

APPENDIX



APPENDIX:

GLOSSARY OF TERMS

TERM	LESSON	PART OF SPEECH	DEFINITION
Algal blooms	3	<i>Noun</i>	A large, rapid increase in the amount of algae in a body of water caused by excess nutrients from outside sources (such as fertilizers or sewage), and sometimes having harmful effects on humans and wildlife.
Ambush	3	<i>Verb</i>	To make a surprise attack from a hidden position.
Annual cycle	1	<i>Noun</i>	The phases that occur in an animal's life over the course of a year. For migratory birds, the annual cycle consists of a breeding season, a non-breeding season, and two migration periods.
Archival GPS tags	2	<i>Noun</i>	A small device that receives signals from orbiting satellites and stores this information on a tiny computer located inside of the tag. When attached to an animal these devices allow researchers to track the animal's movements.
Argos tag	2	<i>Noun</i>	A tracking device that transmits signals to a system of satellites called Argos orbiting in space. The satellites transfer information about the location of the tracking device to computers on earth.
Biomagnification	3	<i>Noun</i>	The accumulation of substance, such as a pesticide or other chemical, as it is eaten by organisms progressively higher up the food chain.
Biome	1	<i>Noun</i>	A region of the Earth with a characteristic climate and plant life.
Bird band	2	<i>Noun</i>	A small, individually numbered metal or plastic tag that is attached to the leg or wing of a wild bird to enable individual identification. Colored bands are often added to enable identification without having to recapture the bird. By re-sighting (color band only) or recapturing (metal band) individuals we can determine how long a bird survives and observe its movements.
Bird-safe glass	4	<i>Noun</i>	Glass designed to be more visible to birds so that birds do not fly into it and get injured or killed.
Breeding grounds	1	<i>Noun</i>	The region where an animal lives while reproducing.



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Brood	4	<i>Noun</i>	A group of eggs or nestlings in a nest.
Cannon net	2	<i>Noun</i>	A large net that is shot out of small cannon so that it lands over a group of birds on the ground, trapping them underneath.
Climate	1	<i>Noun</i>	Weather conditions averaged over a long period of time.
Clutch	1, 3	<i>Noun</i>	The group of eggs laid in a nest.
Conservation	3	<i>Noun</i>	The act of protecting the natural environment for species preservation, recreation, or economic reasons.
Dependent Variable	3	<i>Noun</i>	A community of organisms and their physical environment.
Ecosystem	3	<i>Noun</i>	A community of organisms and their physical environment
Electromagnetic wave	2	<i>Noun</i>	A form of energy that moves as electric and magnetic waves. Examples include radio waves, which cannot be seen, and visible light.
Endangered	4	<i>Noun</i>	At great risk of extinction.
Estuary	1	<i>Noun</i>	A body of water where fresh water from a river mixes with salt water from the ocean.
Fledging	1	<i>Verb</i>	The time in a young bird's life when its wings and muscles have developed enough for it to leave the nest and begin flying. A bird that has reached this stage is called a fledgling.
Foraging	1	<i>Verb</i>	Searching for food.
Full annual cycle	1	<i>Noun</i>	<i>See annual cycle.</i>
Game bird	1	<i>Noun</i>	A bird hunted for sport or food.
Global Positioning System (GPS)	2	<i>Noun</i>	A system of satellites and receiving devices used to determine the location of something on Earth.
Habitat	1	<i>Noun</i>	The natural home or environment of a living organism.



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Homing method	2	<i>Noun</i>	A method of directly locating an animal by using an antenna and receiver to follow radio signals coming from a transmitter attached to an animal.
Hypothermia	1	<i>Noun</i>	A serious condition that occurs when the body temperature gets too low.
Incubate	1, 3	<i>Verb</i>	To keep eggs warm so that the young inside can develop.
Independent Variable	4	<i>Noun</i>	A variable whose variation does not depend on that of another. Often denoted by x and demonstrated on the x-axis.
Latitude	1	<i>Noun</i>	Imaginary lines around the Earth that are parallel to the equator and are used to describe the distance of a point north or south of the equator. Expressed in degrees, latitude ranges from 0° at the equator to 90° at the North Pole and -90° at the South Pole.
Lichen	1	<i>Noun</i>	A composite organism that is composed of an algae and fungus.
Light-level geolocator	2	<i>Noun</i>	A lightweight, electronic tracking device, usually used in bird migration research to map migration routes, identify important staging areas, and sometimes provide additional ecological information. A geolocator periodically records ambient light level to determine location.
Longitude	1	<i>Noun</i>	Imaginary lines from pole to pole around the earth that are used to describe the distance of a point east or west of a line called the prime meridian. Expressed in degrees, longitude ranges from 0° at the prime meridian to 180° east of this line and -180° west of this line.
Mangrove forest	1	<i>Noun</i>	A coastal forest habitat that can grow in salt water. Mangrove help control flooding and are known for hosting a high diversity of animal life.
Migration	1	<i>Noun</i>	Seasonal movement of animals between one region where breeding takes place and another.
Migratory birds	1	<i>Noun</i>	Birds that move between one region where breeding takes place and another in response to seasonal changes in the availability of food.
Migratory connectivity	1	<i>Noun</i>	Links between the breeding, migration, and overwintering phases of a migratory animal's annual cycle.



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Mist net	2	<i>Noun</i>	Tall, long nets used to trap birds for research purposes. Nets are made out of very fine threads making them difficult for birds to see.
Model	4	<i>Noun</i>	A model represents a person, thing, or system. A computer model is a program designed to simulate what might or did happen in a situation.
Morphology	3	<i>Noun</i>	The size, shape and structure of a living thing.
Mudflat	1	<i>Noun</i>	A flat area of muddy land near the sea that is exposed when the tide goes out.
Overwinter	1	<i>Verb</i>	To spend the winter.
Passive Integrated Transponder (PIT Tag)	2	<i>Noun</i>	An electronic microchip that can be glued to a bird band, attached to a bird's leg, or inserted surgically under the bird's skin. PIT tags require no batteries, so can theoretically last for a bird's entire life. PIT tags can only be read a very short distance from receiving stations.
Permafrost	1	<i>Noun</i>	A layer of soil that remains frozen throughout the year.
Pine stands	4	<i>Noun</i>	A growth of pine trees covering a specific area that are the same species with similar size compared to the rest of the forest area.
Qualitative	4	<i>Adjective</i>	Relating to a non-numeric measurement.
Radio antenna	2	<i>Noun</i>	A device that captures or transmits radio waves.
Radio receiver	2	<i>Noun</i>	A device that picks up a signal or information. In radio telemetry, the receiver picks up a signal in the form of an electromagnetic wave and converts it into a sound.
Radio telemetry	2	<i>Noun</i>	A tracking technique that uses an antenna and receiver to locate an animal wearing a device that transmits radio signals.
Radio transmitter	2	<i>Noun</i>	A device that produces and sends out a signal or information.
Raptor	3	<i>Noun</i>	A type of bird of prey that often has strong talons and keen vision or hearing.



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Reproductive success	4	<i>Noun</i>	The number of offspring produced by an individual or pair.
Satellite telemetry	2	<i>Noun</i>	Following an object on the Earth's surface through the use of orbiting satellites. A Platform Terminal Transmitter (PTT) is attached to the bird. The PTT sends a signal full of information to an orbiting satellite. The satellite re-transmits the data to a receiving station, which researchers then access through their computer.
Satellite transmitter	2	<i>Noun</i>	A device that emits signals to orbiting satellites. When attached to an animal, these devices allow researchers to track the animal's movements.
Scrub habitat	4	<i>Noun</i>	Habitats dominated by shrubs.
Schematic	2	<i>Noun</i>	A diagram that displays how something is made.
Suppression	4	<i>Noun</i>	Keeping something from happening.
Tracking technology	2	<i>Noun</i>	Methods used to determine the location and follow the movements of something or someone.
Tree canopy	2	<i>Noun</i>	The upper branches and leaves of trees.
Triangulation	2	<i>Noun</i>	A method of indirectly estimating the location of a radio transmitter attached to an animal. Starting from three different locations, the direction radio signals are coming from are observed and then drawn as lines on a map. Where the lines intersect indicates the location of the animal.
Wintering grounds	1	<i>Noun</i>	The region where an animal spends the winter. For migratory birds this refers to where they migrate to and live during the time of year when they are not nesting and raising young.



APPENDIX:

WEBSITES REFERENCED

LESSON 1

- Follow that Bird! Website
<https://nationalzoo.si.edu/migratory-birds/follow-bird>
- Migratory Connectivity Project
<http://www.migratoryconnectivityproject.org/>
- Smithsonian Insider Article: Satellite Tracking Helps with Curlew Conservation
<http://insider.si.edu/2015/05/satellite-tracking-helps-with-curlew-conservation/>
- Smithsonian's National Museum of Natural History Black-bellied Plover Info Sheet
<https://dcbirds.si.edu/bird/black-bellied-plover>
- Smithsonian's National Zoo and Conservation Biology Institute Black-crowned Night Heron Fact Sheet
<https://nationalzoo.si.edu/animals/black-crowned-night-heron>
- Smithsonian's National Zoo and Conservation Biology Institute Brown Pelican Fact Sheet
<https://nationalzoo.si.edu/animals/brown-pelican>
- Smithsonian's National Zoo and Conservation Biology Institute Texas Shorebird Expedition Blog
<https://nationalzoo.si.edu/migratory-birds/news/texas-shorebird-expedition-blog>

LESSON 2

- LoJack
<https://www.lojack.com/>
- NOAA Solar Calculator
<https://www.esrl.noaa.gov/gmd/grad/solcalc/>
- Smithsonian Channel "Wild Inside the National Zoo" Video on Black-crowned Night Herons
<http://www.smithsonianchannel.com/videos/wild-inside-the-national-zoo-the-great-night-heron-mystery/33474>

LESSON 3

- Smithsonian.com Article: Popular Pesticides Linked to Drops in Bird Populations
<https://www.smithsonianmag.com/science-nature/popular-pesticides-linked-drops-bird-population-180951971/>

LESSON 4

- SageModeler
<https://codap.concord.org/releases/latest/static/dg/en/cert/index.html#shared=16233>
- SageModeler - Intro Video
<https://drive.google.com/file/d/0ByX3PPKyWVhHUEJYbFRIX0hxUEk/view>
- SageModeler - Kirtland's Warbler Application
<https://codap.concord.org/releases/latest/static/dg/en/cert/index.html#shared=27129>
- SageModeler - Full Population Model
<https://codap.concord.org/releases/latest/static/dg/en/cert/index.html#shared=31780>

OTHER

- Smithsonian's National Zoo and Conservation Biology Institute
<https://nationalzoo.si.edu/>
- Smithsonian Migratory Bird Center
<https://nationalzoo.si.edu/migratory-birds>
- Experience Migration Exhibit
<https://nationalzoo.si.edu/animals/exhibits/experience-migration>





THE END

Photo by Tim Romano, Smithsonian's National Zoo



Thank You!

THANK YOU FOR PARTICIPATING IN
FOLLOW THAT BIRD! A SCIENCE AND TECHNOLOGY UNIT ON TRACKING BIRDS.
WE HOPE YOU AND YOUR STUDENTS HAD A WILD TIME WITH IT!

Questions or feedback? Email FONZed&volunteers@si.edu



<https://nationalzoo.si.edu/migratory-birds/follow-bird>



Smithsonian Conservation Biology Institute
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