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# K-12 Partnership Lesson Plan

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# *Habitat Loss and Fragmentation*

# *The Good, Bad, and Ugly*

## Overview

Habitat fragmentation is visible all over Michigan. Roads, lawns, buildings, farmland, and other changes in habitat have turned our state, and most others, into a huge patchwork quilt of ecotypes. Unfortunately, the lines between those quilt squares and the small size of those patches has had a huge impact on the wildlife that call Michigan home. Come join us for a session of active games and prizes. You can really see what impacts fragmentation has by putting yourself in the shoes of the critters dealing with the changes we make. Weather permitting we will head outside for some fun, so come dressed for the chill in the air and be prepared to get active and have fun!

**Objectives**

At the conclusion of the lesson, students will be able to:

* Explain how habitat fragmentation can influence the survival and reproduction of two competing species
* Describe the recent, 400 year history of land use change in the Great Lakes Region
* Identify causes and consequences of land use change and habitat fragmentation
* Understand why it is difficult for small populations to survive
* Identify some key endangered species in Michigan

**Length of Lesson**

1 hour

**Grade Levels**

6-9

**Standards covered (NGSS)**

Disciplinary Core Ideas:

* **MS-LS2-1**: analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem
* **MS**-**LS2-4**: construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
* **MS**-**LS2-2**: construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems
* **MS**-**LS2-5**: evaluate competing design solutions for maintaining biodiversity and ecosystem services
* **MS**-**LS1-4**: use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively
* **MS**-**ESS3-4**: construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact earth’s systems.

Cross Cutting Concepts:

* Patterns
* Systems and system models
* Stability and change of systems

Science and Engineering Practices

* Developing and using models
* Analyzing and interpreting data
* Engaging in argument from evidence

***Previous Michigan Standards Met:***

* **L3.p2B:** describe common ecological relationships between and among species and their environments (competition, territory, carrying capacity, natural balance, population, dependence, survival, and other biotic and abiotic factors)
* **L3.p3A:** identify the factors in an ecosystem that influences fluctuations in population size
* **L3.p4A:** recognize that, and describe how, human beings are part of Earth’s ecosystems. Note that human activities can deliberately or inadvertently alter the equilibrium in ecosystems.
* **B3.4C:** examine the negative impact of human activities
* **B3.5C:** predict the consequences of an invading organism on the survival of other organisms
* **B3.5d**: describe different reproductive strategies employed by various organisms and explain their advantages and disadvantages
* **L5.p1C**: explain how extinction removes genes from the gene pool

**Materials**

* 20 containers with lids for food
* 2 different types of candy or reward (multiple pieces per type)
* 20 red flags, 20 blue flags, 20 white flags, 20 yellow flags
* 45 red eggs, 45 green eggs, 45 blue eggs (you may substitute any object that symbolizes an egg)
* Stop watch
* Whistle to signal time

**Background**

Habitat fragmentation is visible all over Michigan. Roads, lawns, buildings, farmland, and other changes in habitat have turned our state, and most others, into a huge patchwork quilt of ecotypes. Unfortunately, the lines between those quilt squares and the small size of those patches has had a huge impact on the wildlife that call Michigan home. This activity helps to highlight the impacts fragmentation has by putting yourself in the shoes of the critters dealing with the changes we make. The Kirtland’s warbler is an endangered bird species that only nests in young jack pine forests of central and northern Michigan. Two challenges that limit the population size of this species is habitat availability and brood parasitism by the brown headed cowbird, which inhabit open areas and invaded areas in Michigan after deforestation and conversion to agriculture. The cowbirds lay their eggs in the nests of the warblers, and the offspring often out-compete the warbler offspring for food and essential resources. For more information about these organisms, see Michigan Natural Features Inventory summary on the Kirtland’s warbler at

<http://mnfi.anr.msu.edu/abstracts/zoology/dendroica_kirtlandii.pdf>.

Students in this activity take the roles of the two different species, and play a game to find out which species are most successful in a fragmented environment.

### Activities of the session

1. Prior to the activity, identify locations for food containers, wintering grounds and nest building materials. Fill 10 containers with mostly Life Savers and a few Jolly Ranchers. Place these containers in open areas of the game area, because they contain mostly Brown Headed Cowbird food. In the other 10 containers, fill them with mostly Jolly Ranchers and a few Life Savers. Place these containers in the forested areas because they are filled with Kirtland’s warbler food. You may choose to fill some containers with only one type of food.
2. Play the game with the students using the rules on the activity sheets (found on the “Habitat Loss and Fragmentation” lesson page on the KBS GK-12 website).
3. Discuss with the students the following questions
4. Which of the three groups was the most successful at surviving?
5. Which of the three groups was most successful at reproducing?
6. Why was it difficult for the Kirtland’s warblers to reproduce and find enough food?
7. Would it have been easier if the forested areas were larger or less fragmented?
8. What advantage did the cowbirds have?
9. Were the resistant warblers more successful than the susceptible cowbirds?

**Resources**

* Michigan Natural Features Inventory Kirtland’s Warbler summary: <http://mnfi.anr.msu.edu/abstracts/zoology/dendroica_kirtlandii.pdf>
* Michigan Natural Features Inventory Special Animals list: <http://mnfi.anr.msu.edu/data/specialanimals.cfm>
* Michigan Natural Features Inventory Special Plants list: <http://mnfi.anr.msu.edu/data/specialplants.cfm>
* All game materials available on the “Habitat Loss and Fragmentation” lesson page on the KBS GK-12 website.