



Water Wits

*aquatic safety, science, and stewardship
education program*

GRADES K-2



Dear Educators,

June 30th, 2015

With thousands of people enjoying activities on Oregon's waterways each year and rising demand for clean water resources, there is a need to educate people early about responsible waterway use. Humans and wildlife both need resilient waterways for health, safety, and survival. That's why we have developed this new K-12 educational curriculum, *Water Wits*!

This program aims to encourage awareness and responsible use of aquatic and marine resources. It goes beyond traditional boating and water safety education to include stewardship messages and scientific principles. It is designed to be interdisciplinary, academically rigorous, interactive, and student-led. We hope that by taking an integrated approach to thinking about water, this curriculum will spark a renewed interest in responsible waterway enjoyment for both educators and students.

Water Wits addresses 3 pillars of aquatic literacy:

Safety: what are the best practices for smart decision-making in, on, and around the water?

Stewardship: how can we reduce our impacts and manage water resources for people and wildlife?

Science: how do physics, engineering, ecology, and the social sciences explain and inform both of these?

The curriculum includes 12 complete lesson plans, divided into grade units (Kindergarten-2nd Grade, 3rd-5th Grade, 6th-8th Grade, and 9th-12th Grade). All lessons are aligned to state and national education standards, including Next Generation Science and Common Core, across multiple subjects. Each unit contains 3-4 lesson plans with suggestions for how to adapt the activity to best suit your student. Lesson plans include a list of aligned standards, background information, detailed instructions, and additional resources including printable worksheets and hand-outs. Each is designed to be completed in one class period, but many offer rich opportunities for extension and suggestions for additional activities are also included.

The *Water Wits* program includes concepts from all subjects: Science, Math, Social Studies, Language Arts, and Physical Education. It also fosters 21st-century skills including collaboration, critical thinking, problem solving, global awareness, and civic and environmental literacy. We encourage you to work with other educators at your school or in the community to create a cross-cutting implementation plan. Doing so will provide you with exciting professional development opportunities and enable you to reach students with different learning styles and interests!

While much of the *Water Wits* curriculum is designed to be academic in nature, the interactive activities and low-cost materials make the lessons adaptable for almost any setting. Determine the age range of your audience and set up the hands-on portions of appropriate lessons at public events, workshops, classroom visits, or your camp site.

For more information and additional support, or if you are interested in adapting this curriculum for your own organization or agency, please contact MariAnn McKenzie, Boating Safety Education Coordinator at mariann.mckenzie@oregon.gov / 503-378-5158.

Thank you for choosing the *Water Wits* program. We hope that you and your students enjoy it!



Randy Henry, Boating Safety Program Manager



Sara Shaw Roberts, Curriculum Writer



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Aligned Standards

2014 ORSS (NGSS)

- K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time
- K-ESS3-3. Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
- K-ESS2-2. Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.
- 2-ESS2-2. Develop a model to represent the shapes and kinds of land and bodies of water in an area.
- 2-ESS2-3. Obtain information to identify where water is found on Earth and that it can be solid or liquid.

OR SOCIAL SCIENCE

- K.10. Explain how people can care for the environment.
- 1.12. Give examples of local natural resources and describe how people use them.

COMMON CORE MATH

- K.OA. Understand addition as putting together and adding to, and subtraction as taking apart and taking from.
- 2.OA. Represent and solve problems involving addition and subtraction.

COMMON CORE ELA

- 1.2. Ask and answer questions about key details in a text read aloud or information presented orally or through other media.
- 2.4. Tell a story or recount an experience with appropriate facts and relevant, descriptive details, speaking audibly in coherent sentences.

Activity at a glance

Students roll a special dice to create their own story about what happens to a body of water because of natural conditions such as drought and because of human water use.

Materials

- Clear bowl or waterproof container, large enough to hold 2 liters of water
- Graduated cylinder or beaker
- Small pebbles
- Assembled jumbo dice (see dice template page)
- Books for reading (optional, see Additional Resources)

Background Information

Despite its name, the planet Earth is mostly water. Water makes up over 70% of Earth's surface and can be found in many different forms and **reservoirs** (see figure below). All life on Earth depends on water in some form for survival—for humans, we need the fresh water found in lakes, rivers, and under the ground. However, fresh water is not al-

ways readily available for people and wildlife. Weather factors like rainfall and **drought**, and human uses such as **irrigation** and industry can change regional water availability dramatically from year to year. This can cause problems for **aquatic** animals that rely on water

for **habitats**, and for people too. Without a water supply farms can't produce the crops we need for food, and drinking water can become more expensive. Many industries such as mining, plastics manufacturing, and electricity production require water as well.

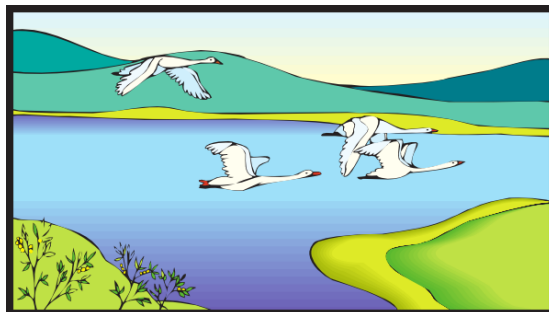


Image credit: Creative Commons

Everything on Earth needs plenty of clean, fresh water to survive—including us!

Distribution of Earth's Water

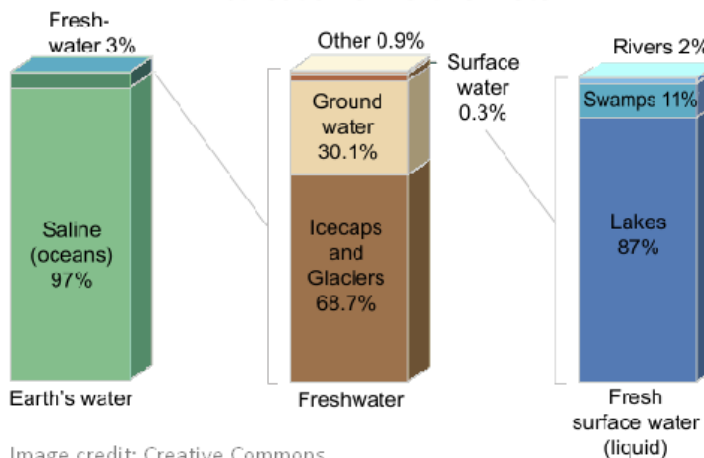


Image credit: Creative Commons

Water scarcity can affect boaters too. When water levels drop, features of the bottom such as rocks, roots, or sandbars are exposed, creating hazards. For all of these reasons it is in everybody's best interest to protect our waterways by reducing our water consumption and not polluting.

Procedures

1. Fill the bowl with 2 liters of water and place near the front or middle of the class where all students will have a good view. Place small pebbles in the bowl to represent the bottom of the lake. Have the pre-made jumbo dice (see pg. 3), the graduated cylinder and a sink or pitcher of water nearby.
2. Introduce the activity and engage the students by asking them what all plants and animals, including them, need to survive. Answers will include food, shelter, etc. but the answer you are looking for is *water!* Water is one of the most important resources on Earth for all living things. Ask students to BRIEFLY name a few places where water is found (ice, snow, oceans, groundwater, etc).
3. If time allows, read part or all of one of the books listed in the *Additional Resources* section. This may also be done at the end as a wrap-up activity.
4. Tell students that now, they are going to create their own story about water together! The story will depend on the roll of the dice, similar to a “choose your own adventure” book.
5. Explain that the large bowl of water in the middle of the room represents all of the water in a local lake (use the name of a local water body that students may be familiar with).
6. Students will take turns rolling the jumbo dice. Each side of the dice will have an action, and an accompanying question (see pg. 4). The action will decide whether they add or take water away from the lake. The question must be answered by the group before moving on to the next roll.
7. Like all good stories, ours starts with “*once upon a time...*” Read the brief passage to the right aloud, then start playing the game! Ensure that students are taking turns and treating the dice with care. Throughout the game, help guide students in adding and taking away the correct amounts of water, and in brainstorming answers.

NOTE: The game can be played indefinitely. You may play just until every side of the dice has been rolled, until you run out of water, or until students lose interest, then move on to the wrap-up questions on pg. 4.

8. After you have finished rolling the dice, ask students to re-tell the story of what happened to their lake by taking turns to share different parts.

Once upon a time, in a land not so far away....

There once was a lake named [local or imaginary water body name]. It was home to many animals who loved to play in the fresh clear water. Fish hid in the rocks while birds skimmed the surface with their wings. At night, foxes would slip quietly through the shadows to drink from the lake. Trees and plants grew tall and strong along the edges. People loved to play in the water too, and during the summer the happy sounds of children splashing and squealing in the lake would echo off the trees.

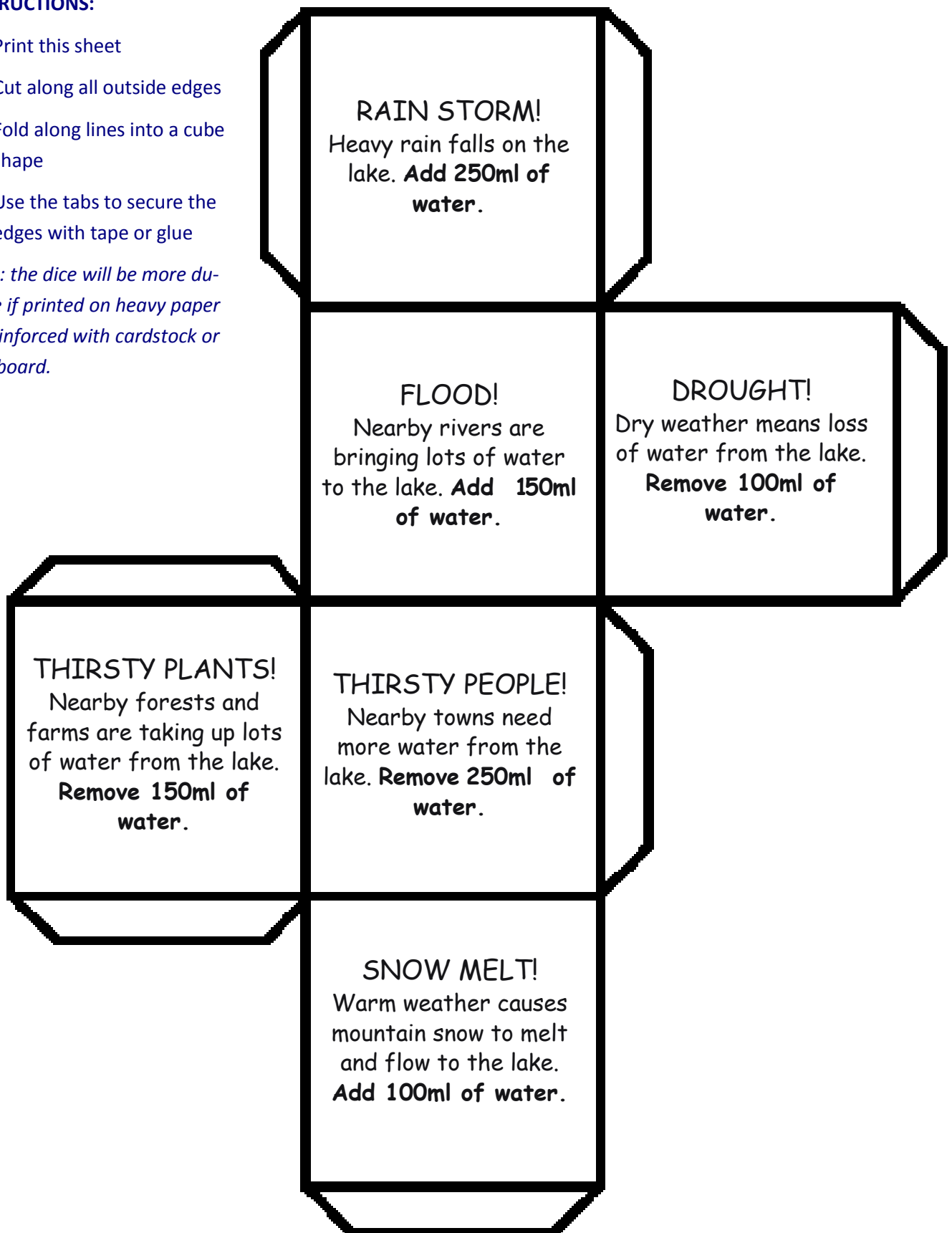
But nothing stays the same forever, and things at Lake [name] were about to change...

To adapt this activity for grades 3-5, break students up into small groups. Distribute to each group their own bowl, beaker, and dice, and have them play the game and do the water measurements themselves. You may also wish to have older students cut and assemble their own dice.

INSTRUCTIONS:

1. Print this sheet
2. Cut along all outside edges
3. Fold along lines into a cube shape
4. Use the tabs to secure the edges with tape or glue

Note: the dice will be more durable if printed on heavy paper or reinforced with cardstock or cardboard.



Questions for dice game

Note: If you plan to play the game several times, ask for only one answer each time the dice lands.

FLOOD: Why do floods happen? (*possible answers: broken dams, heavy rainfall, rivers running too high*)

DROUGHT: What are some causes of drought? (*hot weather causing lots of evaporation, lack of rain, irrigation*)

RAINSTORM: Name something that needs fresh water to live. (*fish, people, plants, deer, birds, frogs, etc.*)

SNOW MELT: Is snow a solid or a liquid? (*snow is solid and rain is liquid. An example of water in gas form is fog.*)

THIRSTY PLANTS: What do plants need besides water to survive? (*sunlight, nutrients*)

THIRSTY PEOPLE: What are some ways people use water every day? (*bathing, brushing teeth, drinking, etc.*)

Wrap-up discussion questions

What happened to the lake bottom when the water got too low? (*It is exposed like an island*) Why can this be dangerous for boaters? (*boats can get caught on the rocks and be damaged*)

How can people reduce their water use? (*taking shorter showers, turning off the water when brushing their teeth, turning off lights because electricity uses water, etc.*)

Additional Resources

One Well: The Story of Water on Earth by Rochelle Strauss, illustrated by Rosemary Woods

A Drop of Water Around the World by Barbara Shaw McKinney, illustrated by Michael S. Maydak

Water in Oregon—Education handout: <http://www.oregon.gov/owrd/pubs/docs/infosheet5.watered.pdf>

Willamette Water 2100—Anticipating water scarcity and informing integrative water system response in the Pacific Northwest: <http://water.oregonstate.edu/ww2100/>

Oregon State Marine Board Education Program

PO Box 14145
Salem, OR 97309



Serving Oregon's recreational boating public through education, enforcement, access, and environmental stewardship for a safe and enjoyable experience.

For more information please contact Mariann McKenzie,
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Aligned Standards

COMMON CORE: READING

- 1.2. Retell stories, including key details, and demonstrate understanding of their central message or lesson.
- 2.3. Describe how characters in a story respond to major events and challenges.

OR SOCIAL SCIENCE

- Explain why rules are needed and how rules reduce conflict and promote fairness.

HEALTH BENCHMARKS

- Identify safety equipment needs and procedures for physical activity.
- Identify ways to reduce risk of injuries in and around water.
- Demonstrate water safety behavior.
- Set a goal for safety in and around water.
- Explain the importance of safety at play including wearing helmets, pads and other safety equipment.

Activity at a glance

Students participate in a call-back and movement game to learn safe practices for participation in water-related activities.

Materials

- White board and markers
- Open space for playing the game, inside or outside
- Copies of “Boating Safety 101” hand-outs

Background Information

In Oregon and nation-wide, drowning is the second-leading cause of death in children age 15 and under. Especially for very young children, many of these deaths would have been preventable with the proper knowledge and understanding of how to act safely in, on, or around the water.

This game will introduce students to several skills important to know when in or around the water, including the proper behaviors for swimming, floating in a river, helping somebody who has fallen in the water, and what to do if they’ve fallen in the water themselves.

Equipped with these skills, students will be more likely to take personal action to prevent accidents and feel more confident and secure when enjoying water activities with their friends and families.

Objectives

Students will:

- Understand several important skills for safety in, on, and around the water
- Have fun playing a group game in their classroom
- Use a short story to reinforce concepts and identify right and wrong water safety practices



Image credit: Creative Commons

Understanding a few important skills will keep water-related activities both fun and SAFE!



Look!

Throw!



Feet up!

Wear a life jacket!



Huddle!

Procedures

1. Introduce the activity by telling students they will be playing a game to learn about being safe in, on, and around the water. This game is just like Simon Says, but because it involves boats it is called—Captain Says!
2. List the responses which students must do on the board, and explain each one:
 - **Ask:** Before approaching or going into any water, students should always ask an adult if it’s okay! *Motion: Students hold their hands around their mouths and pretend to be calling to their parents.*
 - **Look:** Students pretend to scout out the surrounding area. This is something they should always do before going into any type of water, even a pool! If something doesn’t look safe, they should go and get an adult. *Motion: Students hold up their hand over their eyes, mime looking around or having binoculars, etc.*
 - **Throw:** If somebody falls into the water, students should NEVER go after them or try to pull the person out themselves! Instead they should throw something that floats, like a life jacket or even a cooler, towards that person for them to grab, and also yell for help. *Motion: Students can pretend to throw a life ring.*
 - **Feet up:** Lots of kids go floating or tubing on the river with their families. This can be fun but also dangerous, because the bottom of rivers often have branches and rocks that can catch your feet. To be safe, students should always float with their feet up at the surface, pointing down-river. *Motion: Students sit or lie on the floor and stick their feet up in the air.*
 - **Huddle:** What should you do if you fall into cold water? First of all, you should ALWAYS be wearing your life jacket so you can easily float. To keep your body warm, you should “huddle”, which means holding your knees against your body and crossing your arms while you float. *Motion: Students sit on the floor and huddle as tight as they can.*
 - **Life jacket:** The number one most important rule for any time you are in, on, or around the water! Students should always be wearing a life jacket, and encourage their families to do so as well. *Motion: Pretending to pull on and buckle up a life jacket (they can even make the “clicking” sounds.*
3. Play the game! For a more physically engaging game, be sure to alternate the sitting and standing motions. Encourage kids to be vocal with their responses, i.e., actually “asking” their parents aloud.
4. Wrap up the activity by reinforcing the meaning of each of the concepts learned and why they are important. Extend the activity with the “What would you do” story on the following page.



What would you do?

Read the following story aloud, then ask students what Louise did right and wrong. What would students do differently? Encourage use of the concepts learned in the "Captain Says" game. For an extra interactive element, select a student to play Louise and have her act out the scene in front of the class.

Louise was so excited to play in the river today! The sun was bright and the river looked so nice and cool. She had gotten ready by putting on her swimsuit and life jacket, and was waiting on the beach for her parents to go with her into the water. But they were taking a long time, and she was getting very hot, so she took off her life jacket. That felt better! The river looked calm so Louise stood with just her ankles in the water, feeling the cold water on her skin and the mud between her toes. A small fish suddenly appeared and started nibbling on her toes, startling Louise. She squealed, kicked, lost her balance, and fell into the water! It was deeper than she thought and really cold, taking her breath away. For a few seconds, she couldn't scream and started splashing around, trying to get back to shore, and choking on water. Luckily, Louise's dad saw the whole thing and came running to help. He pulled her out of the river and onto the beach. Louise was safe but very cold, wet, and scared. From now on, she decided, she would leave her life jacket on no matter what—just in case!

Additional Resources

US Army Corps of Engineers Kids' Water Safety—animated cartoons, games, and coloring: <http://bobber.info/>

Boating Safety Sidekicks—coloring pages, quizzes, and interactive activities: www.boatingsidekicks.com

Safe Kids Worldwide—Boating Safety Tips: www.safekids.org/boatingsafety

Oregon State Marine Board 6cUhb Education Program

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Activity at a glance

Students sing a song to encourage confidence and knowledge about swimming, while performing motions to reinforce the concepts.

**The Swimming Song!**

(sung to the tune of the Hokey Pokey)

*You put your right arm in,
You pull your right arm out,
You put your left arm in,
and you paddle all about!*

*You kick and kick your legs
And don't get water in your snout-
That's how you swim around!*

*You put your life vest on,
DON'T take your life vest off,
You put your life vest on,
And you buckle it all up!*

*You kick and kick your legs
And don't get water in your snout-
That's how you swim around!*

*You pick a safe place here,
You pick a safe place there,
You pick a safe place here,
And if it's cold then don't swim
there!*

*You kick and kick your legs
And don't get water in your snout-
That's how you swim around!*

What other good swimming practices can you think of?

Suggestions

- Use this song as an introduction or wrap-up for other activities in the K-2 unit.
- Engage students by asking them to invent motions to go along with the lyrics.
- Extend the activity by helping students write additional lyrics about the concepts they have learned during this unit.

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Boating Safety 101



Make sure all gear and people are balanced



Don't make sudden movements that could tip the boat over



Stay seated at all times when boat is in motion



If your boat does capsize, STAY WITH IT! Most boats will float even when upside-down. And a boat is much easier to spot by rescuers than a person!



For safety, everyone on board should wear a life jacket at all times — adults AND kids. Children 12 & under must wear one when the boat is in motion— it's the law!

I PLEDGE TO USE THESE SAFE PRACTICES WHEN ON A BOAT.

SIGNED: _____

DID YOU KNOW?
Life jackets are available to borrow at many Oregon Waterways! For a list of sites, visit: www.oregon.gov/osmb

Draw a picture of your family having a fun day on the water here!



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1-10-1 Principle—in cold water, you have *one minute* to get your breathing until control and calm yourself, *ten minutes* of meaningful movement, and *one hour* before you lose consciousness due to hypothermia.

Acceleration— in physics, is the rate of change of velocity of an object.

Action and Reaction—in every interaction, there is a pair of forces acting on interacting objects. Each reaction is in response to the initial action.

Aeolipile—also known as a “Hero’s Engine”, it is a simple bladeless steam turbine which spins when the central water container is heated. Torque is produced by steam jets exiting the turbine, much like a rocket engine.

Anglers—Men, women, or children who fish.

Aquatic—of or relating to water.

Balanced and unbalanced forces—If two individual forces are of equal magnitude and opposite direction, then the forces are said to be balanced. An object is said to be acted upon by an unbalanced force only when there is an individual force that is not being balanced by a force of equal magnitude and in the opposite direction.

Ballast—heavy material, such as gravel, iron, or water, placed low in a vessel to improve its stability.

Biofouling—the gradual accumulation of waterborne organisms on the surfaces of structures in water that contributes to corrosion of the structures and to a decrease in the efficiency of moving parts.

Blubber—The thick layer of fat between the skin and the muscle layers of whales and other marine mammals. It insulates the animal from heat loss and serves as a food reserve.

Boat—all watercraft used or capable of being used as a means of transportation on the water, including a seaplane on the water (not in flight) but NOT including boathouses, floating homes, air mattresses, beach and water toys, or single inner tubes.

Booms—a temporary floating barrier used to contain an oil spill and prevent it from reaching the shoreline. Booms help to concentrate oil in thicker surface layers so that skimmers, vacuums, or other collection methods can be used more effectively.

Buoyancy—the ability or tendency to float in water or air or some other fluid.

Capsize—to overturn in the water.

Catch limits—also known as bag limits; laws imposed on fishermen restricting the number of animals within a specific species or group of species they may kill and keep. Size limits and fishing seasons sometimes accompany catch limits.

Chemical dispersants— a common tool used after oil spills to break up oil slicks on the water surface into smaller particles and increase the oil's rate of degradation by wind or wave action.

Cold water immersion—When one’s body completely enters cold water. The definition of cold water is

variable. For practical purposes, significant risk of hypothermia usually begins in water colder than 70° F.

Density—the degree of compactness of a substance.

Deposition—the geological process in which sediments, soil and rocks are added to a landform or land mass. Wind, ice, and water, as well as sediment flowing via gravity, transport previously eroded sediment, which, at the loss of enough kinetic energy in the fluid, is deposited, building up layers of sediment.

Drought—a prolonged period of abnormally low rainfall; a shortage of water resulting from this.

Equilibrium—a state in which opposing forces or influences are balanced.

Erosion—A type of weathering in which surface soil and rock are worn away through the action of glaciers, water, or wind.

Force— In physics, something that causes a change in the motion of an object.

Friction—the resistance that one surface or object encounters when moving over another.

Habitat—the natural home or environment of an animal, plant, or other organism.

Hydrologic cycle—the storage and movement of water between the *biosphere* (the regions of Earth occupied by living organisms), *atmosphere* (the blanket of gases surrounding the Earth), *lithosphere* (the rigid outer part of the earth, consisting of the crust and upper mantle), and the *hydrosphere* (all the waters on the earth's surface, such as lakes and seas).

Hyperventilation—a condition characterized by abnormally prolonged and rapid breathing, resulting in decreased carbon dioxide levels and increased oxygen levels that produce faintness, tingling of the fingers and toes, and, if continued, alkalosis and loss of consciousness.

Hypothermia—a medical emergency that occurs when your body loses heat faster than it can produce heat, causing a dangerously low body temperature.

Incapacitation—occurs within 5 – 15 minutes in cold water. Vasoconstriction decreases blood flow to the extremities in an effort to preserve heat in the core, thereby protecting the vital organs but allowing the periphery to cool. Within this critical time frame you will lose meaningful movement in your hands and feet, and then your arms and legs.

Inertia—a tendency to do nothing or to remain unchanged.

Invasive species—an organism (plant, animal, fungus, or bacterium) that is not native and has negative effects on our economy, our environment, or our health.

Involuntary reaction—there are two types of involuntary reactions, *autonomic* and *reflex*. The autonomic nervous system controls the body's internal environment without conscious intervention and helps to regulate vital functions. A reflex is an involuntary response to a stimulus, such as withdrawing your hand from a hot surface before you become aware of the heat.

Irrigation— is the watering of land to make it ready for agriculture.

List—a nautical term for when a boat tilts towards one side.

Marine mammals—a diverse group of species including whales, polar bears, dolphins, and otters that rely on the ocean for their existence. All of these species have the five characteristics of mammals: they are warm-blooded, have hair or fur, give birth to live young, nourish their young with mother’s milk, and breathe air.

Mass—a measure of the number of atoms in an object. The basic unit of measurement for *mass* is the kilogram.

Mitigation—The elimination or reduction of the frequency, magnitude, or severity of exposure to risks; the minimization of the potential impact of a threat or warning.

Morphology—the shapes of river and stream channels and how they change over time.

Native species—an organism (plant, animal, fungus, or bacterium) that is naturally found in a region. These can be either endemic (found only within a particular region) or indigenous (found both within the region and elsewhere).

Natural resources—anything that people can use which comes from nature. People do not make natural resources, but gather them from the earth. Examples are air, water, wood, oil, wind energy, hydro-electric energy, iron, and coal.

Newton’s First Law—every object will remain at rest or in uniform motion in a straight line unless compelled to change its state by the action of an external force.

Newton’s Second Law—The acceleration of an object as produced by a force is directly proportional to the magnitude of the force, in the same direction as the force, and inversely proportional to the mass of the object.

Newton’s Third Law—For every action, there is an equal and opposite reaction. The statement means that the size of the forces on the first object equals the size of the force on the second object.

Non-point source pollution—water and air pollution from many diffuse and sometimes unknown sources.

Oil skimmers—a machine that separates a liquid from particles floating on it or from another liquid, such as oil.

Organic materials—matter composed of organic compounds that has come from the remains of organisms such as plants and animals and their waste products in the environment.

Overfishing—a non-sustainable use of aquatic or marine resources in which the supply of fish and other animals is depleted or exhausted.

Plankton—small and microscopic organisms drifting or floating in the sea or fresh water, consisting chiefly of tiny plants and algae, small crustaceans, and the eggs and larval stages of larger animals.

PFD—Personal Flotation Device

Point source pollution— a single identifiable source of air, water, noise or light pollution.

Porous—having minute spaces or holes through which liquid or air may pass.

Reservoir—a large natural or artificial lake used as a source of water supply.

Resource manager—a person who develops conservation and rehabilitation plans for nature reserves, land, rivers, and other natural resources, so that people can use these resources in an ecologically sustainable way.

Shock—lasts for only about a minute after entering the water and refers to the effect that cold water has on your breathing. Initially, there is an automatic gasp reflex in response to rapid skin cooling; this can lead to hyperventilation. If the head goes underwater, water may be breathed into the lungs during the gasp.

Slicks—a film or layer of oil floating on an expanse of water, especially one that has leaked or been discharged from a ship.

Stakeholders—people who can affect, be affected by, or have personal interest in an issue.

Strainer—a common river hazard consisting of sticks or branches. Water passes through these but solid objects like boats or people do not, similar to a kitchen strainer. Even boaters wearing life jackets can drown if they are washed into a strainer, because they can get trapped underwater against the branches by tons of water pressure.

Sustainable—capable of being maintained at a steady level without exhausting natural resources or causing severe ecological damage.

Town Hall Meeting—an informal public meeting at which community members discuss issues and concerns.

Vectors—a pathway by which non-native species are transported or carried to new environments. This can include currents, boats, humans, or other organisms.

Volume—the amount of space that a substance or object occupies, or that is enclosed within a container.

Water scarcity—the lack of sufficient available water resources to meet the demands of water usage within a region.

Woody debris—large wood that falls into a stream or river, including logs, branches, and root balls. This debris can cause dangerous hazards in rivers for boaters.

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