

RIVER CENTER'S

# OCEAN CURRENTS & PLASTIC VOYAGES



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## RIVER CENTER

The River Center is a program of the Loxahatchee River District. The Loxahatchee River District, an award-winning wastewater treatment facility established in 1971 to protect the Loxahatchee River from pollutants, is the leading authority on the Loxahatchee River. Its physical plant can treat up to 11 million gallons of wastewater from northern Palm Beach and southern Martin Counties each day, preventing those pollutants from entering our watershed. This special district also provides both scientific and educational programs for the Loxahatchee River and serves as an advisory agency for the many diverse efforts under way.



# PREVISIT INFORMATION

We are delighted that you have chosen to bring your students to the Loxahatchee River District's River Center for an educational field experience. The River Center staff would like for your visit to be as fun and educational as possible. The goal of this field experience is to instill the students with an understanding and appreciation of the Loxahatchee River watershed through its unique plant and animal habitats as well as a new perspective on water resources and conservation. To make this an enjoyable field trip for teachers, students, and our program presenters, please follow these guidelines.

## PLEASE READ

Please contact the River Center if you will be *more than 15 minutes late* or for any questions, concerns, or changes at 561-743-7123 ext. 4200 or [Education@LRECD.org](mailto:Education@LRECD.org).

### SCHEDULE

**PROGRAM: 10 A.M. - 12 P.M.**

**LUNCH: 12:15 P.M.**

*Classes that usually eat lunch between 10:30am and 11:30am should have a snack before or during the bus ride to the River Center. Groups may have lunch after 12:00pm at the River Center's chiki hut.*

### RECOMMENDATIONS FOR A GOOD TRIP

- Students should wear name tags with their first name.
- Chaperones: 1:6 ratio for younger groups (ages 5-9) or 1:10 ratio for older groups (ages 10+).

### EXPECTATIONS

- Teachers and chaperones will be responsible for discipline of the children. ***All adults will be active participants in the activities with the children.***
- Students are expected to be good listeners, respectful to our program presenters, listen carefully and follow directions.
- There are live animals on site and in aquaria, so please do not tap or bang on the aquariums or exhibits in order to avoid stressing the animals.
- Students should practice classroom behaviors including keeping their hands to themselves, not talking out of turn, and watching for attention clues.
- To minimize distractions for students, ***please remind all chaperones and teachers to switch cell phones to silent.***

### ADDRESS AND DIRECTIONS

**Address: 805 U.S. Highway 1 Jupiter, FL 33477**

**Directions:**

- I-95: Exit 87A (Jupiter Exit) East Indiantown Road (Turnpike: Exit 116 Indiantown Road)
- Indiantown Road: Travel EAST until you reach U.S. Highway 1
- Turn Left (NORTH) onto U.S. Highway 1
- Travel NORTH through one stoplight, turn right (EAST) at the flashing light into Burt Reynolds Park.
- The River Center is the light blue building located by the fire station.






# CHECKLIST

## MY NOTES


### SURVEY LINKS

In-Person Field Trips:  
<https://www.surveymonkey.com/r/RCschool>

Virtual Field Trips:  
<https://www.surveymonkey.com/r/rcvirtual>

- BUS RESERVED
- PERMISSION SLIPS
- PRE-LESSON PLANS TO TEACHERS
- COMMUNICATE ANY 504/IEP/ESOL/ESE/ ACCESSIBILITY ISSUES
  
-  STUDENT NAME TAGS
-  1:6 RATIO FOR CHAPERONES
-  PACKED LUNCHES
-  SNACK BEFORE PROGRAM
-  DIRECTIONS FOR THE BUS DRIVER
  
- COMPLETE RIVER CENTER SURVEY
- POST-LESSON PLANS TO TEACHERS
- POST LESSON EVALUATIONS



## BACKGROUND

The U.S. produces over 250 million tons of trash every year, and the amount continues to increase. Disposing of all that waste negatively affects wildlife. Although the production of cheap and disposable plastics has made life more convenient, it is of great concern regarding litter and quantity of waste. 12% of waste produced each year in the U.S. is plastic (30 million tons) and on 8% of this plastic waste is recycled. The rest go into landfills or in the environment. Plastic waste is a large component of marine debris.

While most of the waste produced today in the U.S. is recycled or deposited in landfills, this was not always the case. Much trash was deposited into the open oceans until the Clean Water Act passed in 1972. Many other countries still deposit waste directly into lakes, rivers, or directly into the ocean. Over time, this has resulted in a tremendous amount of garbage in every ocean around the world that can travel incredible distances with the currents.

Because the ocean is so vast, there is no current estimate on the amount of trash it contains, but the majority of marine debris recovered is plastic. Plastic does not degrade so once it reaches the ocean it is there to stay. It will breakdown into smaller pieces, even microscopic (Microplastics). This happens through sun exposure, wind and wave action, and salt from the water.

## VOCABULARY

- Biodegradable, debris
- Solid waste
- Sewage
- Entangled
- Ingest
- Litter
- Plastic
- Pollution
- Microplastic
- Biomagnification
- Bioaccumulation
- Disposable
- Petroleum
- Stormwater
- Runoff
- Clean Water Act
- Recycle
- Reuse
- Reduce
- Water supply
- Shoreline
- Currents
- Tides
- Wrackline
- Water column
- Swamp
- Estuary
- Ocean
- Freshwater
- Saltwater
- Brackish water

# STANDARDS

## FOURTH GRADE SCIENCE

SC.4.L.17.4: Recognize ways plants and animals, including humans, can impact the environment.

SC.4.P.8.1: Measure and compare objects and materials based on their physical properties including mass, shape, volume, color, hardness, texture, odor, taste, attraction to magnets.

SC.4.E.6.3: Recognize that humans need resources found on Earth and that these are either renewable or nonrenewable.

SC.4.N.1.1: Raise questions about the natural world, use appropriate reference materials that support understanding to obtain information (identifying the source), conduct both individual and team investigations through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.

SC.4.N.1.4: Attempt reasonable answers to scientific questions and cite evidence in support.

## FIFTH GRADE SCIENCE

SC.5.N.1.1: Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.5.N.1.6: Recognize and explain the difference between personal opinion/interpretation and verified observation.

SC.5.P.8.2: Investigate and identify materials that will dissolve in water and those that will not and identify the conditions that will speed up or slow down the dissolving process.

SC.5.P.13.1: Identify familiar forces that cause objects to move, such as pushes or pulls, including gravity acting on falling objects.

SC.5.E.7.2: Recognize that the ocean is an integral part of the water cycle and is connected to all of Earth's water reservoirs via evaporation and precipitation processes.

## MATH

MAFS.4.MD.1.1, MAFS.4.MD.2.4

MAFS.5.MD.1.1, MAFS.5.MD.2.2

## LANGUAGE ARTS

LAFS.4.RI.1.3, LAFS.4.RI.3.7,  
LAFS.4.SL.1.1, LAFS.4.SL.1.3,  
LAFS.4.SL.2.4

LAFS.5.RL.2.6, LAFS.5.RI.2.6,  
LAFS.5.W.3.8, LAFS.5.SL.1.1

# LESSON TARGETS

- I can identify sources of marine debris.
- I can describe the potential effects of plastic waste on aquatic wildlife and habitat, specifically the coastal shorelines of Jupiter, Florida.
- I can determine specific actions citizens can take to help remedy the problem of marine debris.



## TEACHER MATERIALS

- [Reservoir Station Signs](#)
- 11 dice
- 11 different rubber stamps and ink pads or [Stamp Templates](#) and glue sticks
- [Passport Worksheets](#) – One for each student
- Set up stations around the classroom (or outside). Each station will need a reservoir sign, a die, plus either an inkpad and rubber stamp, or stamps and a glue stick.

## STUDENT MATERIALS

- Pencil
- Paper
- Clipboard
- Passport worksheet

## DIFFERENTIATION STRATEGIES

- Working in a group setting to explain vocabulary
- Use of open-ended questions
- Relate topic to their everyday life
- Hands-on instruction
- Use of visuals
- Modification of text or curriculum

# ENGAGE

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## PRE-VISIT LESSON - Complete before visiting the River Center

Question 1: How does trash and plastic litter get into the ocean and onto the beach?

1. Rainwater washes plastic into streams where it is then carried out to sea.
2. Tides carry trash off the beach into the ocean and carries marine debris from the ocean onto the beach.
3. Storm drains and sewage overflows into local waterways.
4. Boats such as fishing boats, cargo ships, cruise line ships, and oil platforms leave trash, equipment, nets, and other debris behind.
5. Waste that escapes from the landfill process.
6. Industrial oil spills and large human catastrophes.
7. Natural Disasters.

Question 2: Why is trash and plastic litter harmful to wildlife?

1. It is harmful to wildlife because of the potential for entanglement and ingestion.
2. The highest number of animals harmed are sea birds and sea turtles.

Question 3: Why is trash and plastic litter harmful to humans?

1. Humans can be cut from trash and plastic litter on the beach and in the ocean.
2. Humans can become sick from bacteria.
3. Humans can become sick from contaminated plastic waste.

Question 4: What are some challenges with trash and plastic litter that get into the ocean and onto the beach?

1. There is a challenge to remove these tiny fragments without harming wildlife.
2. Litter is found throughout the water column. Even when it is not visible on the water's surface, it can be found farther down.
3. It is concentrated in large, circular ocean currents known as gyres (ex. Great Pacific Garbage Patch).
4. Future generations will only see a reduction in marine debris if all countries and organizations collaborate together to both prevent and clean up plastics.



# EXPLORE

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## VISIT TO THE RIVER CENTER

1. Welcome, introduction to the Loxahatchee River District, overview of today's field trip, and safety/rules talk
2. Divide the students into 2 groups to rotate through 3 different activities
  - a. Lovin' the Loxahatchee River Tour – focusing on habitats, human impacts on these habitats, habitat destruction and restoration
  - b. Ocean Current and Plastic Voyages hands-on activity (See below)
  - c. Water resources discussion
    - i. Where does our water come from?
    - ii. How we use water in our everyday lives?
    - iii. Where it goes once it flows down the drain?
    - iv. What is the process of wastewater treatment?
    - v. How can I help? Water conservation
3. Touch tank demonstration

# EXPLAIN

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## Completed at the River Center

Have student name some common items that are made out of plastic. Talk about marine debris and litter that is washed onto our beaches. Discuss ways in which plastic can become ocean trash. How did the plastic they have at home end up in the ocean or another body of water? How could they keep plastic from becoming aquatic debris? Discuss ways plastics might negatively affect aquatic animals if they are not disposed of properly.

Students will work together as teams to collect as much trash off their beach (sand container) as they can. After the first round, have the students sort the trash they were able to collect on the table and review what the different items represent. What did they notice when they were collecting the trash? What was the easiest way to get the trash? What were the easiest and hardest items to collect? Was there trash buried that you did not see?

We cannot rake the beach with large-scale machines because of sea turtles, the wrackline, shorebirds, and dune plants that are protected. Students will try again, but this time they will use only trash grabbers (clothes pins) which is more realistic. Did they recover all the items? If not, why? What obstacles did they face? Can you suggest more efficient ways to recover the items from the sand?

Plastics can be distributed throughout the water column. Ask the students how they would collect the items from an aquatic environment. How would it be different than the sand? What obstacles might they face? How would they remove small plastic pieces from the deepest parts of the ocean? How would they remove plastic without disturbing marine wildlife?

# ELABORATE

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## **POST-VISIT LESSON - Completed at the River if time allows OR complete in the classroom after the field trip.**

Students will brainstorm what can be done to keep plastics out of the ocean and freshwater environments and ways to reduce, reuse, recycle, rethink, and respect. Students will create a solution to the pollution. They can invent something that cleans up trash on the beach, in the rivers, the ocean, or their community. Older students can label and write about their inventions.

1. Have students design their inventions on paper including materials needed, concept ideas, purpose, and models.
2. Students will build a prototype of their designs. Students can use a variety of materials such as recycled items, Legos, Playdough, computer renderings, etc.
3. Have the students present their inventions to the other teams in the class. Facilitate a student led discussion on potential challenges, questions, thoughts, ideas, suggestions to help each team improve on their design and see it from another's perspective.

# EVALUATE

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## **POST-VISIT**

1. Participation in the activity.
2. Write about your experiences at the Loxahatchee River Center.
3. Grade assessment and participation of the pre and post activities described in the Engage and Elaborate sections.

# STEM CONNECTIONS

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## Creating STEM Connections

**Science** - See standards listed above.

### Technology

Have the students do some more research on marine debris and plastic pollution. Once they have completed their research they will get in the same groups and revise their design. Once their design is complete they can make a PSA using the following suggestions:

1. Skit
2. iMovie
3. Poster
4. Commercial

### Engineering

1. There are several different countries, companies, non-governmental organizations, and individuals that are developing and creating ways to clean up the ocean. Research technology is being designed and used today to help clean the oceans.
2. Review the engineering, design, and physics on how these different concepts and inventions would work cleaning up the oceans or not.
3. Find one and design a model.

**Mathematics** - See standards listed above.

# LOXAHATCHEE RIVER DISTRICT

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## FOCUS AREA CONNECTIONS



### SOLID WASTE

Ocean currents can move marine debris long distances as well as locally. For these reasons we may see garbage on our beaches from local sources as well as from other states or countries.



### STORMWATER

Stormwater can wash garbage from our yards and streets into stormwater drainage pipes. These pipes lead directly to the Loxahatchee River. This is how local land sources contribute directly to the solid waste pollution in our community.



### WATER SUPPLY

As plastics begin to breakdown, they can become suspended in the water as “microplastics” that cannot be seen by the naked eye. These microplastics have the potential to invade our water supply through lakes and rivers.



## WASTEWATER

Plastic objects that are flushed or washed down drains can end up in the wastewater treatment facility as well as microplastics.

# RIVER CENTER EXHIBITS

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## Connecting the tour and the activity



### WILD AND SCENIC

Humans live around the river and there are loads of houses built right alongside forks of the river that are not designated as Wild & Scenic. This can pose threats to the river and its wildlife. Lawn chemicals can runoff into the river during rainstorms and heavy winds can blow trash into the river. All these pollutants have negative impacts on wildlife. Managing our solid wastes is important so that it doesn't end up where it isn't supposed to be.



### ESTUARY

One of the most unique creatures of the estuary is the oyster. Oysters are slow growing shelled creatures that cannot move; they are permanently fixed to the one spot where they started to grow. So how do they catch food if they cannot move? Oysters are called filter feeders, they use their gills to suck in water, and their microscopic food- plankton! If the oysters are filtering their food from the water what else do you think they are doing to the water? Cleaning it! Oysters keep the water in the estuary clean, which is beneficial to all the baby/juvenile fish and other creatures living there. One issue that oysters can face, however, is disease caused by pollution, in particular, micro-plastics. These are plastics that have broken down to the microscopic level and are filtered out of the water and into the tissues of the oyster. If the oyster has these microplastics in its tissues, what do you think happens when their predators eat them (racoons, birds, crabs, fish, etc.)? Those predators can also have microplastics build up in their tissues. We call this bioaccumulation (oysters) and biomagnification (predators).



### DOCK PILING

Here at the Dock Piling, there is increased human contact and therefore more chance for point and non-point sources of pollution in the water. An example of point source pollution would be plastic trash blowing out of boats and into the water, where non-point source pollution would be stormwater runoff picking up plastic debris and entering the water from communities living along the shoreline. For humans, we can help minimize the risk of environmental pollution by changing how we manage our waste. By using trash cans with latching lids, we can minimize the amount of extra plastic waste blowing into the watershed, and by reducing the amount of single use plastic in our daily lives we can diminish the plastic pollution problem our ecosystems face. It is important to have clean water in the estuary. We want clean water going out to the ocean and coming into the estuary!

## ○ CORAL REEF

There is no plastic pollution on our Coral Reef here, but could you imagine all the ways this habitat can be negatively impacted by pollution? Fishing line could wrap around the fan corals and restrict them from growing; fish would try to eat plastic bags getting plastic stuck in their mouth or gills; floating plastic waste could congregate and block the sunlight from corals, plankton, and seagrasses forcing them to starve. We don't want any of those things to happen, and the good news is there are many ways humans can help! By storing our trash in containers with lids, limiting single use plastics, reusing plastic products, and recycling properly we can reduce pollution in our waterways. We can also further help by implementing oyster reef restoration, and creation/instillation of artificial reefs in areas where coral is no longer growing. By lending a hand to nature we preserve habitats, and the creatures that call them home, for ourselves and future generations!



# POST FIELD TRIP LESSON

Thank you for participating in a field trip at the River Center. We hope your students enjoyed their experience learning about the Loxahatchee River ecosystems as well as the different hands-on activities and animal encounters.

We are always looking for feedback and ways to improve our programs at the River Center. Please take a couple of minutes to complete the River Center's field trip survey. We would really appreciate it!

<https://www.surveymonkey.com/r/RCSchoolSurvey>

*Attended a Virtual Field Trip? Use this survey:* <https://www.surveymonkey.com/r/rcvirtual>

***Please refer to the 5E lesson plan and the "Elaborate" section as a post-lesson activity.*** This is for you to utilize back in the classroom as a continuation of your experience at the River Center. They are an educational, fun, and creative way to gain more knowledge.

We appreciate your support and interest in the River Center and our programs. Please contact us with any questions or concerns. We look forward to seeing you and your students at the River Center in the future!

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Explore | Experience | Connect