



# Ecosystem Engineers Lesson Plan

*Lesson adapted from "Aquatic Wild K-12 Curriculum & Activity Guide"*

**Age Group: Any**

**Time Frame: 20-30 minutes**

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## **Overview:**

An animal's ecosystem is a complicated and ever-changing community that directly impacts the animal's survival. Within its ecosystem, an animal must find resources essential to live. Such essential resources include food, water, shelter, appropriate social groupings, space, and air. When we develop an environment for an animal here at Marineland, everything that an animal needs to ensure its well-being must be considered. Due to the great variation in needs among different animal species, animal habitats in zoos and aquariums must be similarly varied. To examine the complexity of designing a habitat that successfully supports a healthy animal, students will design a habitat for one of the species at Marineland.

## **Objectives:**

- Students will identify the resources critical to an organism's survival
  - Students will be able to define the terms "habitat", "ecosystem", "niche", "zoo", and "aquarium"
  - Students will understand the intimate relationship between an animal's physiology and habitat
  - Students will interpret the considerations involved in housing animals in a zoological community
  - Students will have the opportunity to practice research methods
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## **Materials:**

- |                                                                |                      |
|----------------------------------------------------------------|----------------------|
| • Index cards                                                  | • Toothpicks         |
| • Research materials (books, kid-friendly articles, magazines) | • Plastic containers |
| • Writing materials                                            | • Yarn/string        |
| • Paper                                                        | • Tape               |
| • Legos                                                        | • Modeling clay      |
| • Popsicle sticks                                              | • Animal figurines   |
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## **Background:**

The physical environment is central to an organism's survival. At the most basic level, all living organisms require food, water, space, air and shelter. However, the required quantity and composition of such resources vary significantly amongst animal species. Each habitat provides animal species with the unique resources required for the population to survive. For example, a leatherback sea turtle may consume up to their body weight in jellyfish per day. Thus, leatherback populations most commonly inhabit deep, offshore waters that also breed large jellyfish blooms. However, the Eastern gray squirrel feeds primarily on a variety of nuts and seeds and must inhabit a forest habitat. In the case of wild-type habitats, the ability for the environment to support an organism's niche is critical to population survival.

The habitats developed in zoos and aquaria focus upon animal comfort. The basic resources required for comfortable survival can be easily provided in a zoological setting, but the methods of delivering such resources become complex when introduced in an aquarium. Water, the most critical component of an aquatic habitat, is complicated by the need to maintain proper temperature, salinity, pH, dissolved oxygen, and algal growth (Council for Environmental Education, 2016). Further, accommodations must be made to provide a body of water dynamic enough to support the physical requirements of each animal. While some species of fish thrive best in moving currents, other species survive best in static water. Deep divers require an abyssal habitat, while coastal species may prefer a shallow, rocky bottom. Incredible attention to an animal's natural needs and comfort must be given when creating zoological environments.

The vast diversity of adaptations seen across animal species is remarkable. Consequently, no two animal habitats are exactly the same. As international interest in aquaculture, mariculture, and the zoological community grows, research regarding animal needs are essential to identifying the components that define a successful habitat (Council for Environmental Education, 2016). Research conducted in natural streams, rivers, lakes, and the ocean are providing the keys that unlock the secrets to the successful design of animal habitats in zoological institutions.



## **Lesson:**

1. Prepare index cards labeled with one of the following animal species: Atlantic bottlenose dolphins, loggerhead sea turtle, Kemp's Ridley sea turtle, sand tiger shark, common octopus, lionfish, giant hermit crab, yellow spotted stingray, green moray eel, diamondback terrapin.
2. Blindly draw one card from a container.
3. Engineer an artificial habitat in which the animal written on the selected index card could comfortably survive. Remember to engage in literary research and to consult reference materials for key background information pertinent to their selected animal's natural environment, biology, and behaviors (Use the attached worksheet to help guide the research).
4. Upon completion of research, design and build a replica zoo exhibit or habitat for their animal. Establish a scale for habitats, such as 1in = 5 ft.
5. Using the materials and information gathered during the research period, construct a habitat that is reflective of the animal's natural environment, physical needs, and common behaviors.
6. Describe the physical components of the design (ex. habitat size, pool depth...), and include how the model meets the basic needs of the animal.
7. Reflect upon the components of habitat that were necessary for the survival of the animals. Responses should include components such as: food, shelter, water, space, air.

## **Discussion questions:**

- What resources are fundamental to life?
- How do the basic needs of each animal vary from one another? How do their designed habitats reflect this variation?
- Compare the student's models to the actual habitats at Marineland. How do the habitats at Marineland meet the basic needs of the animals? What similarities exist between students' models and Marineland's habitats?



## Know before you go!

***Before you begin building the habitat, answer the following questions. The more you know about the animal, the easier it will be for you to build a proper habitat!***

The animal that will live in this habitat is: \_\_\_\_\_

***Circle the option that best describes your animal.***

|                                                                                          |            |           |          |
|------------------------------------------------------------------------------------------|------------|-----------|----------|
| Will the animal grow to be large, medium, or small?                                      | Large      | Medium    | Small    |
| Does the animal live in water, on land, or does it spend time in both water and on land? | Water only | Land only | Both     |
| Does the animal breathe air or breathe in water?                                         | Air        | Water     |          |
| Does the animal travel long distances?                                                   | Yes        | No        |          |
| Do individuals live in groups, or by itself?                                             | In groups  | By itself |          |
| Is the animal active, or does it like to rest in one place?                              | Active     | Rest      |          |
| What climate does the animal live in?                                                    | Warm       | Cool      |          |
| Is the animal an herbivore, carnivore, or omnivore?                                      | Herbivore  | Carnivore | Omnivore |
| Does the animal have a form of camouflage?                                               | Yes        | No        |          |
| Does the animal like to hide or be out in the open?                                      | Hide       | Open      | Both     |
| Is it an invasive species?                                                               | Yes        | No        |          |
| Does the animal shed/molt?                                                               | Yes        | No        |          |
| Extra notes:                                                                             |            |           |          |

Worksheet adapted for K-5



## Know before you go!

***Before you begin building the habitat, answer the following questions. The more you know about the animal, the easier it will be for you to build a proper habitat!***

**Animal:** \_\_\_\_\_

***Circle the option that best describes your animal.***

|                                                        |                                                                                                       |
|--------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Will the animal grow to be large, medium, or small?    | Large      Medium      Small                                                                          |
| Is the animal terrestrial, marine, or semi-aquatic?    | Terrestrial    Marine    Semi-aquatic                                                                 |
| What biome does the animal live in?                    | Freshwater    Marine    Desert    Forest<br>Grassland      Tundra                                     |
| What climate does the animal live in?                  | Polar    Temperate    Arid    Damp tropical    Mild<br>Mediterranean      Cold tundra                 |
| From where does the animal get its oxygen?             | Air      Water                                                                                        |
| Does the animal migrate long distances?                | Yes      No                                                                                           |
| Does the animal exhibit any form of camouflage?        | Yes      No<br><br><i>If yes, what form:</i><br>Countershading    Mimicry    Disruptive<br>coloration |
| Is the animal social or solitary?                      | Social      Solitary                                                                                  |
| Is the animal active, or does it prefer to be at rest? | Active      Rest                                                                                      |
| Is the animal an herbivore, carnivore, omnivore?       | Herbivore    Carnivore    Omnivore                                                                    |
| Does the animal prefer hide, or to be out in the open? | Hide      Open      Both                                                                              |
| Is the animal an invasive species?                     | Yes      No                                                                                           |
| Does the animal shed/molt?                             | Yes      No                                                                                           |
| Extra notes:                                           |                                                                                                       |

Worksheet adapted for 6-12