Science Unit: ***Animals, Matter, and Mankind in the Environment***

Lesson 4: ***Satellite Tag Scavenger Hunt***

Summary:	Students use **rented avalanche beacons** to create a **simulation** (outside on the school grounds) that illustrates how scientists use **satellite tags** to track migratory species like **leatherback sea turtles**.
School Year:	2013/2014
Developed for:	Renfrew Elementary School, Vancouver School District
Developed by:	Sheila Thornton (scientist); Jessica Wersta-Duncan and Lucia Bildstein (teachers)
Grade level:	Presented to grade K/1/2; appropriate for grades K-4 with age appropriate modifications
Duration of lesson:	2 hours
Notes:	Prior to this session, identify suitable locations for satellite tagged animals (bushes, trees, in schoolyard, etc). Reserve avalanche beacons for a midweek session well in advance, from an organization such as Mountain Equipment Co-op (MEC). Fifteen beacons will be sufficient for four animals and 11 groups of four students; if budget allows, provide two beacons per group. Discounts for groups or for midweek rentals may be offered; during the ski season, beacon availability may be limited but is much higher mid-week. IMPORTANT – rental of beacons does not include batteries; therefore, budget for purchase and allow time to install batteries in all the transceivers prior to the session.

Objectives

Students will be able to:

1. Gain an appreciation for the challenges faced by species undertaking trans-ocean migrations
2. Understand the migratory patterns and life history of the Leatherback Sea Turtle
3. Appreciate the difficulties in researching pelagic (open ocean) species
4. Explore the methodologies used to track pelagic species through the use of radio and satellite tags

Background Information

One of the difficulties encountered by scientists is trying to observe and follow animals to gain information without disturbing them.

Imagine if your parents wanted to know *exactly* what you did all day - where you went, what part of the playground you played in during recess, where you sat at the lunch table. And then imagine what it would be like if they followed you around all day in order to get that information. Would your behaviour change if they were watching you all the time?

It's the same thing with wild animals. When scientists are trying to find out information about what animals do, where they go, what they eat, where they spend their time, they have to be very careful that their presence doesn't change the behaviour of the animals that are being observed.

Technology has been very useful in assisting scientists with this task. Remote cameras allow researchers to observe animals without disturbing them, but are only useful if you know where the animals are going to be, so that you can set up a camera to record their behaviour.

With migratory animals that travel great distances, or aquatic species that spend a significant portion of their time out of sight and underwater, the task is even more challenging.

A number of tools have been developed to assist in studies of wild animals. ***Tags*** that collect data on time, temperature, location, diving depth, speed of movement and other factors have allowed scientists to enter into the world of an animal.

One type of tag is called an ***archival tag***. Archival tags are mini-computers with hard drives that record and store data, which can then be downloaded to a desktop computer and analysed. The disadvantage to archival tags (record-keeping or data-logging tags) is that they need to be retrieved from the animal in order to collect the data. In the case of a species like the leatherback sea turtle, it may be very difficult to retrieve the tag, as the turtles migrate for thousands of kilometers across an entire ocean.

Satellite tags are another type of tag that is useful (but expensive) for tracking migratory and aquatic animals. These tags collect data as the animal travels and regularly upload it to a satellite orbiting the earth. A scientist may then download the data to their computer as the animal continues on its migration, allowing for real-time tracking of an individual as it crosses the ocean.

Vocabulary

Migration	The act of moving from one region to another
Benthic	The region at the bottom of an ocean or lake
Pelagic	Relating to, living or occurring in the sea far from shore
Satellite	A spacecraft that is sent into orbit to gather or send back information to earth

Materials

- Avalanche beacons
- BATTERIES for avalanche beacons
- Plastic bag or container
- CBC *Nature of Things* documentary (“Trek of the Titans”)
- “Research animal” (stuffed toy or plastic figure)

In the Classroom

Introductory Discussion

1. The ancestors of leatherback sea turtles have been around since dinosaurs roamed the earth. This ancient species swims faster, travels further, and dives deeper than any other reptile on the planet. It is the largest reptile that exists on earth, and may exceed two metres in length and weigh more than 900 kg. Surprisingly, this turtle grows from a hatchling that could easily fit in the palm of your hand, to massive proportions, fuelled by… jellyfish!
    - How many jellyfish do you think a turtle would have to eat each day? It is estimated that the average leatherback sea turtle consumes about 250 jellyfish every day, which is equivalent to ~75% of their body mass. In elementary student terms, this would be equivalent to a 20 kg kindergartner consuming 15 kg of food!
    - Can you guess why they migrate across the oceans?
    - What do you think might cause difficulties for the leatherback on its journey across the sea? (Fishing nets, plastic bags, ocean pollution, etc).

2. Screen the *CBC Nature of Things* documentary "Trek of the Titans" for an excellent discussion on turtle migration, satellite tag installation and use by a Canadian leatherback sea turtle biologist, and threats to the turtles on the nesting beaches and during migration. Screen the film in its entirety or select portions to highlight areas of interest.

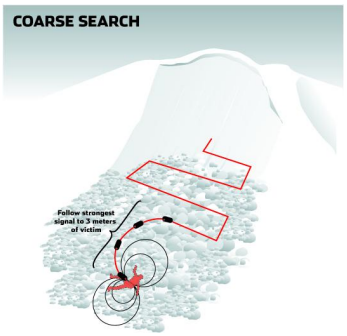
Science Activity

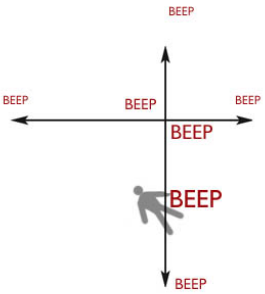
Set-up

1. Prepare one "animal" for each group of students (a large ziplock bag with a stuffed toy inside works well).
2. Place a "tag" (paper information slip containing facts about the animal) inside the bag.
3. Enlist mentor students/group leaders if possible. During the lecture portion of the class, send group leaders out into the school ground with instructions on where to hide the animals.
4. All transceivers with the animals should be set to TRANSMIT.
5. Divide the children into groups of four or five, with one mentor/leader per group.

Provide instructions to the group for use of the satellite transmitter (avalanche beacon):

1. Each group will move to a corner of the school ground to begin their search (research base).
2. Once in position, a leader will be tasked with holding the transceiver, and will switch it from TRANSMIT to RECEIVE (do not switch them on until immediately before the search, as they will pick up signals from all the transceivers around them). They are now ready to pick up signals from the tagged animals.
3. Have the students walk out in a pre-determined distance (this will depend on your search area and will be established by the teacher/scientist team during the scouting phase). Use either an alternating U pattern or a spiral (large concentric circles within the search area, moving inward until a signal is acquired).





4. Once a signal is acquired, head in the direction of the signal until it begins to fade.
5. Turn 90˚ to the left or right. If the signal is increasing in strength, continue onward to find the strongest point.
6. Once the students have found a tagged animal, have them remove a data point tag from the bag and set out to find another animal.
7. Have all the students return to the classroom at a predetermined time, and instruct the mentors to gather the animals/transceivers.