

Inanga/Whitebait

Find the saltwater wedge



*Inanga spawning sites can be hard to find, but if you can find the **upstream end of the saltwater wedge** it can help focus your search.*

The saltwater wedge is found where saltwater from the sea merges with freshwater from the river. Saltwater is denser/heavier than freshwater due to its mineral content, so it stays on the riverbed while the freshwater floats over top. This leaves a wedge-shaped area of salty water underneath the fresh river water – called the saltwater wedge.

What is salinity?



Salinity tells you the mass of dissolved salts in the water – usually expressed as parts per thousand (ppt) – seawater around NZ has a salinity of about 35 ppt.



About 90% of the dissolved salts are sodium chloride (table salt) the other salts are made up of chlorine, sodium, magnesium, sulphur, calcium and potassium



Freshwater has a salinity of less than 0.5 ppt.

To find the upstream edge of the saltwater wedge we have to test the salinity of the water at the bottom (on the bed) of the river.

To do this you will need:



salinity meter (a cable/pole for the unit, or a way of collecting water from deeper water may be useful)

Salinity meters can be obtained from NIWA Instrument Systems, Envco or similar instrument suppliers. Or, you could contact your local City or Regional Council and see if they will assist you.



GPS unit

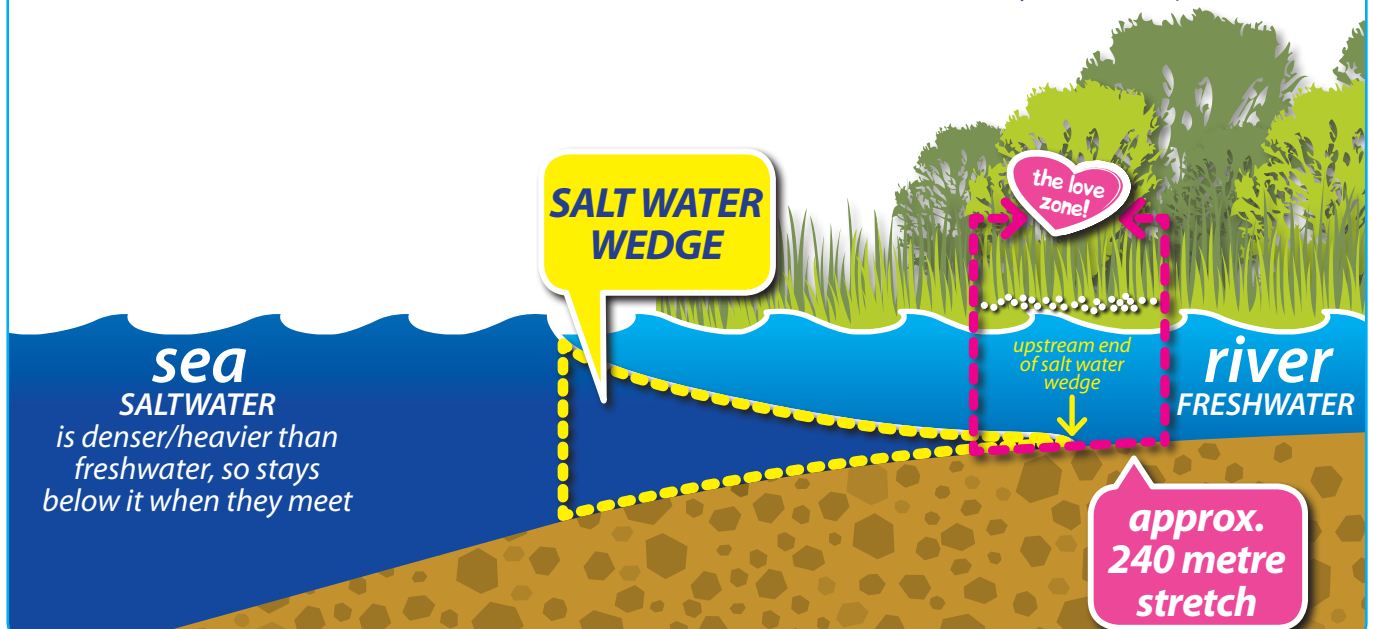


note-taking equipment (or a data recording sheet, see next page for an example)



kayak (might be useful in deep/wide rivers)

Ensure you follow best-practice health and safety protocols when using kayaks, e.g., using approved kayak instructors, ensuring there are at least two of you in case of capsiz etc.



Procedure for TESTING SALINITY:

- Step 1.** Find when the next high spring tide is from your local tide table. This is when you'll need to do your testing.
- Step 2. DAY 1**
Head to the LOWER END of the waterway well before the predicted high spring tide time.
- Step 3.** LOWER the salinity meter probe to the bottom of the DEEPEST part of the river, wait until the reading stabilises and record the salinity/time/GPS location location – make sure you record this as the 'bottom' salinity.
- Step 4.** LIFT the salinity meter probe up to the surface at the same spot, wait until the reading stabilises then record the salinity/time/GPS location again – make sure you record this as 'surface' salinity.
- Step 5.** MOVE UPSTREAM slightly and repeat steps 3 & 4. If the readings are similar to your first location double the distance to the next location upstream and repeat steps 3 & 4 again.
- Step 6.** Continue to REPEAT STEP 5 until the salinity readings start to lower, then lower the distance between locations again.
- Step 7.** Once the 'bottom' salinity drops below 0.5 ppt the PREVIOUS location tested downstream is then marked as today's 'upstream edge of the saltwater wedge'.
- Step 8. NEXT DAY/S**
REPEAT steps 1–7, but try and time your survey to arrive at your 'upstream edge of saltwater wedge' location from yesterday closer to high tide.

Other TIPS:



Make sure the salinity meter is calibrated – put the probe in the ocean and it should read approximately 35 ppt, put it in a glass of tapwater and it should read less than 0.5 ppt.



Use bridges to take readings in the middle of the river.



Make sure you rinse the salinity probe under tapwater at the end of the day.



Watch out for structures in the river (e.g. tide gates/weirs) that stop the upstream movement of saltwater.



It takes time for the saltwater to make its way upstream. The saltwater wedge might keep moving upstream well after the time the tide was predicted to be high at the river mouth or a nearby port.



The tide coming into a river acts like a dam and pushes against the flow of the river. The freshwater may be held back some distance further up from the upstream edge of the saltwater wedge.



The position of the saltwater wedge is affected by how big the tide actually is THAT DAY (see next point) and the flow of the river THAT DAY – so you will probably need to average its position over several days.



Tide tables tell you when and how big the high tide SHOULD be on that day, but the actual high tide is massively influenced by the weather and air pressure – high air pressure and offshore winds can make the actual tide much smaller than was predicted in tide timetables.

FURTHER READING & RESOURCES:

- Find a moon phase calendar at www.moonconnection.com
- Find local tide tables at www.lin.govt.nz/hydro

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AQUATIC SCIENCE & VISUAL COMMUNICATION



Saltwater Limit Survey

METADATA	
Waterway name:	Catchment name:
Date (DD/MM/YY):	Observers names:
Nearest standard port:	Predicted time of high tide (HH:MM):
Current local atmospheric pressure (hPa):	Observed time of high tide (HH:MM):
Any impediments to tidal flow? (if yes, provide details) Unknown / No / Yes:	Flow condition: Low / Normal / High / Unknown

OBSERVATION DATA		
Did this survey include a search for evidence of inanga spawning: Yes / No		
What was observed? Spawning / Eggs / Both / Neither	Any previous spawning records for this site? Yes / No / Unknown	Relative to the spawning site, the saltwater limit is Upstream / Downstream / Adjacent / Unknown

SALINITY DATA									
Observed location of saltwater limit::			Easting (NZTM):			Northing (NZTM):			
#	Waypoint	Time (HH:MM)	Easting (NZTM)	Northing (NZTM)	Channel TL/Centre/TR	Depth (m)	Salinity (ppt)		
							Bottom	Mid-water	Surface
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

Supporting documents
Photo filenames:

Sketch of site

Sketch should include survey extent, spawning sites, impediments to flow/passage, saltwater limit, vegetation types, land use, photo points, GPS points

NOTES FOR OBSERVERS

METADATA

Waterway name: name of the waterway that was surveyed

Catchment name: as published in *Catchments of New Zealand* (1956)

Date: date on which the field component of the survey was completed

Observers names: for verification of survey results

Nearest Standard (or Secondary) port: see www.linz.govt.nz for lists of Standard and associated Secondary ports

Predicted time of high tides at nearest port: see www.linz.govt.nz for tidal predictions at the nearest port

Current local atmospheric pressure: atmospheric air pressure can alter local tidal amplitude significantly

Observed time of high water at survey site: time that you observed water levels to peak at the survey site

Any impediments to tidal flow: is there a culvert, tide gate, sand bar etc that could impede tidal flow?

Flow conditions: is the waterway obviously above or below normal flow conditions?

OBSERVATION DATA

Did this survey include a search for evidence of inanga spawning?

Did you actively search for eggs or see spawning?

What was observed?

Eggs found, spawning seen, both or neither

Has spawning been recorded in this waterway previously? Is there any record of previous spawning in this waterway?

SALINITY DATA

Observed location of saltwater limit:

from the data set collected, where is the upstream limit of saltwater

For each location that you measure the salinity, enter the following data:

Time: time that the measurement was taken

Easting: longitude of the measurement site from GPS using the NZTM coordinate system

Northing: latitude of the measurement site from GPS using the NZTM coordinate system

Channel: indicate where in the channel the salinity measurement was taken - true left, centre or true right

Depth: how deep was the water at the site where the salinity measurement was taken?

Salinity: what was the salinity at the bottom, in mid-water and at the surface?