to "slow down", particularly in the early morning and late in the day. Fish do not seem to become active until mid-morning to early afternoon.

To become a knowledgeable angler, therefore, is more than being able to cast your line well; it is necessary to read water, and the natural conditions that are present.

It is a good idea to carry a thermometer as part of your fishing gear. If you are unsure whether you should fish on a particularly hot (or cold) day, take a temperature of the water, just to be sure. Water warmer than 23 degrees Celsius is dangerous for salmon, as any excessive energy bursts can leave them at a higher risk of post-release mortality.

Dr. Bruce Tufts, Atlantic Salmon Journal, Summer 2002

Water Levels

During certain times of the year, some rivers will experience lower or higher than normal levels. It is important to recognize when a river's levels are not at the optimum, as this will affect angling.

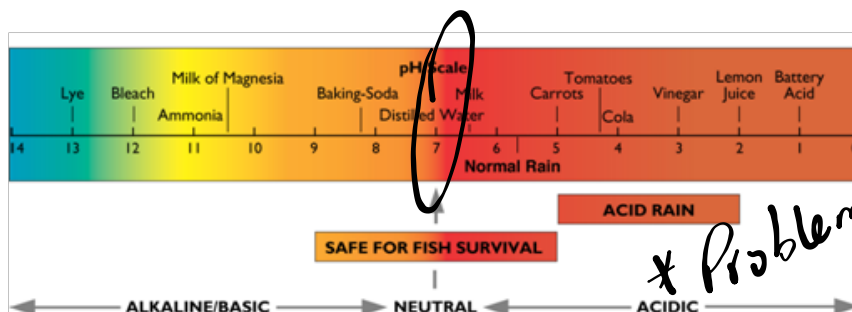
A few things to keep in mind:

- Salmon will most likely not take a fly when water levels are excessively high; salmon begin to take again when the water begins to drop and they start to hold in pools and runs;
- A salmon will likely take a fly better in shallow to moderate water (2-8 ft) versus deep pools
- If water levels are excessively low, it is probable that salmon will likely be held in pools or runs that have adequate depths.

Bruce Boudreau
<http://members.attcanada.ca/~salmon/primer8.htm>

The pH Scale

The pH Scale: The color distribution of the chart represents the indicator colors of pH paper that is used to determine the pH of liquids.



Helping a Salmon on its Way

Water flow upstream and downstream past dams is especially important to migrating wild Atlantic salmon. **Fish ladders** are built to provide them an artificial flow upstream. **Downstream passage** through a tube, something like a waterslide, is used to assist their movement towards the ocean.

Angling restrictions are commonly applied to areas near dams and near these important migrational passages

Fish ladders

Fish ladders are built with low barriers coming out into the water flow to slow it down, and provide a way for Atlantic salmon to actually gain height around the dam. It is important that the flow be sufficient to attract the salmon to the entrance of the fish ladder. Fish ladders need to be maintained, and repaired from time to time.

Downstream passage

Downstream passage needs to have sufficient flow to attract the wild Atlantic salmon. If smolt or adult salmon are instead attracted to the flow passing through the hydro-electric dam turbines, there is a high likelihood of their not surviving.

An extra hazard is that sometimes sticks or even logs can become wedged in the downstream passage. It needs to be checked.



Fish Ladder

Tom Moffatt/ASF

VEAZIE DAM ON PENOBSCOT COMING DOWN - BREACHING CELEBRATED JULY 22



A milestone was reached on July 22 with the breaching of the Veazie Dam, lowermost obstruction for Atlantic salmon and other migratory species. This dam's removal has been the work of more than a dozen years, with ASF playing an important role.

[Read more](#) ▶

[Watch Video of Breaching of Dam](#) Click here ▶

Veazie Dam Removal Video



HOMEWORK...

- in computer lab tomorrow so bring materials to work on research paper and/or eco-point activities.
- here is the rubric that I will be using to mark your research papers...aim for a 6 in each category!

Intro to ES 120 - Research Rubric



Attachments

Magic on the River.pdf

Intro to ES 120 - Research Rubric (Fall 2013).pdf