HIGH SCHOOL
LESSON GUIDE

Into the Outdoors

EXPLORING THE MANGROVES FOOD WEB

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FUTURE ANGLER™ FOUNDATION
FAF

SPORT FISH RESTORATION

LIFE SCIENCE

GRADE LEVELS
High School - Grades 8-10

CONTENT AREA
Life Science

UNIT THEME
Aquatic Science

TOPIC
Food Chains and Food Webs

TIME REQUIRED
Two, 45-minute sessions

OVERVIEW

The mangrove is one organism that has adapted to the saltwater and the anaerobic conditions of the estuary. That's one reason the mangrove has become a keystone species that defines the ecosystem and serves as a key point for energy flow within the system. The energy flow begins when the photosynthetic activity of the mangroves converts solar energy into chemical energy. Mangrove leaves are periodically dropped and these leaves serve as a major energy source for the rest of the pyramid. Colonies of bacteria decompose the leaf matter, releasing energy that is picked up by plankton and other primary level consumers. These processes form the base of the mangrove food pyramid.

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CONCEPT Mangroves Food Web

ENDURING UNDERSTANDING:

Students will understand the differences in the various levels of the mangrove food web.

CONTENT OBJECTIVES:

Students will be able to define the key lifeforms that make up the different levels in the mangrove food web.

LEARNER OBJECTIVES:

Students will use video, online research and classroom discussion in defining the mangrove food web.

PROCESS OBJECTIVES:

Students will work in small groups to process new information and use evidence to come to conclusions..

MATERIALS NEEDED (each group, each student):

- Internet access to webpage and video http://intotheoutdoors.org/topics/pathways-to-fishing-florida-and-everglades-food-webs/
- Food Web - Word Bank Student Worksheet (free downloadable PDF)

PROCEDURES

Session 1 - Before watching the two videos, or reading the website background information on the web page (http://intotheoutdoors.org/topics/pathways-to-fishing-florida-and-everglades-food-webs/) ask students what they know about the estuary or mangrove food webs. Also ask students how many have actually fished near a mangrove ecosystem and what they know about species that inhabit mangroves.

Have students download and print or distribute the Food Web - Word Bank Worksheet from the website. Instruct students to note organisms from the Word Bank while watching the video. After viewing the video, review and discuss what Word Bank organisms they felt belonged in what level in the mangrove food web pyramid.

Next, divide the class into small groups of two or three students. Have student groups conduct online research (including the "Learn More" section on the website) on each of the words in the Word Bank and place them in the appropriate level in the mangrove food pyramid. Also suggest Google searches for organisms and trophic strategies for mangrove estuaries.

Session 2 - Classroom Discussion

Have each group of students present their findings and the supporting reasons for level placement of some of the key organisms. After all the groups have presented their findings, lead a group discussion on the transfer of energy in the ecosystem. (or lead a group discussion on how energy flows in the ecosystem.) Also contrast and compare the mangrove ecosystem with that of an oak forest.

Conclude the discussion with a sampling of students who might be interested or have the opportunity to be part of a mangrove food web while by being an angler.

ASSESSMENT

Students will be informally assessed based on their participation during class presentations and discussions.

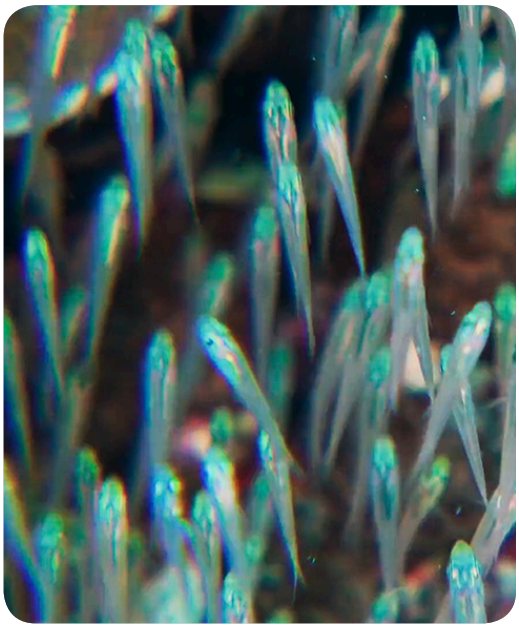
Students can be formally assessed on meeting the formal learning objectives on how thoroughly students completed their Food Web - Word Bank Worksheet.

EXTENSION ACTIVITY

Encourage students to select an aquatic ecosystem that they have visited and are familiar with. Direct students to develop a custom food web worksheet for their select aquatic ecosystem and contrast and compare this new food web with mangrove ecosystem food web. Have student present their findings to the class.

SPECIAL CONSIDERATIONS:

This activity is richest when completed in groups with answers shared to a whole class. The student worksheet is not a typical worksheet as it encourages students to construct knowledge as they answer questions. The questions build off of each other.



RESOURCES

- The link below answers the question, "what is a mangrove forest?" A possible extension question might be, "In the upper mid-west, are there tree or shrub species that provide ecosystem services (holding banks in place, providing shade for aquatic wildlife) similar to mangroves?" https://oceanservice.noaa.gov/facts/mangroves.html
- This link answers the questions, "What is a mangrove and how does it work?":https://www.amnh.org/explore/videos/biodiversity/mangroves-the-roots-of-the-sea/what-s-a-mangrove-and-how-does-it-work

The following **National Common Core Standards** can be met teaching EXPLORING THE MANGROVES FOOD WEB:

CCSS.ELA-LITERACY.L.8.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.
CCSS.ELA-LITERACY.L.8.4 Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on grade 8 reading and content, choosing flexibly from a range of strategies.
CCSS.ELA-LITERACY.RI.8.1 Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
CCSS.ELA-LITERACY.RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts.
CCSS.ELA-LITERACY.RST.6-8.2 Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
CCSS.ELA-LITERACY.RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
CCSS.ELA-LITERACY.SL.8.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
CCSS.ELA-LITERACY.SL.8.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.
CCSS.ELA-LITERACY.SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
CCSS.ELA-LITERACY.SL.8.6 Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.
CCSS.ELA-LITERACY.W.8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
CCSS.ELA-LITERACY.W.8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CCSS.ELA-LITERACY.W.8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
CCSS.ELA-LITERACY.W.8.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.
CCSS.ELA-LITERACY.WHST.6-8.1 Write arguments focused on discipline-specific content.
CCSS.ELA-LITERACY.WHST.6-8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CCSS.ELA-LITERACY.WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
CCSS.ELA-LITERACY.WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research.

National Common Core Standards continued:

CCSS.ELA-LITERACY.L.9-10.1 Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
CCSS.ELA-LITERACY.L.9-10.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9-10 reading and content, choosing flexibly from a range of strategies.
CCSS.ELA-LITERACY.RI.9-10.1 Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
CCSS.ELA-LITERACY.RST.9-10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
CCSS.ELA-LITERACY.RST.9-10.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of text.
CCSS.ELA-LITERACY.RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
CCSS.ELA-LITERACY.SL.9-10.1 Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9-10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
CCSS.ELA-LITERACY.SL.9-10.2 Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.
CCSS.ELA-LITERACY.SL.9-10.3 Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.
CCSS.ELA-LITERACY.SL.9-10.4 Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
CCSS.ELA-LITERACY.SL.9-10.5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
CCSS.ELA-LITERACY.W.9-10.2 Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
CCSS.ELA-LITERACY.W.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
CCSS.ELA-LITERACY.W.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
CCSS.ELA-LITERACY.WHST.9-10.1 Write arguments focused on discipline-specific content.
CCSS.ELA-LITERACY.WHST.9-10.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
CCSS.ELA-LITERACY.WHST.9-10.9 Draw evidence from informational texts to support analysis, reflection, and research.

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Next Generation Science Standards:

MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. [Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.]

MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. [Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.]

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. [Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.]

HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. [Clarification Statement: Examples of models could include simulations and mathematical models.] [Assessment Boundary: Assessment does not include the specific chemical steps of photosynthesis and respiration.]