



## Activity Overview

Grades: 4<sup>th</sup> – 9<sup>th</sup>

### ESTIMATED TIME:

**Preparation:** 10 Minutes

**Delivery:** 60 minutes

This lesson is designed to give students a background on invasive species and the potential threats they pose to Florida's native species and habitats. Specifically, students will learn about lionfish biology and life history to better understand a successful invasive species and their negative impacts. Presentation slides, a video dissection, and interactive activities will help students gain a general understanding of fish biology and learn some ways in which they can help combat the negative effects of this invasive species.

### KEY QUESTION:

Can you describe the characteristics that make lionfish such a successful invader?

### SKILL OBJECTIVES:

1. Identify the reproductive traits that help lionfish invade and expand their range.
2. Identify how lionfish were introduced to their invaded range. Identify other pathways that might introduce other invasive species.
3. Name two ways in which you can help protect Florida's native ecosystems and combat the lionfish invasion.

### MATERIALS LIST AND STUDENT HANDOUTS:

- Computer and projector with video capability
- One large ball of yarn (any color)
- Beach ball or similar inflatable ball
- Printed Species Index Cards
- 4-6 cones, two sets of colored pennies for number of students, 12 bandanas

### CONSERVATION FOCUS:

The primary goal of the Classroom Invasion activity is to educate students about the effects invasive species, such as lionfish, can have on a native ecosystem and the traits that allow invaders to be so successful. Students will learn ways they can help by encouraging the removal and consumption of lionfish and by preventing future introductions by not releasing pets into the wild.

The topics below will be introduced and continually reinforced throughout the activity.

### ***Conservation Literacy***

1. Invasive species can disrupt complex, natural food webs and create long-lasting damage to native species and habitats.
2. Invasive species are introduced to new ecosystems through various human activities, but humans can help minimize the negative impacts of invasive species.



## Conservation Stewardship

During and after the lesson keep in mind:

1. Students can see how the physical traits of lionfish allow them to successfully invade new habitats.
2. Invasive species can disrupt the native food web and ecosystem balance.

## Core Concepts

1. Natural ecosystems are in balance. Human interactions with the environment, whether intentional or unintentional, can have significant impacts on an ecosystem.

## SAFETY MESSAGES:

The following safety messages will be reinforced throughout the activity:

1. Use caution when running during activities to avoid falling or running into other students.



## Vocabulary

Grades 4<sup>th</sup> – 9<sup>th</sup>:

**Non-native:** A species in a habitat outside its natural range

**Invasive:** A species in a habitat outside its natural range that causes negative impacts to humans and/or ecosystem

**Venom:** A defensive toxin housed in a gland or tissue; must be injected into prey

**Control:** To limit or reduce the negative impacts (of an invasive species)

**Marine:** Related to salt water

**Established:** A species that can survive and reproduce normally in a new habitat

**Gape:** Opening of the mouth

**Swim Bladder:** Organ that regulates buoyancy in water column

**Gonad:** Reproductive organs

**Opportunistic:** Able to adapt to a variety of conditions and increase species' distribution

**Generalist:** Capable of living in a wide variety of habitats and using a variety of resources

**Producer:** Makes energy internally through photosynthesis or chemosynthesis

**Consumer:** Obtains energy by feeding on other organisms

**Trophic level:** Position in food chain or pyramid



## PROCEDURE

### **PART 1: Prep & Set-up – 10 minutes**

- Print Lionfish Invasion Worksheets and Species Index Activity cards
- Set-up Invasion! Activity cones to mark “safe zones” for game.

### **PART 2: Presentation – 30 minutes**

Have worksheets distributed for students so they can follow along during the presentation and fill out answers.

Instructor will give presentation or play video of presentation on lionfish biology and the invasion. A script for the presentation slides is found in the Teacher Notes document. This will cover basic life history of lionfish, their introduction to the invaded area, negative impacts, and efforts to combat lionfish. If students are already knowledgeable then instructor will review key points.

Play video of lionfish dissection, which will provide detailed information on anatomy and behavior of lionfish.

### **PART 3: Activities – 30 Minutes**

Food Web Activity (refer to activity guide):

1. Gather materials for activity: yarn, Species Index Cards, inflatable beach balls or kickballs
2. Provide background information on food webs to students. Food chains are simple interactions between producers and consumers (i.e. dandelion is consumed by rabbit, which is consumed by coyote). Food webs are complex

with multiple cross-interactions between levels (i.e. multiple consumers consume a producer and apex predators prey on multiple lower-level consumers).

3. Trophic levels are made up of multiple layers: Primary Producers (i.e. corals), Primary Consumers (i.e. shrimp, wrasses), Secondary and Tertiary Consumers (i.e. mullet, hogfish, red drum), and Apex Consumers (predators like sharks). These levels are in delicate balance and have many crisscrossing interactions. This creates the food web and provides a diverse system that can manage pressures like fishing, disease, and natural disasters. Losses or overabundances in any level of a food web creates weaknesses throughout the system and risks its collapse.
4. Distribute Species Index Cards randomly to students. Explain the interactions

#### *Safety Rules for Lionfish Activities*

1. *Remind students to be careful of running into other students while participating in activities.*
2. *Make sure area for activity is in a safe location, away from traffic and any environmental hazards, if outdoors.*

between these different species using the chart from the Activity Outline.

5. Organize students into a circle and explain how each interacts with multiple other species. For each



interaction, such as how zooplankton eat phytoplankton but are consumed by clams, have students hold an end of the yarn. As you pass the yarn between students with different species cards, this will make a fairly complex web.

6. Explain how this web creates protection from pressures such as fishing or disease for the organisms in the food web. You can symbolize this pressure by tossing one or two inflatable balls onto the web (it should support them).
7. However, invasive species affect multiple levels of a food web and can cause significant damage or even collapse of the system. Demonstrate this by talking about the different species that lionfish prey on. As you point out each species, have the student drop their end of the yarn to symbolize that lionfish significantly reduced or eliminated their population. Eventually, the web will fall apart and it won't be able to support the ball(s).

Invasion! Activity (refer to activity guide):

1. Gather materials for activity: Species Cards, colored pennies or jerseys, flags or bandanas (half the number of students), 4-6 cones for "safe-zones."
2. Provide background information on how invasive species affect ecosystems in several ways: preying directly on native species, damaging or competing for habitat space, spreading pathogens, and competing for prey or habitat with native species. Invasive species, like lionfish, can affect an ecosystem through one or several of these impacts.
3. Mesopredators and even apex predators are affected by competition with lionfish over habitat space and prey. This often changes predator behavior as they relocate or change target species to avoid competition with lionfish. This activity will show how grouper have to balance typical pressures like avoiding predators, finding habitat, and capturing prey while competing with lionfish for these resources. Lionfish do not have to worry about predators in the invaded range and can devote more energy to finding habitat and capturing prey.
4. Choose an outdoor or large gym space to create "safe-zones" with cones. Assign students teams using Species Cards and use jerseys or pennies to indicate teams. Distribute flags throughout activity area outside the "safe-zones." Explain that Groupers can be tagged by sharks but lionfish cannot. Both Groupers and Lionfish want to gather food (flags) to bring back to "safe-zones." Tagged players switch teams until one team fails to gather food or all are tagged.
5. Ask students if it was more difficult to be on the Grouper team than the Lionfish team. Explain how this is true in real ecosystems as the additional pressure of competition with lionfish significantly affects native predators. This is true for a variety of mesopredators and apex predators; ask students to list some other examples and how that might affect an entire ecosystem.



## **PART 6: Continuing Education – 5 minutes**

The instructor can tell the students to visit [MyFWC.com/Lionfish](http://MyFWC.com/Lionfish) and the [FWCReefRangers.com](http://FWCReefRangers.com) website for general information, events, and programs about lionfish. Attending a local lionfish event and encouraging friends and family to eat lionfish are great ways to combat the lionfish invasion.

### **Accommodations and Modifications**

The vocabulary list and steps of the dissection can be adjusted to suit older or younger students. If time is limited, focus on the internal anatomy and prey item identification.

Instructors can add additional steps such as using a graduated cylinder to measure the volume of interstitial fat deposits of lionfish for more advanced students.

Exceptional Student accommodations can be made for all students to learn, explore and enjoy the lionfish dissection activity.

## **STEAM CONNECTIONS**

S – Observations and explorations of nature are all science based inquires

T – The use of small magnifying boxes to capture and observe arthropods.

E – The topography of the trail has changes in elevation, swamp bottom to upland forest. Study what causes these changes such as erosion, uprooted trees, etc.

A – Collect leaves along the trail and once back in the classroom make a collage with all the leaves collected.

M – Make a chart to show how much habitat each animal needs, and how their habitat can be affected by human encroaching on their habitat.



## FLORIDA STATE STANDARDS

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### 4<sup>th</sup> Grade

- SC.4.L.17: Recognize how plants and animals interact with and depend on each other and their environment to satisfy their basic needs

### 5<sup>th</sup> Grade

- SC.5.L.17.1: Recognize how plants and animals interact with and depend on each other and their environment to satisfy their basic needs

### 6<sup>th</sup> Grade

- SC.6.L.14.3: Explain how all living things share certain characteristics and require various physiological functions for life

### 7<sup>th</sup> Grade

- SC.7.L.16.1: Recognize that reproduction is characteristic of living things and is essential for the survival of species.
- SC.7.L.17.1: Recognize ways plants and animals, including humans, can impact the environment.
- SC.7.L.17.2: Compare relationships between organisms such as predation, mutualism, parasitism, competition, and commensalism.

### 8<sup>th</sup> Grade

- SC.8.N.4.1: Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international

### 9<sup>th</sup> Grade

- SC.912.L.17.8: Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species
- SC.912.L.17.9: Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy through trophic levels



## SUPPLEMENTAL MATERIAL

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- [Lionfish PowerPoint Presentation](#)
- [Presentation Notes for Teachers](#)
- [Lionfish Presentation Worksheet](#)
- [Lionfish Food Web Lesson Plan](#)
- [Invasion! Activity Guide](#)
- [Lionfish Presentation Video](#)
- [Lionfish Dissection Video](#)
- [Species Index Cards for Ecosystem Activity](#)
- [FWC Lionfish Brochure](#)