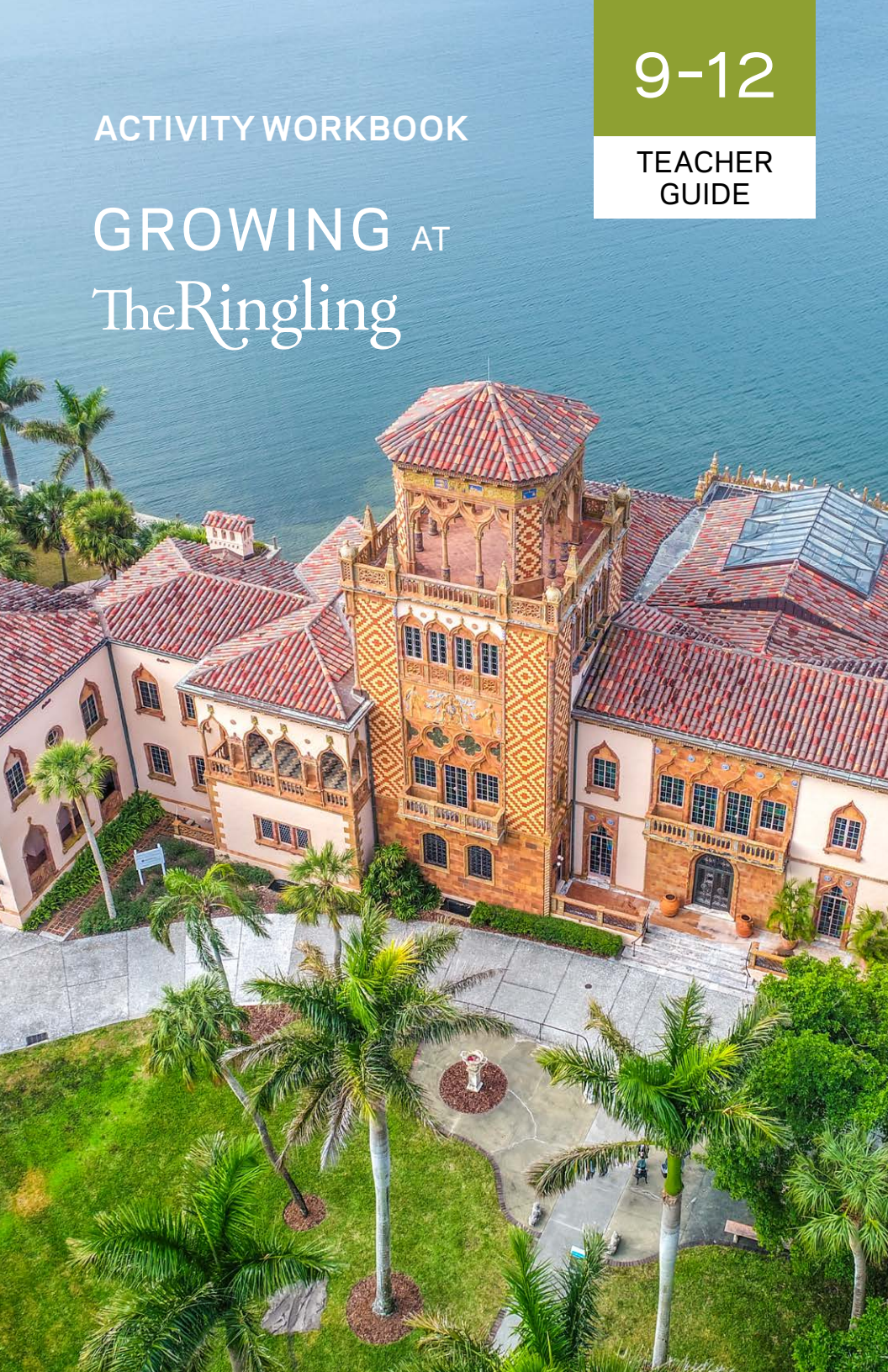
ACTIVITY WORKBOOK

GROWING AT The Ringling

9-12

TEACHER GUIDE



Welcome to the Bayfront Gardens!

The Ringling Museum is known for its art and circus collections, but did you know it is also home to 66 acres of grounds and gardens? During your visit today you will discover various ecosystems, genetic diversity, and beautiful landscapes. As our "living collections" these gardens provide a beautiful and scientific view of The Ringling. We hope you enjoy your garden adventure today!

CONTENTS

This teacher's guide will help chaperones and teachers answer questions about the workbook, and provides lesson suggestions for learning extension in the classroom.

We hope you enjoy your tour today at the Bayfront Grounds and Gardens!

STANDARDS: SC.912.L.14.6, SC.912.L.15.6, SC.912.L.15.12, SC.912.L.16.1, SC.912.L.17.3, SC.912.17.4, SC.912.L.17.8, SC.912.L.17.9, SC.912.L.17.12, SC.912.L.17.16, SC.912.L.17.18, SC.912.L.18.7, SC.912.L.18.8, SC.912.L.18.9

Hardy (-Weinberg) Roses

Start at the Rose Garden located on your map.

The Hardy-Weinberg principle states that genetic variation in a population will stay constant if there are no outside disruptions. Assuming the Rose Garden is a constant population, solve the following problems using the Hardy-Weinberg equation.

$p^2 + 2pq + q^2 = 1$

In this garden there are white roses (qq), pink roses (Pq), and red roses (PP). If 9% (qq) [q = 0.3] of the population has white roses, what percentage has pink and red roses respectively?

$p^2 + 2p(0.3) + (0.3)^2 = 1$

$1 - (0.3) = p$

$p = 0.7$

$(0.7)^2 + 2(0.7)(0.3) + (0.3)^2 = 1$

qq = 9% **Pq = 42%** **PP = 49%**

Using Mendel's laws of segregation and independent assortment, create a Punnett Square predicting the flower color phenotype if you reproduce two pink flowering plants (Pq).

	P	q
P	PP	Pq
q	Pq	qq

What is the probability of the offspring having pink flowers? Red flowers? White flowers?

50% pink flowers (Pq), 25% red flowers (PP) and 25% white flowers (qq)

Loving Sarasota Bay

Head to the Bolger Campiello and Promenade marked on your map.

Sarasota Bay is home to thousands of organisms ranging from Agardhiella seaweed to the zebra-striped Sheepshead fish. The bay is a large but fragile aquatic ecosystem influenced by human activity. In a small group, brainstorm some threats Sarasota Bay faces from human residence and industry.

What are some ways Sarasota Bay might have changed since the Ringling's built their home here in 1926?

Human life has expanded bringing new threats such as human waste, boating, commercial fishing and tourism to the Bay.

Sketch a basic food web of Sarasota Bay using these species.

Plankton – small, microscopic organisms eaten by many animals, especially zooplankton

Shrimp – omnivores feeding on plankton, decaying plants and animals, and small fish

Grouper – large predatory fish

Red Snapper – pinkish-red fish that feeds off crustaceans and small fish

Bonnethead Shark – small shark that mostly feeds on crustaceans

Grunt – a small fish that feeds on smaller fish and invertebrates

Blue Crab – crustacean that eats almost anything including mollusks, worms, decaying animals, and shrimp

Introduce the predatory and poisonous lionfish into your food web. Lionfish eat everything from the large grouper to the small shrimp. What will happen to the species it preys on? What will happen higher up in the food chain? What will happen to the bottom of the food chain?

Invasive species will overeat their food source disrupting the web

Working in small groups, create a list of producers, consumers and decomposers in the ecosystem.

Producers	Consumers	Decomposers

If blue crabs, a decomposer found in Sarasota Bay, were eliminated by red tide, what would happen to the rest of the ecosystem?

The ecosystem would suffer because debris would pile up making it difficult for other species to reproduce and thrive. Blue crabs are an important element in the food chain and other species would lose a food source.

Why is it important to protect our local natural resources?

Natural resources are limited and affect human life. The Bay is a source of food and tourism in our state. Waterways in the Florida aquifer provide water to millions of people worldwide.

Brainstorm some ways you can be involved to protect the Sarasota Bay ecosystem and the abundance of life found here.

You can learn more at **sarasotabay.org**

Can you find small consumers eating algae off the rocks? What else can you see in the bay today?

CLASSROOM CONNECTIONS

Using the internet and other resources, have students research environmental changes happening in Sarasota Bay. Brainstorm ways to protect the bay and its wildlife.

Classify Florida

Head over to the Millennium Tree Trail marked on your map.

Walk the trail and get a feel for the fauna.

On the trail there are several examples of trees native to Florida. Most trees are marked with a label listing their common name and scientific name in the format *Genus species*. Below are two sets of plant classifications, missing some pieces of information. **Find** the Florida species below and **fill in** the remaining information found on the tree labels.

Classification	Organism 1	Organism 2
DOMAIN	Eukaryote	Eukaryote
KINGDOM	Plantae	Plantae
PHYLUM	Coniferophyta	Angiosperms
CLASS	Pinopsida	Commelinids
ORDER	Pinales	Arecales
FAMILY	Pinaceae	Arecaceae
GENUS	Pinus	Sabal
SPECIES	elliottii	Palmetto
Common Name	Slash Pine	Cabbage Palm

Take a good look at these plants. What are some guesses you have about how they have adapted to thrive in a subtropical environment?
Slash pine are adapted to require less water, drawing water from deep underground. Cabbage palms have large fanning leaves to maximize sunlight and CO2 collection.

Which of these Florida plants do you think conducts the most photosynthesis? What about the trees makes you think that?
The Cabbage Palm is better suited for photosynthesis because of its large leaves.

Did you know that 80% of the Earth's photosynthesis occurs in the ocean? How will plastic waste in the ocean affect algae's production of oxygen?

Deep Breaths: Calculating Oxygen

Head over to the large field marked 4 on your map.

Photosynthesis is an important part of the carbon cycle by which plant take in water, sunlight and carbon dioxide. Through the process of cellular respiration, plants create glucose and oxygen.

Working in groups of two, find a tree in this area. Make sure that you are not working too close to the pond!

Using the ruler printed on the side of this page, **estimate** the circumference of your tree, as measured approximately 4.5 feet off the ground. **Calculate** the diameter by dividing the circumference by π. Use the chart below to find the amount of oxygen your tree produces annually.

Average Annual O_2 Production for Trees of Different Diameters

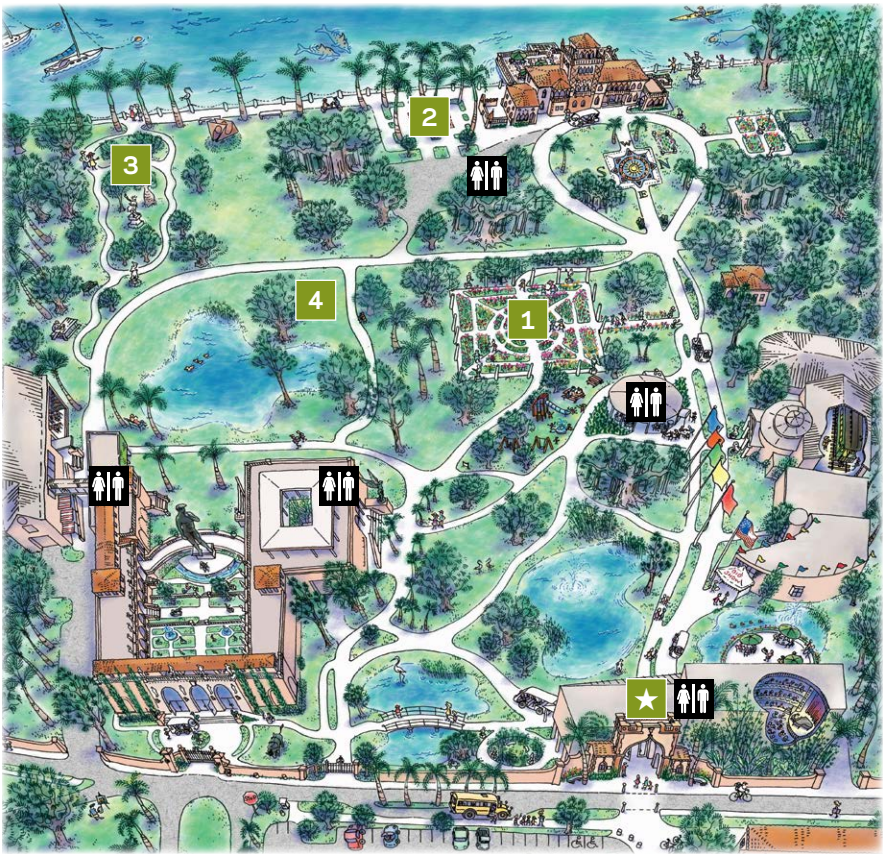
Diameter of tree (in inches)	Avg. amount of O_2 produced annually (in pounds)
1 - 3	6.4
3 - 6	16.5
6 - 9	32
9 - 12	49.9
12 - 15	65.3
15 - 18	80.8
18 - 21	100.5
21 - 24	108.5
24 - 27	83.7
27 - 30	200.8
30+	243.2

How much oxygen is your tree producing annually? _____

Data taken from "Oxygen Production by Urban Trees in the United States," by David J. Nowak, Robert Hoehn, and Daniel E. Crane, in *Arboriculture and Urban Forestry*, 2007.

CLASSROOM CONNECTIONS

Back in the classroom combine the data each group collected of their tree. Determine how much oxygen is produced annually by the trees around this pond. Calculate the amount of oxygen produced daily. How would the oxygen supply be affected by removing just one tree from the grounds?



1 Mable's Rose Garden
2 Bolger Campiello
3 Millennium Tree Trail
4 Field
★ Entrance
Restrooms

HOURS
All Venues Open Daily 10:00 AM – 5:00 PM
Museum of Art & Circus Museum
Open Thursdays until 8:00 PM

5401 Bay Shore Road, Sarasota, FL 34243
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The Ringling
THE JOHN & MABLE RINGLING MUSEUM OF ART
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