

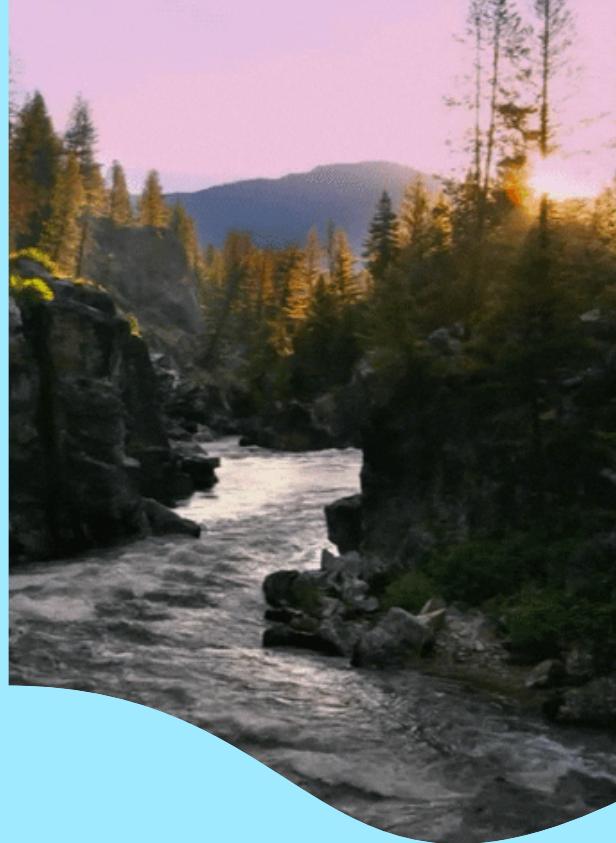
Rubber Ducky Stream Measurements

How *fast* is a river
moving?

• • •

How *much water*
flows through it?

And how can these be *measured*?



Key Terms to Remember...

Flow Velocity

This is *how fast* the water in your stream or river is moving

Discharge

This is the *amount of water* that is moving through your stream

Cross-Sectional Area

The width of the river multiplied by the average depth

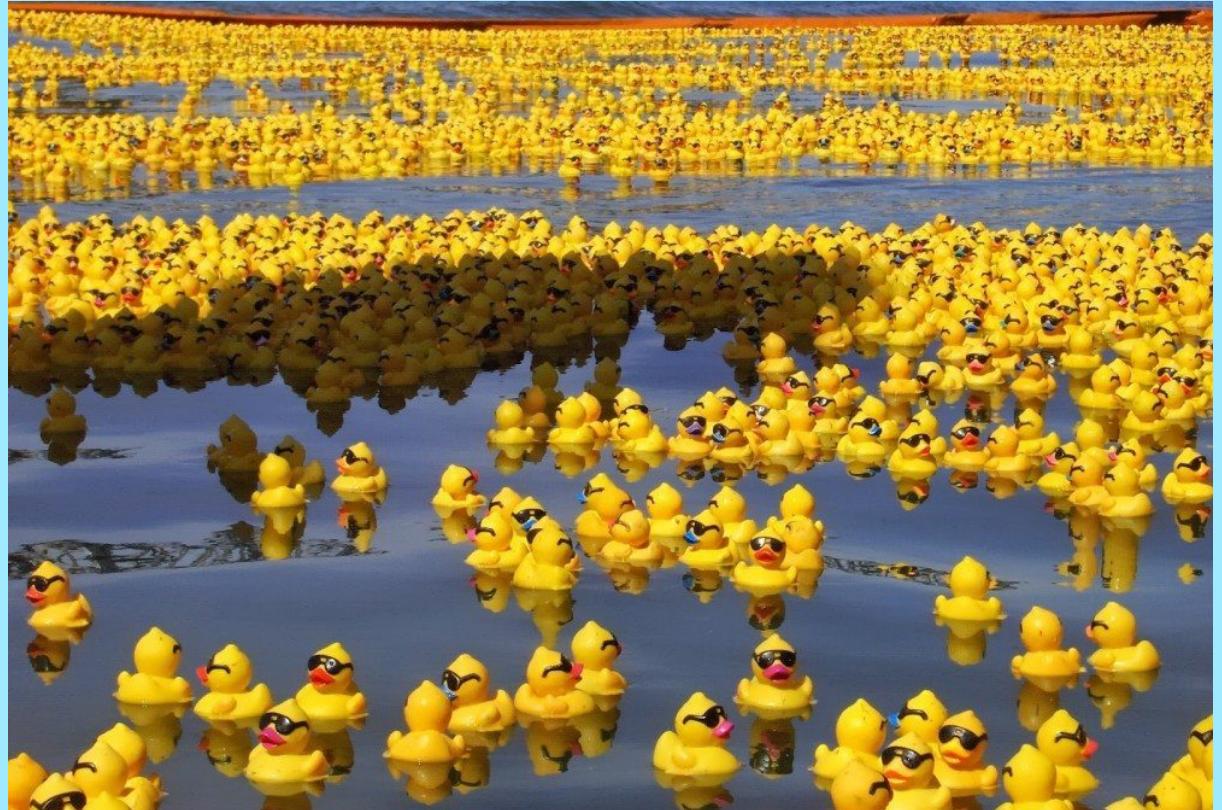
How can we measure?

We are particularly interested in measurements using tools we already have...



Rubber Duck Science

Friendly Floaties



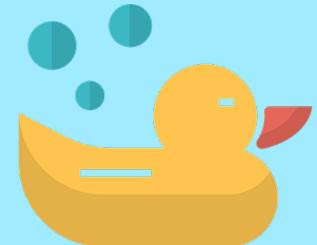
Rubber Duck Science

29 000 Rubber Ducks fell off a container ship in the Pacific Ocean.

1992



A group of oceanographers figured they could use this incident to learn more about ocean currents...

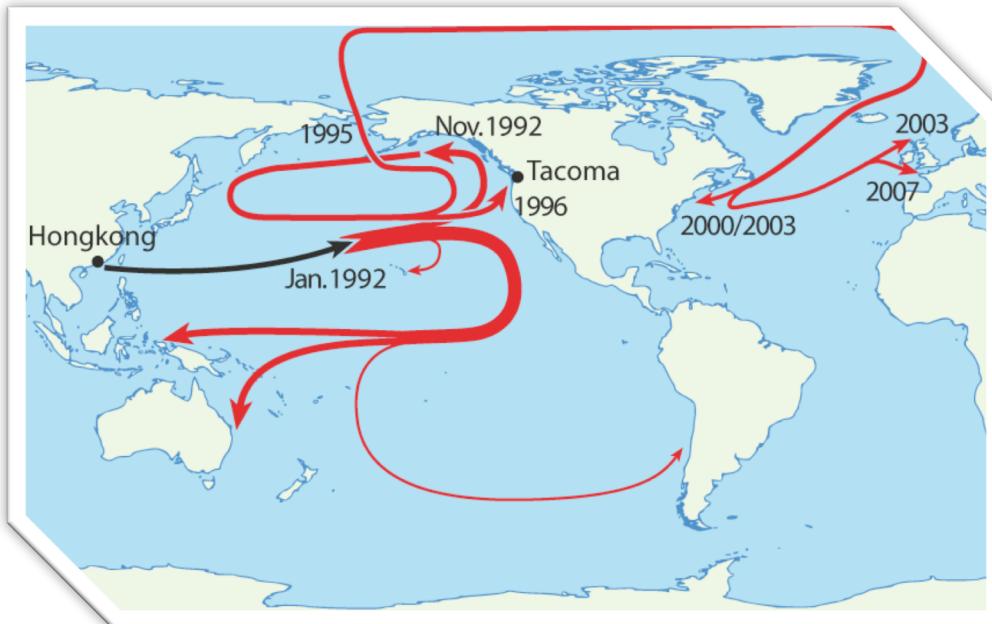


WHERE DID THE FRIENDLY FLOATIES END UP?



Rubber Duck Science

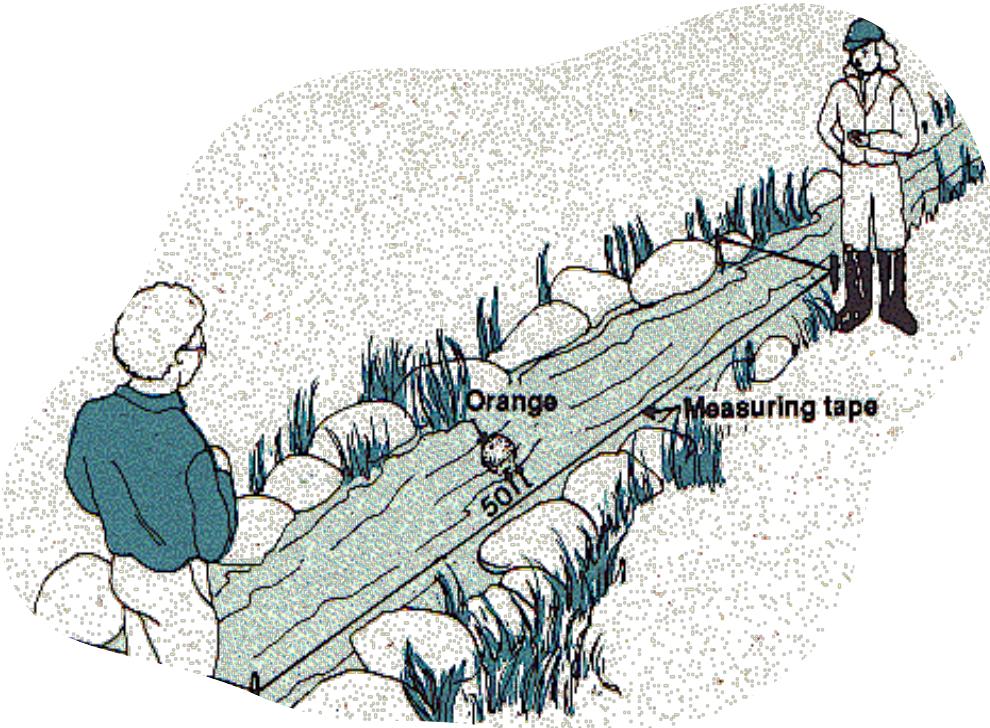
• • •
Beachgoers
around the world
reported sightings
of Floaties...



This is a great example of **citizen science!**

• • •
Allowing
scientists to
create *models*
of ocean
currents!

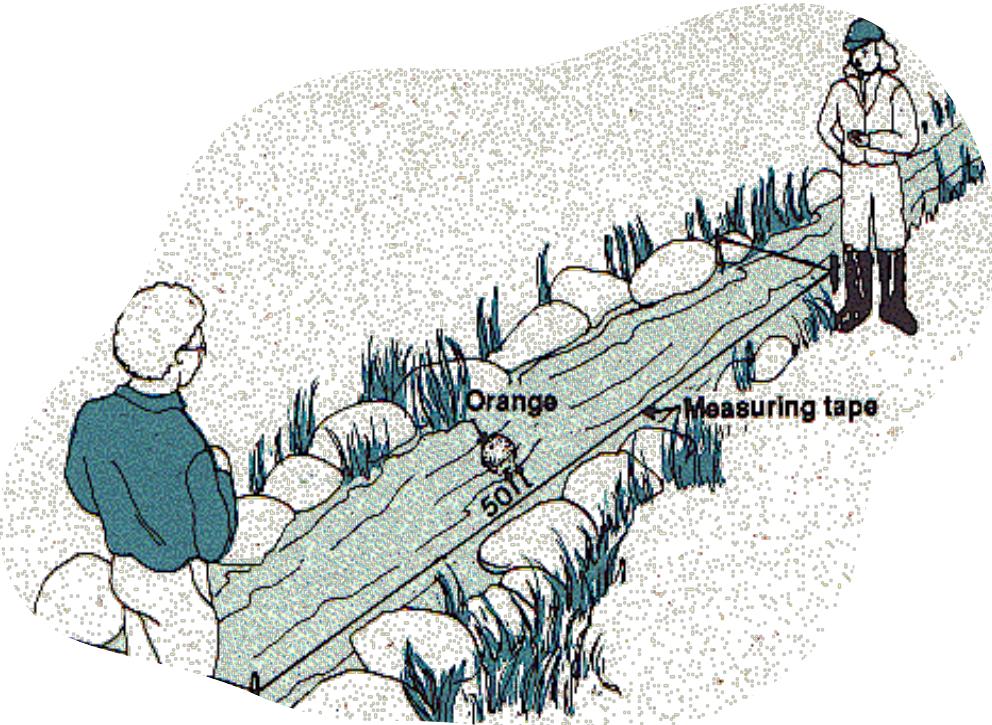




River Float

With some tools we have on hand as well as some creative math, we can use a similar method to measure **Flow Rate** and **Discharge**

It all starts with releasing a rubber duck (or another floatie) and measuring how fast it floats down your river



River Float

Materials You Will Need:

- Flowing water
- Measuring tape
- Calculator, paper and pencils
- Timer
- Rubber Duck, orange, or other floatie

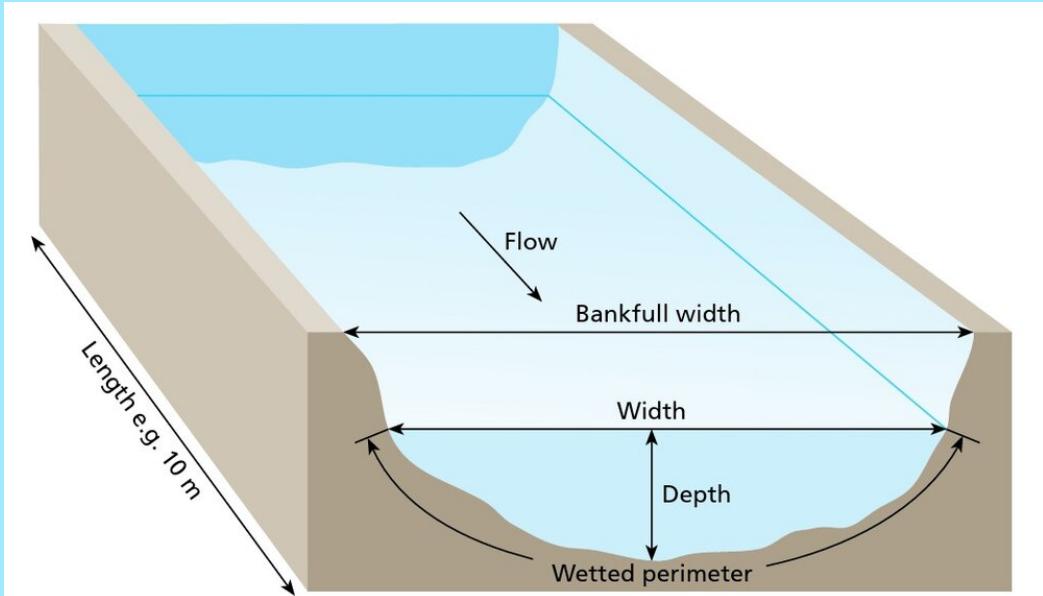


01



Measure the Stream

- a. Measure a **length** of the stream long enough to measure the duck's travel time (about 50 feet)
- b. Measure the **width** of the stream
- c. Measure the **depth** of the stream, in the middle



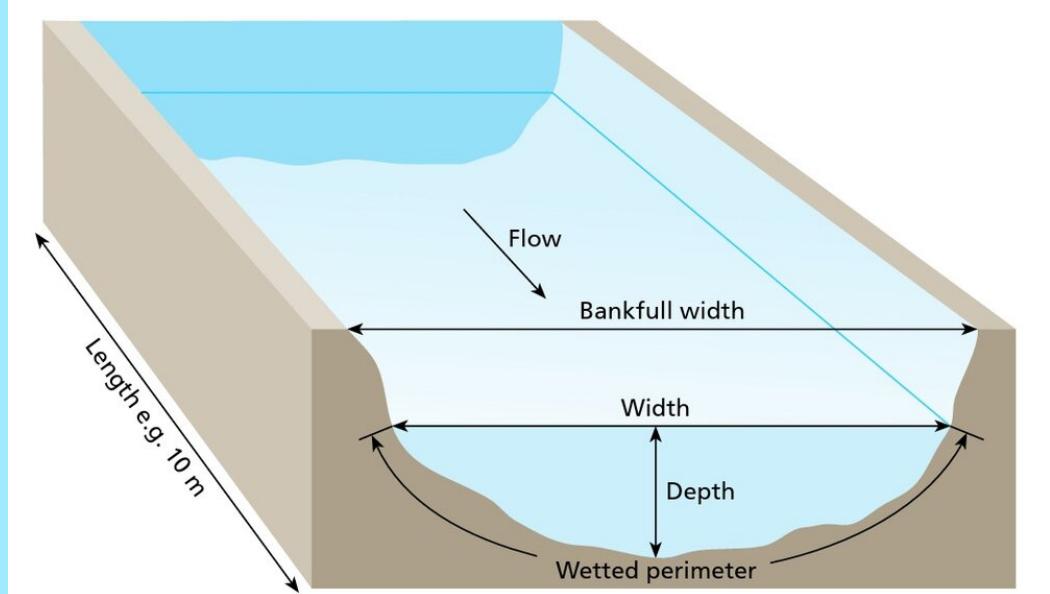
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...

Calculate the Cross-Section

$$\text{Cross Section} = \text{Width} \times \text{Depth}$$

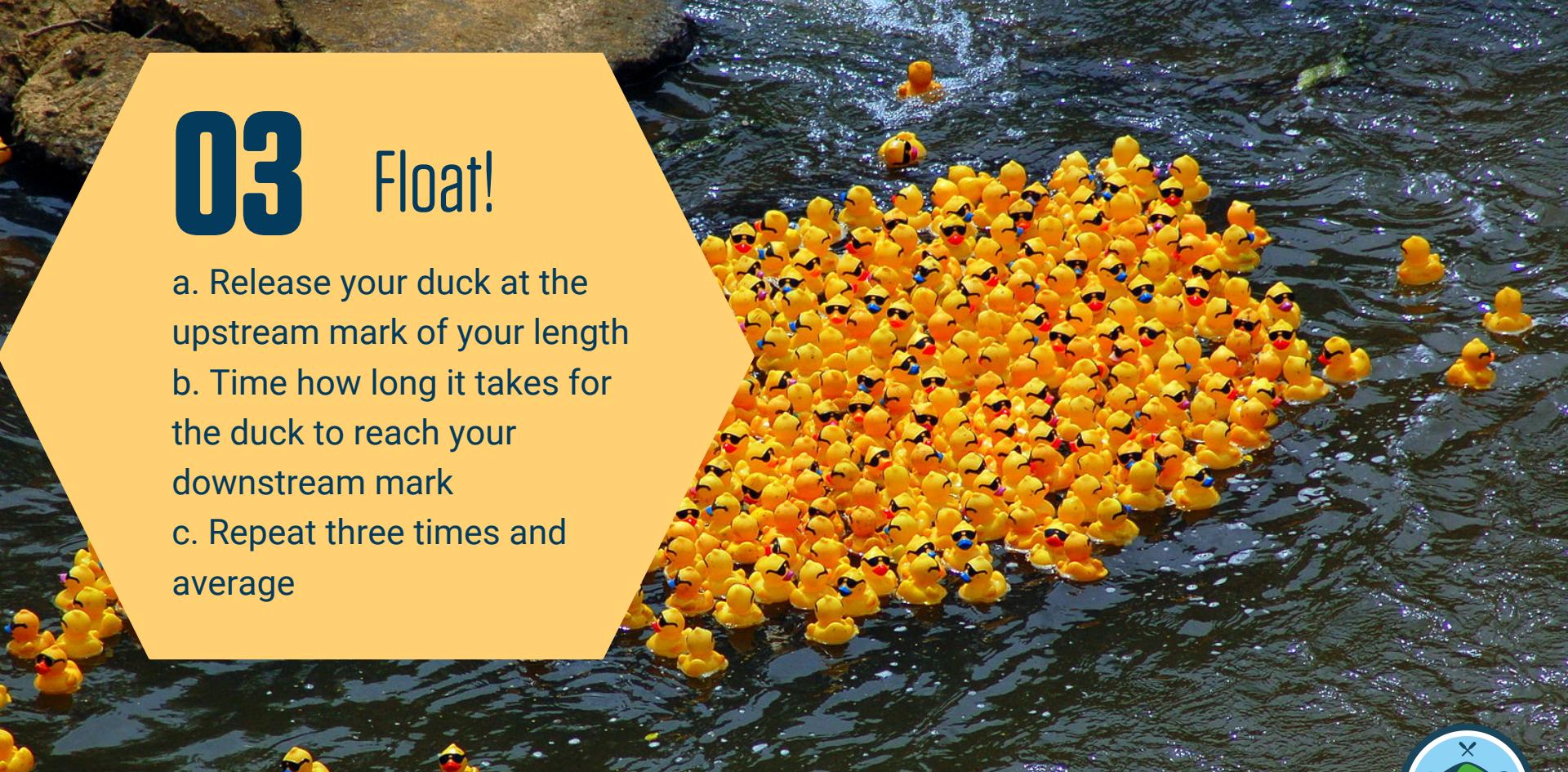
Record on your field sheet!



03

Float!

- a. Release your duck at the upstream mark of your length
- b. Time how long it takes for the duck to reach your downstream mark
- c. Repeat three times and average



04

Flow Velocity

The **Flow Velocity** of the river will be the velocity at which your duck moves downstream....

So we have:

$$\text{Surface Flow Rate} = v = \frac{\text{length (m)}}{\text{time (s)}}$$

$$\text{Mid - Depth Flow Rate} = 0.85v$$



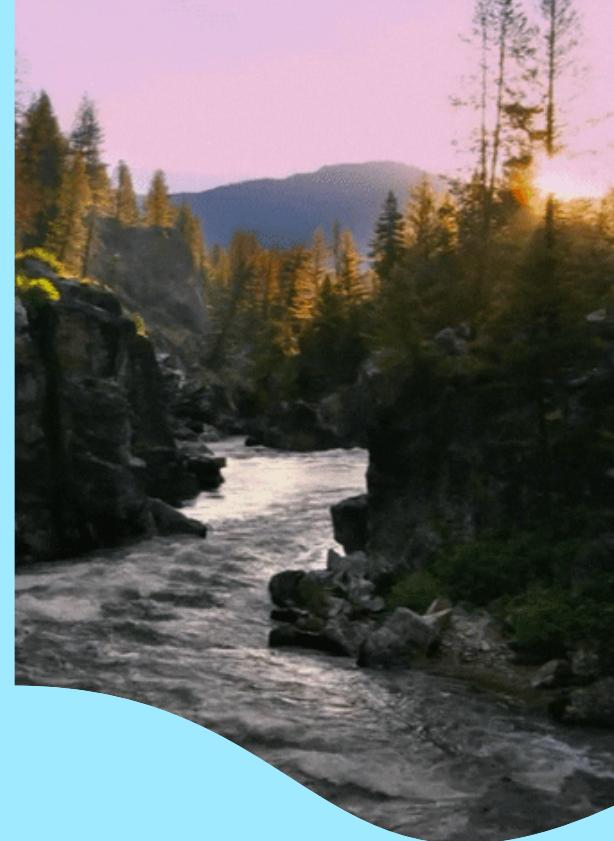
05

Calculate Discharge

...

Discharge
= Flow Rate
× Cross Section

Don't forget to record!

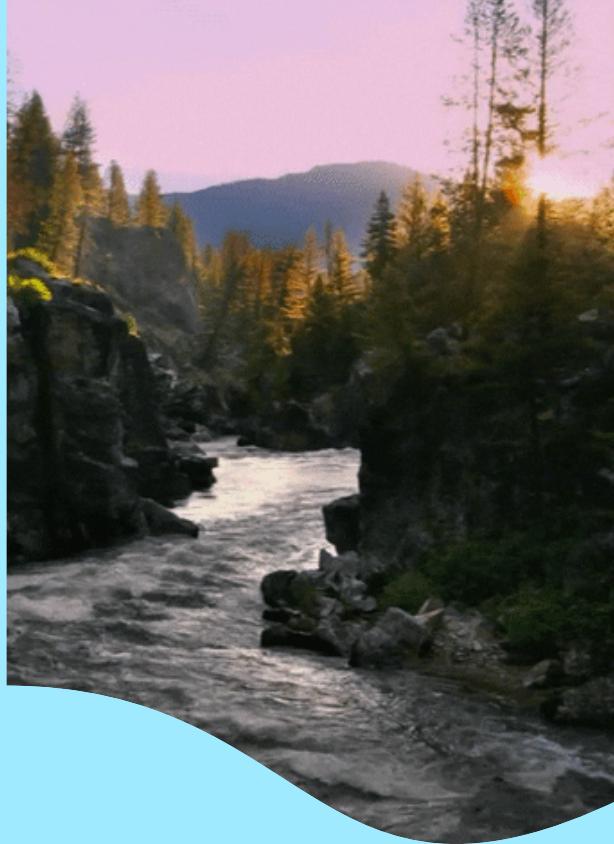


So...

...

How *fast* is a river moving?

The same velocity at which something floats down the river!

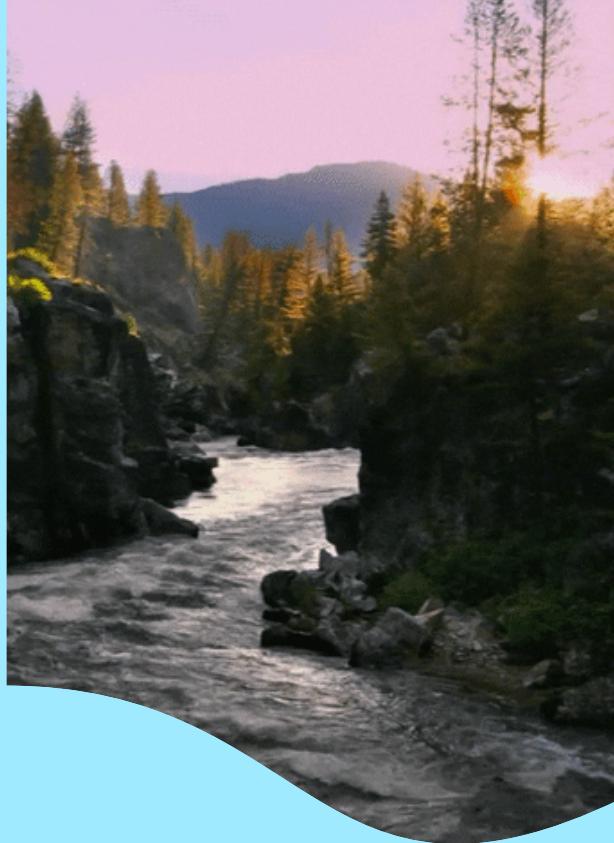


So...

...

*How much water
flows through it?*

*The discharge is the velocity of
the river multiplied by the cross
section!*

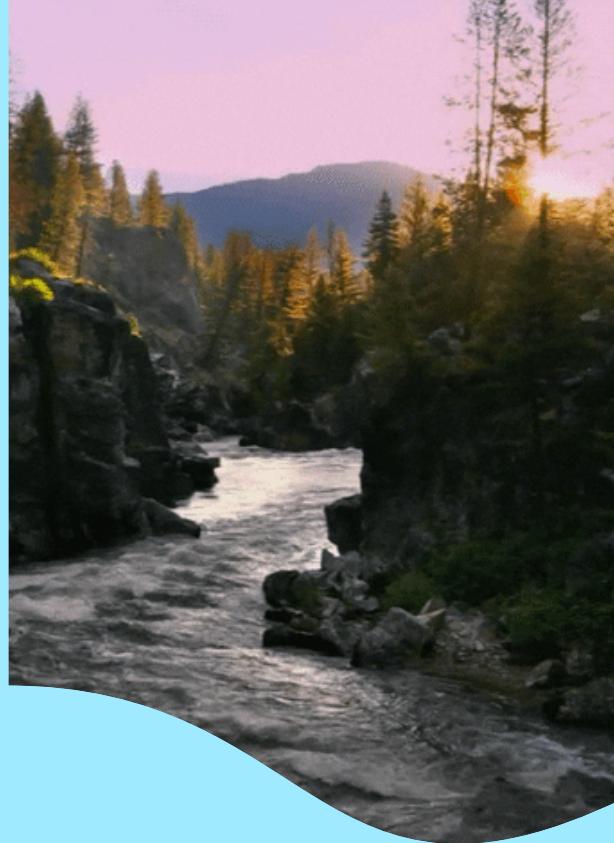


So...

...

And how can these be *measured*?

*With a few simple tools and
some creative math!*





Good Work!



Do you have any questions?

Contact Juno, Science Education Coordinator
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