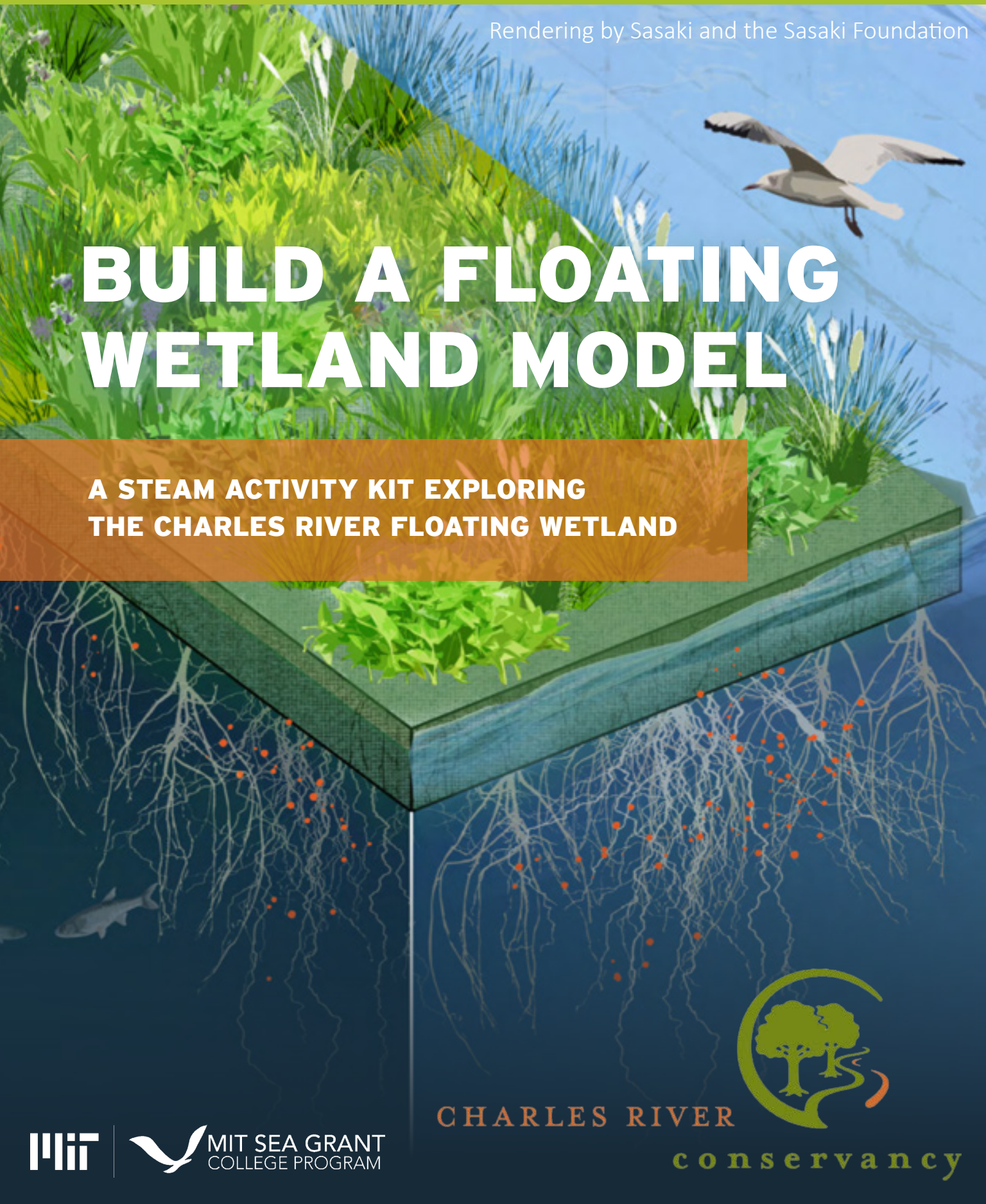

BUILD A FLOATING WETLAND MODEL

A STEAM ACTIVITY KIT EXPLORING THE CHARLES RIVER FLOATING WETLAND

MIT SEA GRANT COLLEGE PROGRAM

CHARLES RIVER conservancy

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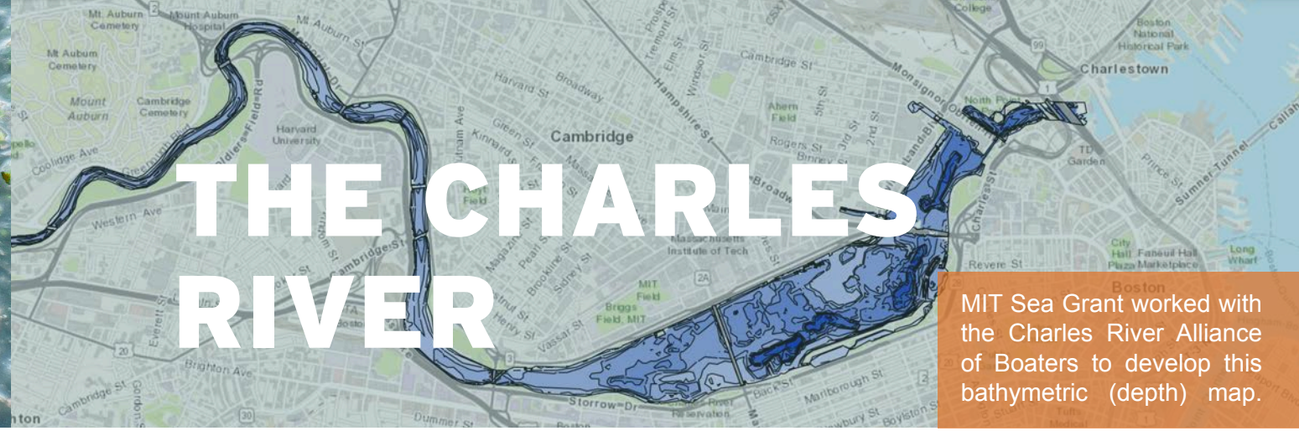


THE CHARLES RIVER

MIT Sea Grant worked with the Charles River Alliance of Boaters to develop this bathymetric (depth) map.

KIT CONTENTS

- Clear tray + thermometer
- Colored pencils
- Daphnia eggs
- Bottled spring water
- Paddle Boston free pass
- Magnifying glass
- Nutrients (spirulina + yeast)
- Paintbrush
- Placemat poster
- Plant grow mat
- Plate and paper towels
- Spray bottle
- Toothpicks
- Water quality test strips
- Watercolor board
- Wheat straws
- Wheatgrass seeds

CHECK THE GLOSSARY FOR ALL ORANGE WORDS!

80 MILES LONG | 8,000 ACRES OF WETLANDS

Despite being the most densely populated **watershed** in Massachusetts, the Charles River is home to many thriving **ecosystems** preserved by the government and advocates like the Charles River Conservancy.

The Charles River used to be a free-flowing tidal **estuary.** A complex habitat of **wetlands** and **mud-flats** supported a diversity of species including shellfish, birds, and **anadromous fish.**

Today, dams maintain a near-constant water level. **Hardscape** covers much of the river, and **nutrient pollution** carried by rainwater from the city streets acts as fertilizer fueling the growth of **algae.**

THE FLOATING WETLAND

700 SQUARE FEET | **INSTALLED SUMMER 2020**

The Charles River Conservancy installed the Floating Wetland on the **Cambridge** side of the river between the **Museum of Science** and the **Longfellow Bridge.**

PROJECT GOALS IN THE CHARLES RIVER

- Create a visually impactful wetland installation that will enliven the river.
- Research the impact of improved habitat on zooplankton species distribution and body size.
- Engage and educate the public about the relationship betwveen river **ecology,** pollution, and water quality.

CURRENT CHALLENGES IN THE CHARLES RIVER

- Lack of vegetation
- Loss of habitat
- Broken food chain
- Nutrient pollution
- Algal blooms
- Water quality

The Charles River Floating Wetland reintroduces native plants to increase habitat diversity and support the tiny animals, **zooplankton,** that graze on fast-growing **algae.**

Algal blooms in the Charles River can be understood as a symptom of a broken food chain. The Floating Wetland is an **ecological intervention** that aims to restore balance.

Northeastern University scientists working on this project hypothesize that the roots of the Floating Wetland will provide a protective habitat for zooplankton to grow, eat more **cyanobacteria,** and reduce algal blooms.

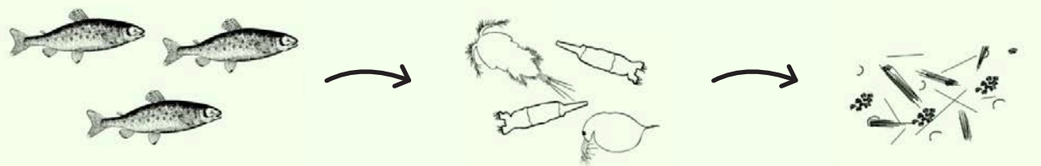
CHARLES RIVER ANIMALS

Photo: Aaron John Bourque

NATIVE PLANT SPECIES

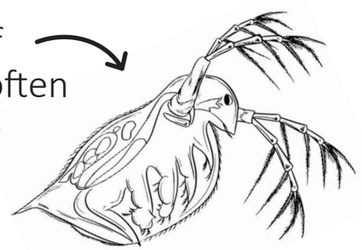
A THRIVING ECOSYSTEM | **20+ SPECIES OF FISH**

Each spring, millions of river herring migrate into the coastal waters of Massachusetts to begin their annual trek up dozens of streams and rivers to **spawn.**



Fish → Zooplankton → Cyanobacteria

Daphnia are one type of **zooplankton.** They are often called water fleas due to their jerky swimming movements.



These tiny creatures eat **cyanobacteria,** algae that grows in the Charles River.

19 NATIVE PLANT SPECIES ON THE FLOATING WETLAND

Planting plan used for the Charles River Floating Wetland

Sweet Flag
Lurid Sedge
Tussock Sedge
Canada Rush
Soft Rush
Hard-stem Bulrush
Soft-stem Bulrush
Seaside Goldenrod
Swamp Milkweed
Boneset
Swamp Rose Mallow
Swamp Rose
Arrow Arum
Spotted Joe Pye Weed
Great Blue Lobelia
Monkey Flower
Common Elderberry
Buttonbush
Blue Flag Iris

[WEEK 1] SET UP THE TRAY

WHAT YOU'LL NEED:

1. Find a sunny spot on a table or a flat, stable surface by a window to set up your mini **ecosystem.**

2. Place the clear tray on top of the waterproof placemat poster of the Charles River Floating Wetland.

3. Carefully fill the tray almost to the top with the bottled spring water, leaving about half an inch between the surface of the water and the top of the tray.

HATCH THE DAPHNIA EGGS

In the dark, try shining a flashlight on the tray! Daphnia are attracted to light.

WHAT YOU'LL NEED:

1. Check the water temperature (it should be at least 65°F for hatching). Morning or early afternoon is best for sun!

2. Carefully pour the **daphnia** eggs into the water in the tray. Slowly stir with a straw. It's normal for eggs to float.

3. Now, prepare the daphnia food! The nutrients mixture contains yeast and **spirulina** powder. Fill the container with spring water, close the lid, shake, and refrigerate.

4. Daphnia can take several days to hatch. **Every day,** look closely to see if you can spot any movement. They will look like swimming fleas. Once they have hatched, use a straw to add one drop of the nutrients **every day.**

[WEEK 2]
SOAK THE SEEDS

WHAT YOU'LL NEED:

1. Fill the container of wheatgrass seeds with water and put the lid on.
2. Let the seeds soak in the water for about **8 hours.** This will soften their seed coat and help them to sprout!
3. Create a reminder for yourself to place the seeds on the grow mat later tonight (see next page). Set an alarm, write a note, or ask someone to remind you!

[LATER]
MAT THE SEEDS

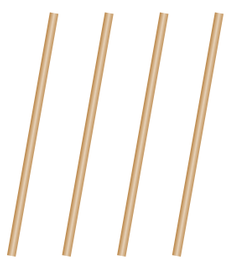
WHAT YOU'LL NEED:

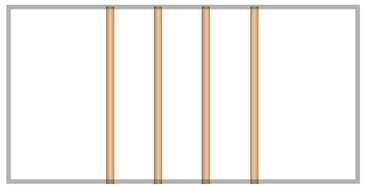
1. **After 8 hours** of soaking the seeds, place the grow mat on the bamboo plate and dump the seeds and water onto the mat. Use your fingers to spread the seeds out.
2. Cover the mat and seeds with a folded paper towel and use the spray bottle to wet the towel completely.
3. **Every day,** spray the paper towel to keep it wet, and check the seeds. After **2-3 days,** once you see sprouts, uncover them and spray with water **every day.**

Rendering by Sasaki
and the Sasaki Foundation

[WEEK 3] BUILD THE MODEL

WHAT YOU'LL NEED:





The straws are the perfect length to fit snugly across the inside of the tray.

1. Position straws in the tray near the rim, above the water, as shown above. The ends of the straws will touch the inside of the tray. The straws should be about an inch apart and parallell to each other.

2. Using both hands, pick up the grow mat from the plate and carefully lay it on top of the straws.

ADD PLANTS AND ANIMALS

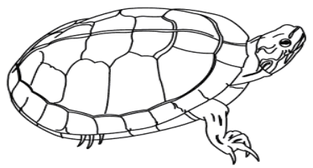
WHAT YOU'LL NEED:

Color these species, cut them out, and add them to your wetland!

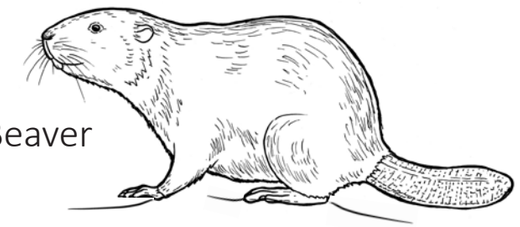
Great Blue Heron

Blue Flag Iris

Painted Turtle



Beaver



OBSERVATIONS LOG

Week 1 Observations:

Week 2 Observations:

Week 3 Observations:

Week 4 Observations:

CONNECT WITH THE CHARLES!

EXPLORE THE CHARLES!

Have a canoe or kayak adventure and explore parks along the Charles River: (thecharles.org/about/visit/)

Christian A. Herter Park
North Point Park
Magazine Beach
Riverbend Park
Pathways

SHARE YOUR PHOTOS!

Share photos of your floating wetland model, **Art with Algae** activity and your Charles River adventures!

SOCIAL MEDIA:

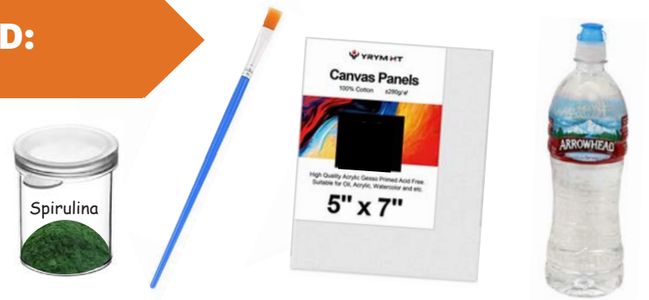
@MITSeaGrant
@CharlesRiverCRC

EMAIL US:

seagrantinfo@mit.edu

[WEEK 4] ART WITH ALGAE

WHAT YOU'LL NEED:



1. Add water to the container of spirulina and mix with the paint brush. This is your natural paint!

2. Paint a floating wetland on your watercolor art board.

CLEANING UP:

The paper towels, plate, and straws are biodegradable. Please recycle water bottles.

By the end of the month, your daphnia will have completed their life cycle (they usually live 10-30 days).

Ask an adult to help you dispose of the tray water

You can use the contents of the tray to water an indoor plant - these are healthy nutrients for your plants!

OR

Ask an adult to help add a small amount of bleach to the tray and pour down the drain with water.

GLOSSARY OF TERMS

Algae: organisms like seaweed that live in water and make their food by using sunlight to turn carbon dioxide and water into food through photosynthesis

Algal bloom: an overgrowth of algae or cyanobacteria that often results in scum on the surface of water, which can be harmful to other organisms

Anadromous fish: a type of fish, such as river herring, that migrates from saltwater to freshwater to release eggs

Cyanobacteria: microscopic organisms (blue-green algae), which can create algal blooms on the water's surface

Daphnia: small swimming zooplankton known as water fleas that live in aquatic environments and eat mostly algae

Ecological intervention: habitat restoration and other environmental solutions to help improve ecosystem health

Ecology: a branch of science focusing on the relationships between living things and their environment

Ecosystem: a community of living organisms interacting with one another and their environment

Estuary: the mouth of a river where fresh and saltwater mix, home to unique plant and animal communities and wetlands

Floating Wetland: a human-made island of plants; the Charles River Floating Wetland aims to restore zooplankton habitat and help improve river health

Hardscape: man-made features in landscape architecture like paths or the concrete walls lining the Charles River

Mud-flats: an area of land that lies just below the surface of water or repeatedly covered by the tide

Nutrient pollution: too many nutrients running from urban areas into a body of water, causing an overgrowth of algae

Organism: a living thing - a person, plant, or animal

Spawn: the process of aquatic animals releasing eggs in water; river herring migrate to the Charles River to spawn

Spirulina: a type of blue-green algae (cyanobacteria)

Watershed: an area that drains streams and rainfall to a common body of water

Wetlands: areas and ecosystems flooded by water, such as marshes or swamps, supporting aquatic and land species

Zooplankton: tiny creatures living in oceans, seas, and bodies of fresh water, which are an important part of the food chain

Learn more about the Charles River Conservancy's Floating Wetland project and MIT Sea Grant:

thecharles.org/floating-wetlands/
@CharlesRiverCRC

seagrant.mit.edu
@MITSeaGrant

This booklet was created by MIT Sea Grant student Andrea Lo and Communications Specialist Lily Keyes in partnership with the Charles River Conservancy, with funding support from the MIT Community Service Fund.

The Charles River Floating Wetland was installed by the Charles River Conservancy in partnership with MassDCR and a number of supporters, including Foth and the Sasaki Foundation. The CRC continues a multi-year partnership with Northeastern University PhD student Max Rome on the research program.

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CHARLES RIVER conservancy