## PREPARE TO TEACH

**SET UP STATION MATERIALS**

- ☐ Talk to the Captain about how s/he wants to handle the station.
- ☐ Fill a 5-gallon bucket with water, and set an empty 5-gallon bucket near it. Note: make sure these are accessible but not in the way of the crew.
- ☐ Make sure the bin contains all of the materials you need. Alert lead instructor if materials are missing or broken. *The bin should be on deck, but the materials are not set up until just before the station begins.*
- ☐ *If the Lead wants you to help with the Trip datasheet:* Fill in the top portion of the datasheet. Include your name and the Lead instructor's name. Review datasheet directions.
- ☐ Gather index card, pencils, and logbooks for the students. Smile!

**PURPOSE**

At this station we find out how ships float and maneuver in the water, and explore the connections between boating and shipping and Great Lakes health.

**CONNECTION TO LAKE HEALTH**

Shipping on the Great Lakes has traditionally been, and continues to be, an affordable way to transport raw materials within the basin and to and from the rest of the world. In addition to the movement of goods, exotic species also hitch rides, particularly in ballast water, and can become invasive in their new locations. Recreational boating also contributes to the movement of aquatic species and has been responsible for the spread of many invasive species from one waterway to another.

## COLLECTING THE "SAMPLE"

**NEXT-GEN ONLY • NEXT-GEN ONLY • NEXT-GEN ONLY • NEXT-GEN ONLY**

**Ship's Wheel & Rudder discussion** (5 min) @ *the Stern*

### 1. How do we steer the ship?

→ Car vs. Ship

VS.

→ Explore the Stern area.

### 2. What is the wheel connected to?

→ **The Rudder**

→ Pushes water one way, and the stern the other way.

### 3. Where do we see this in nature?

→ **A fish's tail!**

**Introduce the Captain & Learn Steering Commands** (8 min)

→ "Spokes" & Directions

→ **Why repeat commands?**

→ Loud environment

→ Ensure understanding

**(Optional)**
**Explore the Navigation Screen**

Lat./Long. : record our sampling location

**Prep for peer teaching!** (3 min)

Student should talk about:

- ☐ **Info in logbook (box at top of page)**
- ☐ **How & where you steer the ship**
- ☐ **Commands and repeating them**

## INTRO (3 min)

**Set up kids to steer**

**2 at a time**

**Captain will explain commands**

→ Repeat command before doing it

**Rotate students every few minutes**

## BUOYANCY (5 min)

### 1. What is the ship made of?

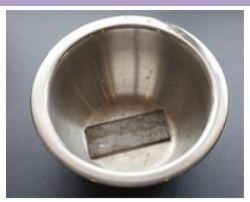
→ **Steel** *8 times the density of water*

### 2. Will steel float?

→ Try it!

### 3. Will steel + a bowl float?

→ Try it!

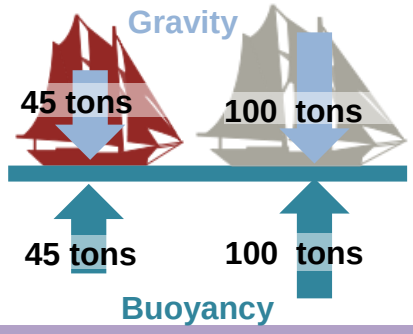


### 4. What is the difference?

→ Shape!

→ A bowl **displaces** MORE water

**To float:** the volume of the fluid displaced by the object must **equal** the weight of the object.




**Understanding check:**

What could we do to the **steel plate** to make it **float**?

→ *Make it bigger: Hammer it into the shape of a boat*

What could we do to the **bowl** to make it **sink**?

→ *Make it smaller: Squish it into a ball, or make a flat plate*

## STABILITY & BALLAST (3 min)

### 1. Will the *Inland Bucket* sink or float?

→ Try it!

→ ☹

### 2. Add weighted keel

→ Try again!

→ Try to tip her over!

### 3. What's happening?

→ **Ballast** keeps a boat from tipping over

→ *Inland Sea* has 10 tons of lead in the keel

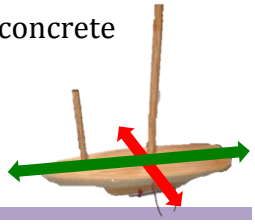
→ *Manitou* has 20 tons of steel and concrete

### 4. Can we have a keel and no ballast?

→ Try it!

### 5. What does the keel do?

→ Try moving the *Inland Bucket* from side to side and from bow to stern. Which is easier?

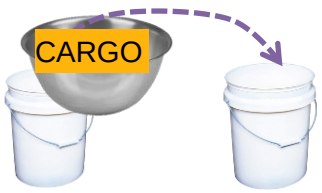


## BALLAST AND LAKE HEALTH (4 min)

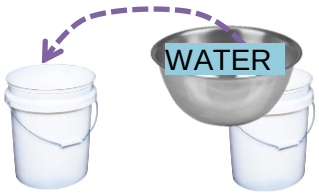
### 1. Does this feel heavy?

Cargo can act as ballast

### 2. Model shipment across an ocean




### 3. Model ballast water on the return trip




→ Ships can move 10,000 tons of water **+ exotic species** from one part of the world to another

**Have you seen any invasive species today?**

→ Quagga mussels, round gobies, and spiny waterfleas arrived by ballast water

→ Since 2006 ALL ships must treat ballast before entering the Great Lakes

→ Recreational boats can also transport invasives – WASH & DRY your boat!

## CLEAN UP

☐ Empty buckets, stack them, and tie them to the lifelines.

☐ Dry teaching tools and place everything neatly back into the Seamanship bin.