



Student Page and Worksheet

Team Name: _____

You are bio-engineers and you have been hired to create a realistic, but fictitious creature (or "beast") for a movie set in the Everglades. You will be given one Everglades ecosystem that will be the center stage of the movie. Your new species must have at least three adaptations that allow it to survive in that particular ecosystem.

The Engineering Process

Engineers start by having a good idea about what they want to accomplish. They ask critical questions about what they want to create, whether it is a skyscraper, an amusement park ride, a bicycle or a smartphone. They ask questions like: What is the problem to solve? What do we want to design? Who is it for? What do we want to accomplish? What are the project requirements? What are the limitations? What is our goal?

As bio-engineers, you will need to follow these steps:

Step 1: Define the Need and Constraints

In this case, your client has set the **NEED**: a new species that could live in a particular Everglades ecosystem, and you must include the following **CONSTRAINTS**:

- Adaptations: Be adapted to live in one of the Everglades ecosystems, with at least three features (adaptations) that allow it to thrive there.
- Size: It can be any size, but keep in mind the size of the ecosystem it must live in. Suggested size range is from .5 cm to 10 m.
- Food source: Must be available in the ecosystem. What abiotic or biotic factors will influence its ability to find food?
- Protection: Must be able to protect itself from biotic factors, such as predators and abiotic environmental factors in the ecosystem.
- Shelter: The creature must be able to find natural shelter within the ecosystem. What abiotic or biotic factors would influence its ability to find shelter?
- Terrifying Threat: The creature must have a feature that poses a "terrifying threat" to your ecosystem (Why would the movie hero need to save the world from this new creature?).

Step 2: Research the Problem

Engineers do a lot of research to figure out their designs. Research your ecosystem to find out what features of that ecosystem are important for the survival of your new species or might hinder its survival. Also, think about how your new creature could pose a terrifying threat to that ecosystem. What features of the ecosystem could your creature influence?

EVERGLADES CURRICULUM

Adaptations in Everglades Ecosystems - Lesson 2



RESEARCH WORKSHEET

Type of Ecosystem: _____ Team Name: _____

Abiotic and Biotic Factors to Consider

Water Level: Is it wet or dry? Or both, depending on time of the year? What is a typical weather pattern and the climate in your ecosystem?

Typical Elevation: Is it generally higher ground or lower? Does it vary within the ecosystem or seasonally or is it all the same? (Hint: wetter ecosystems tend to be lower ground while dry ones are on higher ground.)

Food Source: What plants and/or animals live in the ecosystem that your new species could use as a food source? Will your species have multiple food sources or just one? Will it be a herbivore, carnivore, or an omnivore?

Water: Where will your creature find water? (Note: in dry ecosystems some animals get their water from their food source.)

Protection: What features would your creature have to protect itself from both abiotic conditions and biotic factors such as other inhabitants of the ecosystems? Threats could be from other animals or from ecosystem conditions such as sharp sawgrass, varying water levels, dense vegetation, etc.

EVERGLADES CURRICULUM

Adaptations in Everglades Ecosystems - Lesson 2



Shelter: Where in the ecosystem might your creature be able to find shelter? What are the abiotic and biotic features of the ecosystem that could house it, or could provide materials for the creature to build a shelter?

Generalist or Specialist: Do you think your new species should be a generalist or specialist? Why?

Food Source: What plants and/or animals live in the ecosystem that your new species could use as a food source? Will your species have multiple food sources or just one? Will it be a herbivore, carnivore, or an omnivore?

Keystone Species: Would you characterize your new species as a keystone species? Why or why not?

Terrifying Threat: What feature(s) of your ecosystem could be negatively affected by your beast? What features of your beast could potentially cause a disruption or collapse of the ecosystem?

Step 3: Develop Possible Solutions

Engineers work as a team to brainstorm ideas and create as many solutions as possible. Use the information from your research to think of possible design solutions for your creature. Work with your team to develop as many solutions as possible. This is the time to encourage all ideas, defer judgment, and build on the ideas of others! Stay focused on your task, and have one conversation at a time. Remember, good design is all about teamwork!

List your possible design ideas here:

Step 4: Select a Solution

This is the hardest step! Revisit the needs, constraints, and research from the earlier steps. Compare your ideas, select the best solution for your beast design, and make a plan to move forward with it. Optimize your final design by trading off less important features for those that are more important.

Remember to address the following in your design:

- Adaptations: What adaptations will your new species have that allow it to thrive in its ecosystem? (Remember, you need at least 3)
- Size: How big is it? (Size range from .5 cm to 10 m)
- Food Source: What does it eat? Is that food source available in its ecosystem? Is it plentiful?
- Protection: How will your creature protect itself? And from what?
- Shelter: Where will it find shelter?
- Specialist or Generalist? Keystone Species?
- Terrifying Threat: What is the terrifying threat the creature poses to the ecosystem?

Sketch Your "Perfect Beast"

In the space below, sketch your "Perfect Beast." Be sure to label its key adaptations and give your animal a distinctive name that might suggest something about its appearance, where it lives, what it eats, etc.

Step 5: Build a Prototype

Building a prototype helps make your ideas real! It will help your team verify whether the design meets the original challenge objectives. Push yourself for creativity, imagination, and excellence in design. Use play dough/modeling clay to make a scale model of your new animal species.

Scale: For example, if your animal is 10 meters in length in real life and your model is 10 cm, then your scale is 1 cm = 1 m.

What is the scale of your model? _____

Step 6: Presentation

Your team must “pitch” your design of the “Perfect Beast” to your client. Be ready to present your design to your teacher and the other class teams. Be prepared to defend why your design should be included in the movie. Be sure to:

- Describe the abiotic and biotic factors of the ecosystem you were designing for.
- What is the name of your new species?
- How big is your creature and what scale did you use for your prototype?
- What does it eat? Is it a herbivore, carnivore, or an omnivore?
- What are your creature’s predators and how will it protect itself?
- Where will it find shelter?
- What are the distinct adaptations your creature has that allow it to thrive in the ecosystem?
- Why do these adaptations help the creature survive?
- What features did your team brainstorm that you didn’t use in your design? What trade-offs did you have to make?
- What is your creature’s terrifying threat? How does this pose a threat to the ecosystem?

Use the Rubric below as a guide for your presentation.

CRITERIA	2	1	0
Abiotic and Biotic Factors of the Ecosystem	Included numerous abiotic and biotic factors of the ecosystem	Included a few abiotic and biotic factors of the ecosystem	Did not include abiotic and biotic factors of the ecosystem
Beast Description & Characteristics	Matches several characteristics of the assigned ecosystems and provides evidence	Matches characteristics of the assigned ecosystem but doesn't provide evidence	Does not match characteristics of the assigned ecosystem OR provide evidence
Beast Adaptations	Provides examples of several adaptations and provides evidence	Provides examples of several adaptations but doesn't provide evidence	Does not provide examples of several adaptations or provide evidence
Beast "Trade Offs"	Provides at least one example of a trait or behavior that their beast does not have and provides a rationale for why they did not select those traits or behaviors for their beast	Provides at least one example of a trait or behavior that their beast does not have but does not provide a rationale for why they did not select those traits or behaviors for their beast	Does not provide any examples of a trait or behavior that their beast does not have nor provide a rationale for why they did not select those traits or behaviors for their beast
Language Use & Delivery	Uses correct words in context; Speaks clearly; Makes eye contact	Uses most words correctly in context; Speaks fairly clearly; Makes intermittent eye contact	Uses numerous words incorrectly; Does not speak clearly; Does not make eye contact
PowerPoint Clarity	Uses concise clear language; Uses bullet points to summarize; Slides are readable	Uses most words correctly in context; Speaks fairly clearly; Makes intermittent eye contact	Uses language that is too wordy; Does not use bullet points; Slides are difficult to read
Creativity	Design is original and not like any existing creatures; Name of creature is very descriptive	Design is original but has many similarities to existing creatures; Name of creature is good	Design is not original having numerous traits of existing creatures; Name of creature is not descriptive of the creature
Group Participation	All students in the group participate	Most of the students participate	Only one group member participates