Level	Marine Animal Tracking and	
High School	Bathymetry	
Time Required	Lesson Summary	
90 min. (2-45 min. class periods or 1 ½ 60 min class periods)	Students will use their knowledge of seafloor features to learn about the movements of marine organisms (e.g. sharks). They will gain an understanding of how marine animals are tagged and tracked with satellite technology as well as gain insight regarding the pros and cons of learning about animal behavior.	
Standards		
NGSS		
HS-PS4-2 Waves and their Applications in Technologies for Information Transfer. Evaluate questions about the advantages of using digital transmission and storage of information.		
Vocabulary	Objectives	
Bathymetry Satellite radiometer SPOT tags PSAT tags	<ul> <li>Students will gain understanding of how electromagnetic energy is used to learn about animal behavior.</li> <li>Students will gain understanding of how technologies, sensors, and tools are expanding our ability to explore the ocean</li> </ul>	
Acoustic tags	<ul> <li>3. Students will observe the movements of marine animals and determine which seafloor features are important for species such as sharks.</li> </ul>	
Acoustic tags	<ul> <li>3. Students will observe the movements of marine animals and determine which seafloor features are important for species such as sharks.</li> <li>Materials</li> </ul>	
Acoustic tags • Headphones • Student compu • Marine Animal (Black & White • Shark Tracker	<ul> <li>3. Students will observe the movements of marine animals and determine which seafloor features are important for species such as sharks.</li> <li>Materials</li> <li>Iter</li> <li>Tracking Worksheet (Color) OR Marine Animal Tracking Worksheet</li> <li>App or Shark Tracker Website (see resources)</li> </ul>	



Prior knowledge of bathymetry and names of seafloor features is needed.

## **Safety Considerations**

None

## **Pacing Notes**

Day I: The Energy to Track Animals Video Sheet, shark tracker activity, read Shark Finning and shark facts article (Homework)

Day 2: Watch preview of "Fin", class discussion

Follow-Up (I - 3 weeks after completion of lesson): finish shark tracker sheet

## Before the Lesson

Students should be fluent in the area of bathymetry. Instruction on how sonar is used to collect bathymetric data should be covered prior to this activity. Students should be familiar with the following terms; continental shelf, continental slope, continental rise, seamount, abyssal plain, trench, mid-ocean ridge

Assessments	Classroom Instructions
Pre-Activity Assessments	Introduction
Discuss answers to the Google Maps activity. Determine whether the students have a decent grasp of the bathymetric features. If not reteach before starting the lesson.	While you take attendance, have Google maps projected on the board with several bathymetric features marked. Ask students to quietly write down what they think each feature is named.
Activity Embedded Assessments	Activities
Stop between each	I. Introduce radio tracking of animals by watching three short videos.



video and Ask: Who missed something important from the video? (This should be the answer to one of the questions) Allow the other students to provide the information.	<ul> <li>a. Hand out the video sheet. Encourage students to read through the questions before the videos start.</li> <li>b. Video one: What is the Electromagnetic Spectrum <a href="https://www.youtube.com/watch?v=m4t7gTmBK3g">https://www.youtube.com/watch?v=m4t7gTmBK3g</a></li> <li>c. Video two: Radio Waves <a href="https://www.youtube.com/watch?v=OzDmEA8x0nQ">https://www.youtube.com/watch?v=OzDmEA8x0nQ</a></li> <li>d. Radio tracking wildlife <a href="https://www.youtube.com/watch?v=gXCrvnTilgl">https://www.youtube.com/watch?v=gXCrvnTilgl</a></li> </ul>
sheet and grade.	
If students seem distracted during the discussion consider asking them one of the questions.	<ul> <li>2. Class discussion After the videos have finished lead a short discussion. Consider using some of the following questions in addition to your own. What types of things do we use the electromagnetic spectrum for? Do you use the electromagnetic spectrum everyday? How? Why do you think people would choose to use a tag to track wildlife rather than just tracking them (following them)? Why do you think people are interested in tracking sharks? </li> </ul>
Walk around while students are working. Check their understanding by asking some of the following questions.	<ul> <li>3. Snark Tracker</li> <li>a. This web page, <u>https://www.ocearch.org/tracker/</u>, was created by OCEARCH - a global non-profit organization conducting research on mainly sharks. Their mission is to accelerate Earth's ocean's return to balance and abundance through research, education, outreach, and policy development. You'll notice that a lot of the tags are not currently active. While the students can still learn about animals and their movements from these tags if you want them to use active tags look for a circle radiating outward from a point.</li> <li>b. Introduce the Shark Tracker Worksheet. Have students complete the worksheet while working in pairs, with each student completing their own document.</li> </ul>
Where did you find this information?	
What kind of tag	



Collect and grade the shark tagging sheet. dis add the tag 4. I	<ul> <li>a. Discussion.</li> <li>After students have completed the worksheet hold a class iscussion. Consider asking some of the following questions in ddition to your own.</li> <li>Why are marine animals tracked?</li> <li>What tools are used to track marine animals?</li> <li>Do the SPOT tags hurt or hinder the shark?</li> <li>What are some pros and cons of using the SPOT tags?</li> <li>How are satellites used to track marine animals? (What part of ne electromagnetic spectrum is used to communicate between the ag and the satellite?)</li> <li>Homework Activity</li> <li>Have students read the sections on shark finning and shark fin facts</li> </ul>
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Post Activity Assessments	Closure
Quiz - Use a marine animal track projected on the board. Ask students to list the seafloor features the organism traveled over or close to. Have students write a short paragraph as to why they feel the organism will stay over certain features. mod	Day 2 1. Class discussion Hold a class discussion on last night's homework reading. Consider sing some of the following questions in addition to your own. What do sharks use their fin for? What is a sharks fin made of? What happens to a shark if its fin is cut off? Why are people finning sharks? How does a loss of sharks affect the ecosystem? Why is it important that we track marine animals? Why is it important to understand seafloor features? How does satellite technology help us understand animal novement and seafloor structure? bollow-Up: Students should complete the final portion of the data



frame: I - 3 weeks after initial observation)		
Educator Resources		
<u>Shark Tracker Website</u> <u>Shark Tracker App</u>		
Satellite Info: <u>Satellite Telemetry and Its Impact on Animal Migration</u> (website) <u>Wildlife Journal Junior: Tracking Wildlife</u> , New Hampshire PBS website		
Shark Extension Topic: <u>Shark Fin Soup</u> Article by Leaders in Wildlife Conservation <u>Shark Finning and Shark Fin Facts</u> (website) by Shark Stewards <u>"Fin"</u> , Preview of Eli Roth's shark documentary on Shark Finning		
Turtles: <u>Tour de Turtles</u> Race (all web pages last accessed 6/7/23)		
Acknowledgment		
The creation of the lessons in this series was funded by a generous grant from the National Science Foundation (NSF). The lessons were created as part of the SpectrumX project at the National Radio Astronomy Observatory (NRAO).		
Below is a list of the lesson titles included in the series. All lessons can be accessed from this web page, <u>https://superknova.org/educational-resources/</u> .		
Middle School		
Introduction to Satellites		
Weather Predicting		
Introduction to Radio Wave Communication		
The Importance of Radio Astronomy		
Cubesat Model Building		
Understanding FM Radio		
Radio Frequency Technology		
Who Decides if You Get 5G?		
High School		
The Uses of Radio Waves and Frequency Allocation		



Is Radio Technology Safe? Diffraction of Radio Waves Measuring Sea Surface Temperatures with Satellites Marine Animal Tracking and Bathymetry How to Design Your Own Crystal Radio How Radio Waves Changed the World Simple Wireless Communication Seeing and Hearing the Invisible Local Wireless Radio Frequency Communication Investigating the Internet Connection The Geometry of Radio Astronomy

> Informal Modeling Radio Astronomy



