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Coastal Ecosystem Services Jenga

OVERVIEW

Learning Objective and Key Concepts: Ecosystem Service Jenga is an interactive game that demonstrates the relationship between the physical, biological, and human systems as well as the potential impacts of human and non-human stressors. The Jenga represents a socio-ecological system, where humans can have an influence in the environment. The Jenga pieces will demonstrate ecosystems "supporting" various coastal living creatures and activities, in addition to providing habitat. Playing cards will portray several scenarios where coastal environments will be lost or degraded, thus destabilizing the ecosystem. Options for restoration can be provided to "reinstate" some of the lost habitat and associated ecosystem services.

MATERIALS

- **1 set of painted Jenga blocks**
  - 15 blue (bay habitat)
  - 15 green (wetland habitat)
  - 6 yellow (macro fauna and fish that depend on bay and wetland habitat)
  - 9 red (species that depend on macros fauna and fish)
  - 9 grey (built environment and people)
- **1 stack of playing cards**
- **Vocabulary list and discussion questions**

GAME SET-UP

Cut out each playing card. You can create more ecosystem service scenarios that relate to the key concepts that you want players to learn. Arrange the tower as shown: Place blue blocks on the bottom, followed by the green, yellow, red, and finally the grey. The different colored blocks represent various animals found in different trophic levels of the food web in an estuary as follows:

Grey- Social system, including the built environments, people, communities, and economies that depend on and benefit from the estuary and coastal habitats.

Red- Upper-level predators such as birds, raccoons, and humans that depend on healthy communities of lower-level predators and detritus feeders.

Yellow- Detritus feeders and low-level predators such as shrimp, crabs, fish that inhabit estuarine and wetland ecosystems.

Green – Coastal wetlands are lands that are occasionally flooded within a coastal watershed. There is a diverse set of coastal wetlands that contribute to flood protection and erosion control; provide habitat for many species; improve water quality; and enable recreational opportunities for people.

Blue- Open water estuarine environments. Estuaries are considered some of the most productive ecosystems in the world, many species rely on these habitats for food, habitat, and migration.

GAME SET-UP

1. The first player selects a card, reads it aloud and follows the instructions written on the card. Only the block being removed or returned may be touched.
2. Put the used card in the discard pile.
3. Place removed blocks into a discard pile off to the side.
4. Continue to remove blocks until the tower falls and the socio-ecological system becomes destabilized and collapses, or until all the cards are used up.
5. Reset to play again.

DISCUSSION QUESTIONS:

1. What surprised you in playing this game?
2. What did you discover about human influences on the environment?
3. What questions would you like to investigate further?

VOCABULARY:

Socio-ecological system – The concept/idea that people, communities, and economies are an active part of the natural environment. Humans influence changes in the environment and similarly, are impacted by changes in the environment.

Ecosystem services – The amenities that ecosystems produce which are important for human health, security, recreation, and comfort. Coastal ecosystems provide access to food (seafood and crops), the opportunity to learn from and enjoy coastal environments, clean air and water, recreation opportunities, and other that contribute to physical and economic security.

Estuary – Bodies of water along the coast, usually found where rivers meet the sea creating a unique habitat of brackish water, which is a mix of fresh water flowing from upland areas and salty water from the marine environment.

Coastal wetland – The transition zone between open water and dry upland environments. These serve to improve water quality, and are a nursery habitat for many fish, crabs, and other shellfish and wildlife.

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Climate change has resulted in changes to water flow into the bay, increasing bay temperature, which makes the water saltier and more acidic. These changes in water quality affect the shelled organisms such as oysters and crabs.

Remove 1 ***Blue*** block and one ***Yellow*** block

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During a rainstorm, excess fertilizer used on lawns, farms, and golf courses run off into the estuary. The fertilizer creates an algal bloom in the estuary. As the algae die, they use up oxygen at the bottom of the estuary needed by many benthic animals (such as shrimp and crabs).

Remove 1 ***Blue*** block and one ***Yellow*** block

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A large tropical storm has swept through the area. In addition to flooding roads and some homes, the storm waves and high tide have eroded some of the coastal wetlands.

Remove 1 ***Green*** block and one ***Grey*** block

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A group of school kids put on a play for the entire school and community about how climate change affects the local estuary's health and how, by reducing the use of fossil fuels (oil, coal, and gas), people can slow or stop the impacts of climate change.

Add 1 block of any color

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A high marsh was cleared to build new homes along the estuary. After a rainstorm, sediments from the land now flow into the water, preventing sunlight from penetrating the water. Submerged aquatic vegetation (sea grasses) are unable to grow.

Remove 1 ***Green*** block and one ***Blue*** block

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Sea level rise is creating continuous floods in the estuary that kill off plants in parts of the salt marsh where many small fish and shrimp sought refuge and a place to reproduce.

Remove 1 ***Blue*** block and one ***Yellow*** block

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Salt marshes provide essential habitat for wildlife in an estuary. They are great absorbers of carbon dioxide and can protect areas from flooding and sea level rise. The community decides to restore 200 acres of a salt marsh in the estuary.

Add 1 block of any color

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A large ship created an oil spill in the estuary!

Starting with the lower level Remove one block of each color.

Remove 1 of each – *Blue*, *Green*, *Yellow*, *Red* and *Grey*.

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A ship from another country enters the estuary and empties its ballast water that contains an invasive crab species. The invasive crab competes with other native crabs and fish for resources, such as food and hiding places.

Remove 1 *Yellow* block

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Local restaurants partner with a local university to restore oyster reefs by recycling oyster shells. The oyster shells are used to build new reef structure for oyster spat to settle and grow intro a new oyster reef. The increase in oysters in the bay improves water quality.

Add 1 *Blue* block and one *Yellow* block

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Changes to rain patterns and increase water use upstream have decreased the flow of freshwater down the river and into the estuary. Saltier water affects the food availability for migrating birds.

Remove 1 *Yellow* block and one *Red* block

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With a changing climate, water temperatures are reaching extreme highs that are killing off sea grasses, which are a primary breeding ground for crabs. This causes the crab population to decline.

Remove 1 *Yellow* block

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Not cleaning up after your pet outside causes nutrients and bacteria to run off into the estuary's watershed after rainstorms. This creates algal blooms that kill off some species of young marine life.

Remove 1 ***Blue*** block

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The schools in the estuary's watershed decide to educate their students about the affects humans can have on an estuary and encourages students to take the message home to their family and friends.

Add 1 block of any color